



## Low drop fixed and adjustable positive voltage regulators

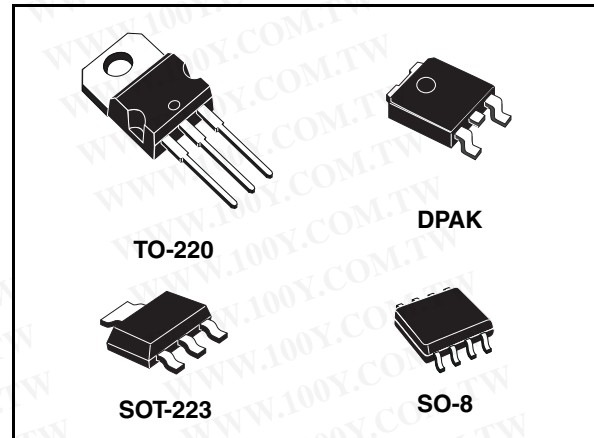
### Features

- Low dropout voltage (1 V typ.)
- 2.85 V Device performances are suitable for SCSI-2 active termination
- Output current up to 800 mA
- Fixed output voltage of: 1.2 V, 1.8 V, 2.5 V, 2.85 V, 3.0 V, 3.3 V, 5.0 V
- Adjustable version availability ( $V_{ref} = 1.25$  V)
- Internal current and thermal limit
- Available in  $\pm 1\%$  (at 25 °C) and 2% in full temperature range
- Supply voltage rejection: 75 dB (typ.)

### Description

The LD1117 is a low drop voltage regulator able to provide up to 800 mA of output current, available even in adjustable version ( $V_{REF} = 1.25$  V). Concerning fixed versions, are offered the following output voltages: 1.2 V, 1.8 V, 2.5 V, 2.85 V, 3.0 V, 3.3 V and 5.0 V. The 2.85 V type is ideal for SCSI-2 lines active termination. The device is supplied in: SOT-223, DPAK, SO-8 and TO-220.

The SOT-223 and DPAK surface mount packages optimize the thermal characteristics even offering a relevant space saving effect.



High efficiency is assured by NPN pass transistor. In fact in this case, unlike than PNP one, the quiescent current flows mostly into the load. Only a very common 10  $\mu$ F minimum capacitor is needed for stability. On chip trimming allows the regulator to reach a very tight output voltage tolerance, within  $\pm 1\%$  at 25°C. The adjustable LD1117 is pin to pin compatible with the other standard. Adjustable voltage regulators maintaining the better performances in terms of drop and tolerance.

勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-54151736  
勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

Table 1. Device summary

| Part numbers |             |             |
|--------------|-------------|-------------|
| LD1117XX12   | LD1117XX25C | LD1117XX50  |
| LD1117XX12C  | LD1117XX28  | LD1117XX50C |
| LD1117XX18   | LD1117XX30  | LD1117XX    |
| LD1117XX18C  | LD1117XX33  | LD1117XXC   |
| LD1117XX25   | LD1117XX33C |             |

# Contents

|    |   |    |
|----|---|----|
| 1  | Diagram .....                             | 5  |
| 2  | Pin configuration .....                   | 6  |
| 3  | Maximum ratings .....                     | 7  |
| 4  | Schematic application .....               | 8  |
| 5  | Electrical characteristics .....          | 9  |
| 6  | Typical application .....                 | 23 |
| 7  | LD1117 adjustable: application note ..... | 26 |
| 8  | Package mechanical data .....             | 27 |
| 9  | Order code .....                          | 39 |
| 10 | Revision history .....                    | 40 |

勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-54151736  
勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

## List of figures

|            |  |    |
|------------|--|----|
| Figure 2.  | Pin connections (top view) . . . . .   | 6  |
| Figure 3.  | Application circuit (for 1.2 V) . . . . .                                      | 8  |
| Figure 4.  | Application circuit (for other fixed output voltages) . . . . .                | 8  |
| Figure 5.  | Negative supply . . . . .  | 23 |
| Figure 6.  | Active terminator for SCSI-2 BUS . . . . .                                     | 23 |
| Figure 7.  | Circuit for increasing output voltage . . . . .                                | 23 |
| Figure 8.  | Voltage regulator with reference . . . . .                                     | 24 |
| Figure 9.  | Battery backed-up regulated supply . . . . .                                   | 24 |
| Figure 10. | Post-regulated dual supply . . . . .   | 25 |
| Figure 11. | Adjustable output voltage application . . . . .                                | 26 |
| Figure 12. | Adjustable output voltage application with improved ripple rejection . . . . . | 26 |
| Figure 13. | Drawing dimension DPAK (type STD-ST) . . . . .                                 | 30 |
| Figure 14. | Drawing dimension DPAK (type FUJITSU-SUBCON.) . . . . .                        | 31 |
| Figure 15. | Drawing dimension DPAK (type IDS-SUBCON.) . . . . .                            | 32 |
| Figure 16. | DPAK footprint recommended data . . . . .                                      | 34 |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

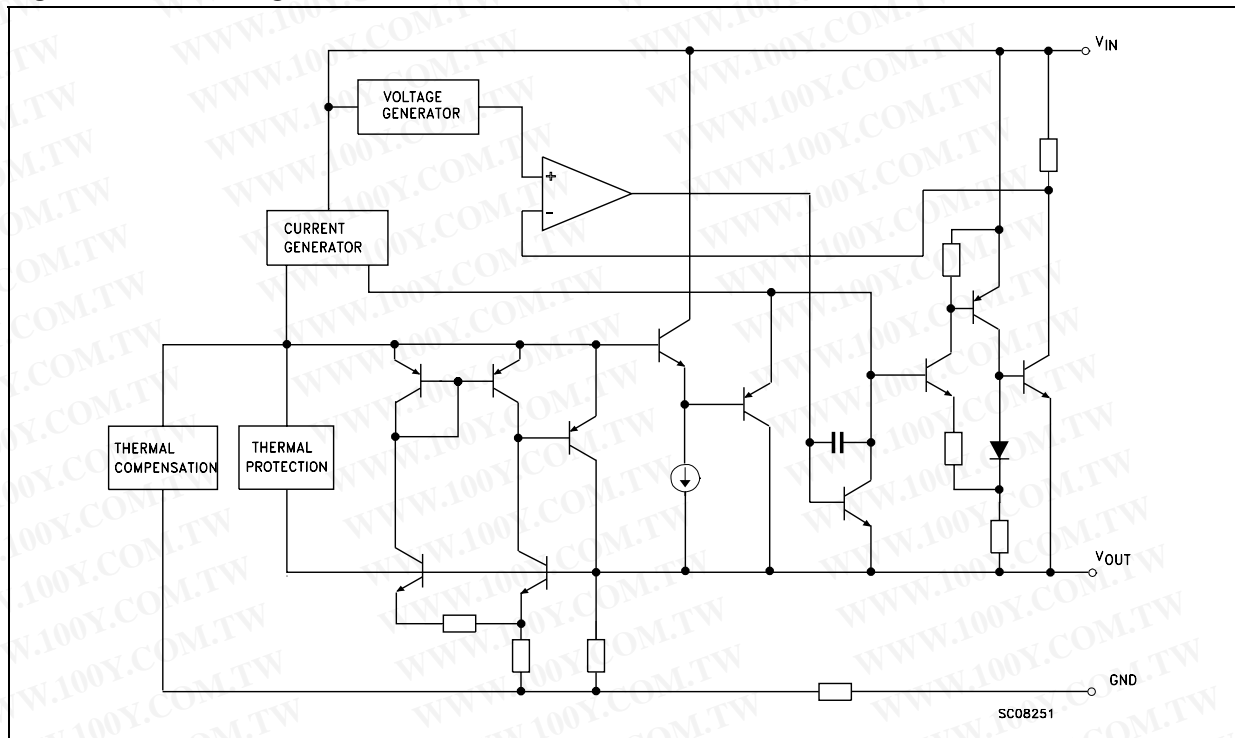
## List of tables

|           |  |    |
|-----------|--|----|
| Table 1.  | Device summary                                     | 1  |
| Table 2.  | Absolute maximum ratings                           | 7  |
| Table 3.  | Thermal data                                       | 7  |
| Table 4.  | Electrical characteristics of LD1117#12            | 9  |
| Table 5.  | Electrical characteristics of LD1117#18            | 10 |
| Table 6.  | Electrical characteristics of LD1117#25            | 11 |
| Table 7.  | Electrical characteristics of LD1117#28            | 12 |
| Table 8.  | Electrical characteristics of LD1117#30            | 13 |
| Table 9.  | Electrical characteristics of LD1117#33            | 14 |
| Table 10. | Electrical characteristics of LD1117#50            | 15 |
| Table 11. | Electrical characteristics of LD1117 (adjustable)  | 16 |
| Table 12. | Electrical characteristics of LD1117#12C           | 17 |
| Table 13. | Electrical characteristics of LD1117#18C           | 18 |
| Table 14. | Electrical characteristics of LD1117#25C           | 19 |
| Table 15. | Electrical characteristics of LD1117#33C           | 20 |
| Table 16. | Electrical characteristics of LD1117#50C           | 21 |
| Table 17. | Electrical characteristics of LD1117C (adjustable) | 22 |
| Table 18. | DPAK mechanical data                               | 33 |
| Table 19. | Footprint data                                     | 34 |
| Table 20. | Order code   | 39 |
| Table 21. | Document revision history                          | 40 |

勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-54151736  
勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

# 1 Diagram

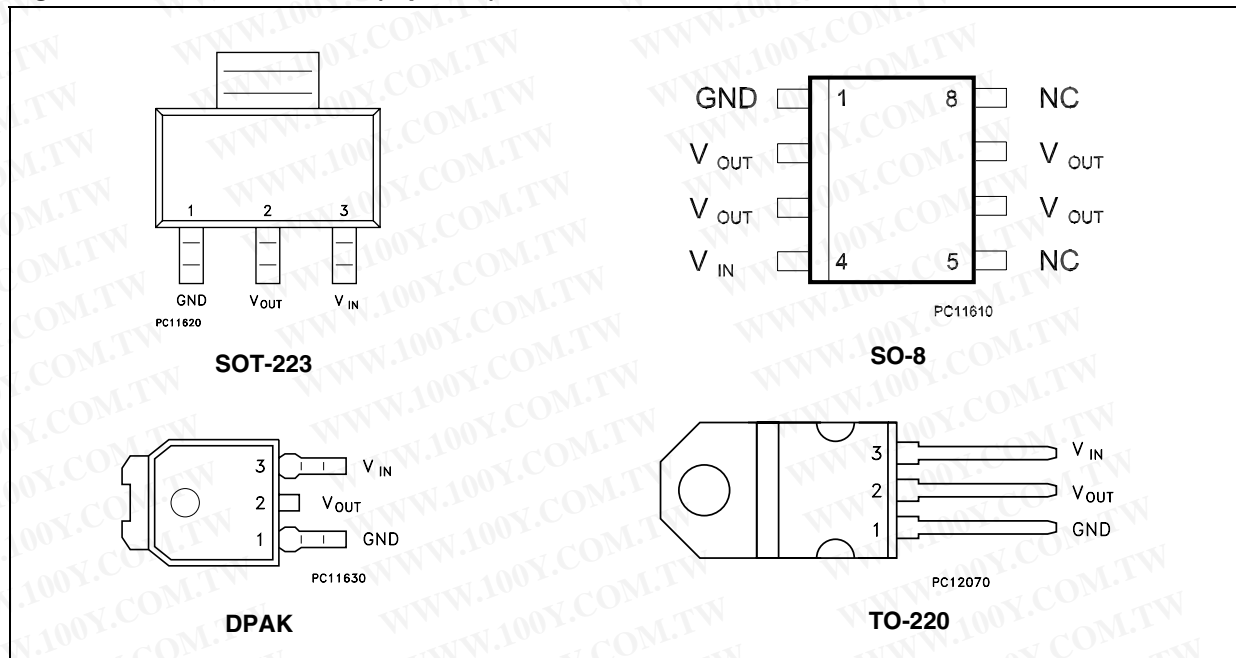
Figure 1. Block diagram



勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-54151736  
勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

## 2 Pin configuration

Figure 2. Pin connections (top view)



Note: The TAB is connected to the V<sub>OUT</sub>.

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

### 3 Maximum ratings

**Table 2. Absolute maximum ratings**

| Symbol    | Parameter                            | Value                | Unit        |
|-----------|--------------------------------------|----------------------|-------------|
| $V_{IN}$  | DC input voltage                     | 15                   | V           |
| $P_{TOT}$ | Power dissipation                    | 12                   | W           |
| $T_{STG}$ | Storage temperature range            | -40 to +150          | °C          |
| $T_{OP}$  | Operating junction temperature range | for C Version        | -40 to +150 |
|           |                                      | for standard Version | 0 to +150   |

**Table 3. Thermal data**

| Symbol     | Parameter                           | SOT-223 | SO-8 | DPAK | TO-220 | Unit |
|------------|-------------------------------------|---------|------|------|--------|------|
| $R_{thJC}$ | Thermal resistance junction-case    | 15      | 20   | 8    | 3      | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient |         |      |      | 50     | °C/W |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

## 4 Schematic application

Figure 3. Application circuit (for 1.2 V)

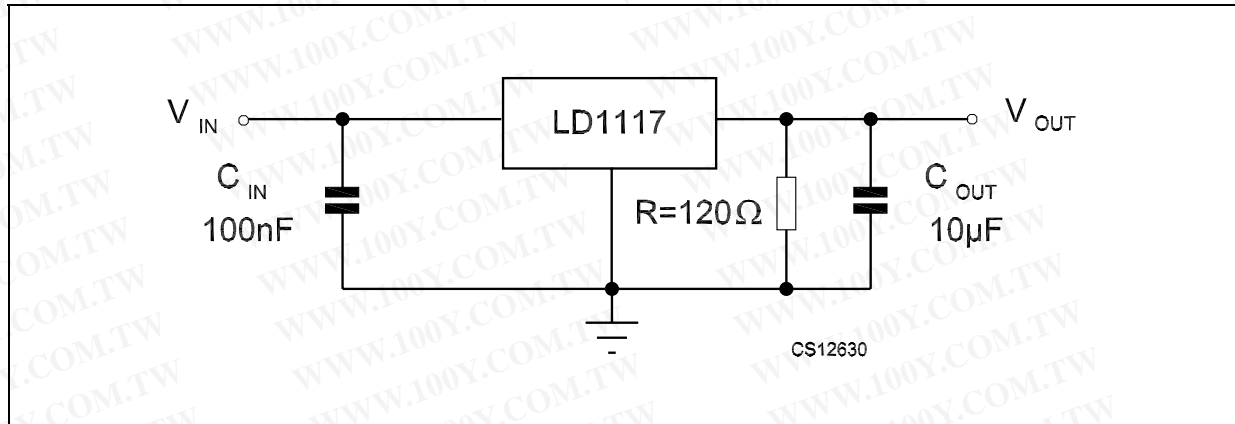
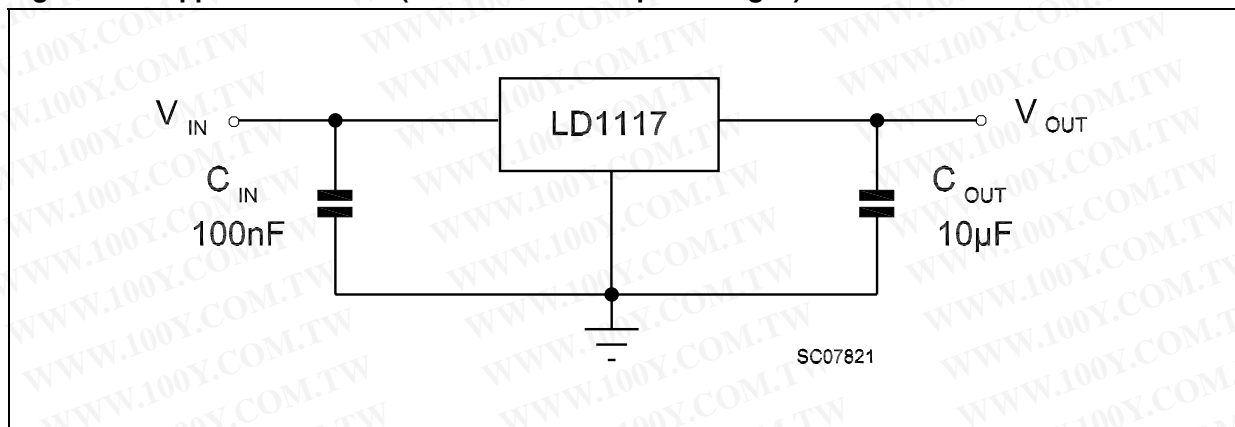


Figure 4. Application circuit (for other fixed output voltages)



勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-54151736  
勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)



## 5 Electrical characteristics

**Table 4. Electrical characteristics of LD1117#12**  
(refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $C_O = 10\ \mu\text{F}$ ,  $R = 120\ \Omega$  between GND and OUT pins, unless otherwise specified).

| Symbol              | Parameter                     | Test condition  | Min.  | Typ.  | Max.  | Unit          |
|---------------------|-------------------------------|---|-------|-------|-------|---------------|
| $V_O$               | Output voltage                | $V_{in} = 3.2\ \text{V}$ , $I_O = 10\ \text{mA}$ , $T_J = 25^\circ\text{C}$   | 1.188 | 1.20  | 1.212 | V             |
| $V_O$               | Reference voltage             | $I_O = 10$ to $800\ \text{mA}$<br>$V_{in} - V_O = 1.4$ to $10\ \text{V}$  | 1.140 | 1.20  | 1.260 | V             |
| $\Delta V_O$        | Line regulation               | $V_{in} - V_O = 1.5$ to $13.75\ \text{V}$ , $I_O = 10\ \text{mA}$   |       | 0.035 | 0.2   | %             |
| $\Delta V_O$        | Load regulation               | $V_{in} - V_O = 3\ \text{V}$ , $I_O = 10$ to $800\ \text{mA}$   |       | 0.1   | 0.4   | %             |
| $\Delta V_O$        | Temperature stability         |   |       | 0.5   |       | %             |
| $\Delta V_O$        | Long term stability           | 1000 hrs, $T_J = 125^\circ\text{C}$   |       | 0.3   |       | %             |
| $V_{in}$            | Operating input voltage       |   |       |       | 15    | V             |
| $I_{adj}$           | Adjustment pin current        | $V_{in} \leq 15\ \text{V}$  |       | 60    | 120   | $\mu\text{A}$ |
| $\Delta I_{adj}$    | Adjustment pin current change | $V_{in} - V_O = 1.4$ to $10\ \text{V}$<br>$I_O = 10$ to $800\ \text{mA}$  |       | 1     | 5     | $\mu\text{A}$ |
| $I_{O(\text{min})}$ | Minimum load current          | $V_{in} = 15\ \text{V}$   |       | 2     | 5     | mA            |
| $I_O$               | Output current                | $V_{in} - V_O = 5\ \text{V}$ , $T_J = 25^\circ\text{C}$   | 800   | 950   | 1300  | mA            |
| eN                  | Output noise (% $V_O$ )       | $B = 10\text{Hz}$ to $10\text{kHz}$ , $T_J = 25^\circ\text{C}$  |       | 0.003 |       | %             |
| SVR                 | Supply voltage rejection      | $I_O = 40\ \text{mA}$ , $f = 120\text{Hz}$ , $T_J = 25^\circ\text{C}$<br>$V_{in} - V_O = 3\ \text{V}$ , $V_{\text{ripple}} = 1\ V_{PP}$ | 60    | 75    |       | dB            |
| $V_d$               | Dropout voltage               | $I_O = 100\ \text{mA}$  |       | 1     | 1.1   | V             |
|                     |                               | $I_O = 500\ \text{mA}$  |       | 1.05  | 1.15  |               |
|                     |                               | $I_O = 800\ \text{mA}$  |       | 1.10  | 1.2   |               |
|                     | Thermal regulation            | $T_a = 25^\circ\text{C}$ , 30ms Pulse   |       | 0.01  | 0.1   | %/W           |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 5. Electrical characteristics of LD1117#18**  
(refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $C_O = 10$   $\mu$ F, unless otherwise specified).

| Symbol       | Parameter                | Test condition  | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|---|------|------|------|---------|
| $V_O$        | Output voltage           | $V_{in} = 3.8$ V, $I_O = 10$ mA, $T_J = 25^\circ\text{C}$   | 1.78 | 1.8  | 1.82 | V       |
| $V_O$        | Output voltage           | $I_O = 0$ to 800 mA, $V_{in} = 3.3$ to 8 V  | 1.76 |      | 1.84 | V       |
| $\Delta V_O$ | Line regulation          | $V_{in} = 3.3$ to 8 V, $I_O = 0$ mA   |      | 1    | 6    | mV      |
| $\Delta V_O$ | Load regulation          | $V_{in} = 3.3$ V, $I_O = 0$ to 800 mA   |      | 1    | 10   | mV      |
| $\Delta V_O$ | Temperature stability    |   |      | 0.5  |      | %       |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125^\circ\text{C}$   |      | 0.3  |      | %       |
| $V_{in}$     | Operating input voltage  | $I_O = 100$ mA  |      |      | 10   | V       |
| $I_d$        | Quiescent current        | $V_{in} \leq 8$ V   |      | 5    | 10   | mA      |
| $I_O$        | Output current           | $V_{in} = 6.8$ V, $T_J = 25^\circ\text{C}$  | 800  | 950  | 1300 | mA      |
| eN           | Output noise voltage     | B = 10Hz to 10kHz, $T_J = 25^\circ\text{C}$   |      | 100  |      | $\mu$ V |
| SVR          | Supply voltage rejection | $I_O = 40$ mA, $f = 120$ Hz, $T_J = 25^\circ\text{C}$<br>$V_{in} = 5.5$ V, $V_{ripple} = 1$ V <sub>PP</sub> | 60   | 75   |      | dB      |
| $V_d$        | Dropout voltage          | $I_O = 100$ mA  |      | 1    | 1.1  | V       |
|              |                          | $I_O = 500$ mA  |      | 1.05 | 1.15 |         |
|              |                          | $I_O = 800$ mA  |      | 1.10 | 1.2  |         |
|              | Thermal regulation       | $T_a = 25^\circ\text{C}$ , 30ms Pulse   |      | 0.01 | 0.1  | %/W     |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 6. Electrical characteristics of LD1117#25**  
(refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $C_O = 10\ \mu\text{F}$ , unless otherwise specified).

| Symbol       | Parameter                | Test condition  | Min.  | Typ. | Max.  | Unit          |
|--------------|--------------------------|---|-------|------|-------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 4.5\ \text{V}$ , $I_O = 10\ \text{mA}$ , $T_J = 25^\circ\text{C}$   | 2.475 | 2.5  | 2.525 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\ \text{mA}$ , $V_{in} = 3.9$ to $10\ \text{V}$  | 2.45  |      | 2.55  | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 3.9$ to $10\ \text{V}$ , $I_O = 0\ \text{mA}$   |       | 1    | 6     | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 3.9\ \text{V}$ , $I_O = 0$ to $800\ \text{mA}$  |       | 1    | 10    | mV            |
| $\Delta V_O$ | Temperature stability    |   |       | 0.5  |       | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125^\circ\text{C}$   |       | 0.3  |       | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\ \text{mA}$  |       |      | 15    | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 10\ \text{V}$  |       | 5    | 10    | mA            |
| $I_O$        | Output current           | $V_{in} = 7.5\ \text{V}$ , $T_J = 25^\circ\text{C}$   | 800   | 950  | 1300  | mA            |
| eN           | Output noise voltage     | $B = 10\ \text{Hz}$ to $10\ \text{kHz}$ , $T_J = 25^\circ\text{C}$  |       | 100  |       | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\ \text{mA}$ , $f = 120\ \text{Hz}$ , $T_J = 25^\circ\text{C}$<br>$V_{in} = 5.5\ \text{V}$ , $V_{ripple} = 1\ \text{V}_{PP}$ | 60    | 75   |       | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\ \text{mA}$  |       | 1    | 1.1   | V             |
|              |                          | $I_O = 500\ \text{mA}$  |       | 1.05 | 1.15  |               |
|              |                          | $I_O = 800\ \text{mA}$  |       | 1.10 | 1.2   |               |
|              | Thermal regulation       | $T_a = 25^\circ\text{C}$ , 30ms Pulse   |       | 0.01 | 0.1   | %/W           |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 7. Electrical characteristics of LD1117#28**  
(refer to the test circuits,  $T_J = 0$  to  $125\text{ }^\circ\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified).

| Symbol       | Parameter                | Test condition  | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|---|------|------|------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 4.85\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25^\circ\text{C}$  | 2.82 | 2.85 | 2.88 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 4.25$ to $10\text{ V}$   | 2.79 |      | 2.91 | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 4.25$ to $10\text{ V}$ , $I_O = 0\text{ mA}$  |      | 1    | 6    | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 4.25\text{ V}$ , $I_O = 0$ to $800\text{ mA}$   |      | 1    | 10   | mV            |
| $\Delta V_O$ | Temperature stability    |   |      | 0.5  |      | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125^\circ\text{C}$   |      | 0.3  |      | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$   |      |      | 15   | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 10\text{ V}$   |      | 5    | 10   | mA            |
| $I_O$        | Output current           | $V_{in} = 7.85\text{ V}$ , $T_J = 25^\circ\text{C}$   | 800  | 950  | 1300 | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25^\circ\text{C}$  |      | 100  |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25^\circ\text{C}$<br>$V_{in} = 5.85\text{ V}$ , $V_{\text{ripple}} = 1\text{ V}_{PP}$ | 60   | 75   |      | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$   |      | 1    | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$   |      | 1.05 | 1.15 |               |
|              |                          | $I_O = 800\text{ mA}$   |      | 1.10 | 1.2  |               |
|              | Thermal regulation       | $T_a = 25^\circ\text{C}$ , 30ms Pulse   |      | 0.01 | 0.1  | %/W           |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 8. Electrical characteristics of LD1117#30**  
(refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $C_O = 10\ \mu\text{F}$ , unless otherwise specified).

| Symbol       | Parameter                | Test condition  | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|---|------|------|------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 5\ \text{V}$ , $I_O = 10\ \text{mA}$ , $T_J = 25^\circ\text{C}$   | 2.97 | 3    | 3.03 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\ \text{mA}$ , $V_{in} = 4.5$ to $10\ \text{V}$  | 2.94 |      | 3.06 | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 4.5$ to $12\ \text{V}$ , $I_O = 0\ \text{mA}$   |      | 1    | 6    | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 4.5\ \text{V}$ , $I_O = 0$ to $800\ \text{mA}$  |      | 1    | 10   | mV            |
| $\Delta V_O$ | Temperature stability    |   |      | 0.5  |      | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125^\circ\text{C}$   |      | 0.3  |      | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\ \text{mA}$  |      |      | 15   | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 12\ \text{V}$  |      | 5    | 10   | mA            |
| $I_O$        | Output current           | $V_{in} = 8\ \text{V}$ , $T_J = 25^\circ\text{C}$   | 800  | 950  | 1300 | mA            |
| eN           | Output noise voltage     | $B = 10\text{Hz}$ to $10\text{kHz}$ , $T_J = 25^\circ\text{C}$  |      | 100  |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\ \text{mA}$ , $f = 120\text{Hz}$ , $T_J = 25^\circ\text{C}$<br>$V_{in} = 6\ \text{V}$ , $V_{\text{ripple}} = 1\ \text{V}_{\text{PP}}$ | 60   | 75   |      | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\ \text{mA}$  |      | 1    | 1.1  | V             |
|              |                          | $I_O = 500\ \text{mA}$  |      | 1.05 | 1.15 |               |
|              |                          | $I_O = 800\ \text{mA}$  |      | 1.10 | 1.2  |               |
|              | Thermal regulation       | $T_a = 25^\circ\text{C}$ , 30ms Pulse   |      | 0.01 | 0.1  | %/W           |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 9. Electrical characteristics of LD1117#33**  
(refer to the test circuits,  $T_J = 0$  to  $125\text{ }^\circ\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified).

| Symbol       | Parameter                | Test condition  | Min.  | Typ. | Max.  | Unit          |
|--------------|--------------------------|---|-------|------|-------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 5.3\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$   | 3.267 | 3.3  | 3.333 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 4.75$ to $10\text{ V}$   | 3.235 |      | 3.365 | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 4.75$ to $15\text{ V}$ , $I_O = 0\text{ mA}$  |       | 1    | 6     | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 4.75\text{ V}$ , $I_O = 0$ to $800\text{ mA}$   |       | 1    | 10    | mV            |
| $\Delta V_O$ | Temperature stability    |   |       | 0.5  |       | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^\circ\text{C}$   |       | 0.3  |       | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$   |       |      | 15    | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 15\text{ V}$   |       | 5    | 10    | mA            |
| $I_O$        | Output current           | $V_{in} = 8.3\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$  | 800   | 950  | 1300  | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^\circ\text{C}$  |       | 100  |       | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^\circ\text{C}$<br>$V_{in} = 6.3\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60    | 75   |       | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$   |       | 1    | 1.1   | V             |
|              |                          | $I_O = 500\text{ mA}$   |       | 1.05 | 1.15  |               |
|              |                          | $I_O = 800\text{ mA}$   |       | 1.10 | 1.2   |               |
|              | Thermal regulation       | $T_a = 25\text{ }^\circ\text{C}$ , 30ms Pulse   |       | 0.01 | 0.1   | %/W           |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 10. Electrical characteristics of LD1117#50**  
(refer to the test circuits,  $T_J = 0$  to  $125\text{ }^\circ\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified).

| Symbol       | Parameter                | Test condition  | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|---|------|------|------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 7\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$   | 4.95 | 5    | 5.05 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 6.5$ to $15\text{ V}$  | 4.9  |      | 5.1  | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 6.5$ to $15\text{ V}$ , $I_O = 0\text{ mA}$   |      | 1    | 10   | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 6.5\text{ V}$ , $I_O = 0$ to $800\text{ mA}$  |      | 1    | 15   | mV            |
| $\Delta V_O$ | Temperature stability    |   |      | 0.5  |      | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^\circ\text{C}$   |      | 0.3  |      | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$   |      |      | 15   | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 15\text{ V}$   |      | 5    | 10   | mA            |
| $I_O$        | Output current           | $V_{in} = 10\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$   | 800  | 950  | 1300 | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^\circ\text{C}$  |      | 100  |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^\circ\text{C}$<br>$V_{in} = 8\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60   | 75   |      | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$   |      | 1    | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$   |      | 1.05 | 1.15 |               |
|              |                          | $I_O = 800\text{ mA}$   |      | 1.10 | 1.2  |               |
|              | Thermal regulation       | $T_a = 25\text{ }^\circ\text{C}$ , 30ms Pulse   |      | 0.01 | 0.1  | %/W           |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 11. Electrical characteristics of LD1117 (adjustable)**  
(refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $C_O = 10$   $\mu$ F, unless otherwise specified).

| Symbol           | Parameter                     | Test condition   | Min.  | Typ.  | Max.  | Unit    |
|------------------|-------------------------------|--|-------|-------|-------|---------|
| $V_{ref}$        | Reference voltage             | $V_{in} - V_O = 2$ V, $I_O = 10$ mA, $T_J = 25$ °C   | 1.238 | 1.25  | 1.262 | V       |
| $V_{ref}$        | Reference voltage             | $I_O = 10$ to $800$ mA, $V_{in} - V_O = 1.4$ to $10$ V   | 1.225 |       | 1.275 | V       |
| $\Delta V_O$     | Line regulation               | $V_{in} - V_O = 1.5$ to $13.75$ V, $I_O = 10$ mA   |       | 0.035 | 0.2   | %       |
| $\Delta V_O$     | Load regulation               | $V_{in} - V_O = 3$ V, $I_O = 10$ to $800$ mA   |       | 0.1   | 0.4   | %       |
| $\Delta V_O$     | Temperature stability         |  |       | 0.5   |       | %       |
| $\Delta V_O$     | Long term stability           | 1000 hrs, $T_J = 125$ °C   |       | 0.3   |       | %       |
| $V_{in}$         | Operating input voltage       |  |       |       | 15    | V       |
| $I_{adj}$        | Adjustment pin current        | $V_{in} \leq 15$ V   |       | 60    | 120   | $\mu$ A |
| $\Delta I_{adj}$ | Adjustment pin current change | $V_{in} - V_O = 1.4$ to $10$ V, $I_O = 10$ to $800$ mA   |       | 1     | 5     | $\mu$ A |
| $I_{O(min)}$     | Minimum load current          | $V_{in} = 15$ V  |       | 2     | 5     | mA      |
| $I_O$            | Output current                | $V_{in} - V_O = 5$ V, $T_J = 25$ °C  | 800   | 950   | 1300  | mA      |
| eN               | Output noise (% $V_O$ )       | $B = 10$ Hz to $10$ kHz, $T_J = 25$ °C   |       | 0.003 |       | %       |
| SVR              | Supply voltage rejection      | $I_O = 40$ mA, $f = 120$ Hz, $T_J = 25$ °C<br>$V_{in} - V_O = 3$ V, $V_{ripple} = 1$ V <sub>PP</sub> | 60    | 75    |       | dB      |
| $V_d$            | Dropout voltage               | $I_O = 100$ mA   |       | 1     | 1.1   | V       |
|                  |                               | $I_O = 500$ mA   |       | 1.05  | 1.15  |         |
|                  |                               | $I_O = 800$ mA   |       | 1.10  | 1.2   |         |
|                  | Thermal regulation            | $T_a = 25$ °C, 30ms Pulse  |       | 0.01  | 0.1   | %/W     |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)



**Table 12. Electrical characteristics of LD1117#12C**

(refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $C_O = 10\ \mu\text{F}$ ,  $R = 120\ \Omega$  between GND and OUT pins, unless otherwise specified).

| Symbol                  | Parameter                        | Test condition   | Min.  | Typ.  | Max.  | Unit          |
|-------------------------|----------------------------------|--|-------|-------|-------|---------------|
| $V_{\text{ref}}$        | Reference voltage                | $V_{\text{in}} - V_{\text{O}} = 2\text{V}$ , $I_{\text{O}} = 10\ \text{mA}$ , $T_J = 25^\circ\text{C}$   | 1.176 | 1.20  | 1.224 | V             |
| $V_{\text{ref}}$        | Reference voltage                | $I_{\text{O}} = 10$ to $800\ \text{mA}$ , $V_{\text{in}} - V_{\text{O}} = 1.4$ to $10\ \text{V}$   | 1.120 | 1.20  | 1.280 | V             |
| $\Delta V_{\text{O}}$   | Line regulation                  | $V_{\text{in}} - V_{\text{O}} = 1.5$ to $13.75\ \text{V}$ , $I_{\text{O}} = 10\ \text{mA}$   |       |       | 1     | %             |
| $\Delta V_{\text{O}}$   | Load regulation                  | $V_{\text{in}} - V_{\text{O}} = 3\ \text{V}$ , $I_{\text{O}} = 10$ to $800\ \text{mA}$   |       |       | 1     | %             |
| $\Delta V_{\text{O}}$   | Temperature stability            |  |       | 0.5   |       | %             |
| $\Delta V_{\text{O}}$   | Long term stability              | 1000 hrs, $T_J = 125^\circ\text{C}$  |       | 0.3   |       | %             |
| $V_{\text{in}}$         | Operating input voltage          |  |       |       | 15    | V             |
| $I_{\text{adj}}$        | Adjustment pin current           | $V_{\text{in}} \leq 15\ \text{V}$  |       | 60    | 120   | $\mu\text{A}$ |
| $\Delta I_{\text{adj}}$ | Adjustment pin current change    | $V_{\text{in}} - V_{\text{O}} = 1.4$ to $10\ \text{V}$<br>$I_{\text{O}} = 10$ to $800\ \text{mA}$  |       | 1     | 5     | $\mu\text{A}$ |
| $I_{\text{O(min)}}$     | Minimum load current             | $V_{\text{in}} = 15\ \text{V}$   |       | 2     | 5     | mA            |
| $I_{\text{O}}$          | Output current                   | $V_{\text{in}} - V_{\text{O}} = 5\ \text{V}$ , $T_J = 25^\circ\text{C}$  | 800   | 950   | 1300  | mA            |
| eN                      | Output noise (% $V_{\text{O}}$ ) | $B = 10\text{Hz}$ to $10\text{kHz}$ , $T_J = 25^\circ\text{C}$   |       | 0.003 |       | %             |
| SVR                     | Supply voltage rejection         | $I_{\text{O}} = 40\ \text{mA}$ , $f = 120\text{Hz}$ , $T_J = 25^\circ\text{C}$<br>$V_{\text{in}} - V_{\text{O}} = 3\ \text{V}$ , $V_{\text{ripple}} = 1\ \text{V}_{\text{PP}}$ | 60    | 75    |       | dB            |
| $V_{\text{d}}$          | Dropout voltage                  | $I_{\text{O}} = 100\ \text{mA}$ , $T_J = 0$ to $125^\circ\text{C}$   |       | 1     | 1.1   | V             |
|                         |                                  | $I_{\text{O}} = 500\ \text{mA}$ , $T_J = 0$ to $125^\circ\text{C}$   |       | 1.05  | 1.2   |               |
|                         |                                  | $I_{\text{O}} = 800\ \text{mA}$ , $T_J = 0$ to $125^\circ\text{C}$   |       | 1.10  | 1.3   |               |
|                         | Thermal regulation               | $T_{\text{a}} = 25^\circ\text{C}$ , 30ms Pulse   |       | 0.01  | 0.1   | %/W           |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 13. Electrical characteristics of LD1117#18C**  
(refer to the test circuits,  $T_J = -40$  to  $125\text{ }^\circ\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified).

| Symbol       | Parameter                | Test condition  | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|---|------|------|------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 3.8\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$   | 1.76 | 1.8  | 1.84 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 3.9$ to $10\text{ V}$  | 1.73 |      | 1.87 | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 3.3$ to $8\text{ V}$ , $I_O = 0\text{ mA}$  |      | 1    | 30   | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 3.3\text{ V}$ , $I_O = 0$ to $800\text{ mA}$  |      | 1    | 30   | mV            |
| $\Delta V_O$ | Temperature stability    |   |      | 0.5  |      | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^\circ\text{C}$   |      | 0.3  |      | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$   |      |      | 10   | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 8\text{ V}$  |      | 5    | 10   | mA            |
| $I_O$        | Output current           | $V_{in} = 6.8\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$  | 800  | 950  | 1300 | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^\circ\text{C}$  |      | 100  |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^\circ\text{C}$<br>$V_{in} = 5.5\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60   | 75   |      | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$ , $T_J = 0$ to $125\text{ }^\circ\text{C}$  |      | 1    | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$ , $T_J = 0$ to $125\text{ }^\circ\text{C}$  |      | 1.05 | 1.15 |               |
|              |                          | $I_O = 800\text{ mA}$ , $T_J = 0$ to $125\text{ }^\circ\text{C}$  |      | 1.10 | 1.2  |               |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$   |      |      | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$   |      |      | 1.2  |               |
|              |                          | $I_O = 800\text{ mA}$   |      |      | 1.3  |               |
|              | Thermal regulation       | $T_a = 25\text{ }^\circ\text{C}$ , 30ms Pulse   |      | 0.01 | 0.1  | %/W           |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 14. Electrical characteristics of LD1117#25C**  
(refer to the test circuits,  $T_J = -40$  to  $125$  °C,  $C_O = 10$   $\mu$ F, unless otherwise specified).

| Symbol       | Parameter                | Test condition   | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $V_{in} = 4.5$ V, $I_O = 10$ mA, $T_J = 25$ °C   | 2.45 | 2.5  | 2.55 | V       |
| $V_O$        | Output voltage           | $I_O = 0$ to 800 mA, $V_{in} = 3.9$ to 10 V  | 2.4  |      | 2.6  | V       |
| $\Delta V_O$ | Line regulation          | $V_{in} = 3.9$ to 10 V, $I_O = 0$ mA   |      | 1    | 30   | mV      |
| $\Delta V_O$ | Load regulation          | $V_{in} = 3.9$ V, $I_O = 0$ to 800 mA  |      | 1    | 30   | mV      |
| $\Delta V_O$ | Temperature stability    |  |      | 0.5  |      | %       |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125$ °C   |      | 0.3  |      | %       |
| $V_{in}$     | Operating input voltage  | $I_O = 100$ mA   |      |      | 15   | V       |
| $I_d$        | Quiescent current        | $V_{in} \leq 10$ V   |      | 5    | 10   | mA      |
| $I_O$        | Output current           | $V_{in} = 7.5$ V, $T_J = 25$ °C  | 800  | 950  | 1300 | mA      |
| eN           | Output noise voltage     | B = 10Hz to 10kHz, $T_J = 25$ °C   |      | 100  |      | $\mu$ V |
| SVR          | Supply voltage rejection | $I_O = 40$ mA, $f = 120$ Hz, $T_J = 25$ °C<br>$V_{in} = 5.5$ V, $V_{ripple} = 1$ V <sub>PP</sub> | 60   | 75   |      | dB      |
| $V_d$        | Dropout voltage          | $I_O = 100$ mA, $T_J = 0$ to $125$ °C  |      | 1    | 1.1  | V       |
|              |                          | $I_O = 500$ mA, $T_J = 0$ to $125$ °C  |      | 1.05 | 1.15 |         |
|              |                          | $I_O = 800$ mA, $T_J = 0$ to $125$ °C  |      | 1.10 | 1.2  |         |
| $V_d$        | Dropout voltage          | $I_O = 100$ mA   |      |      | 1.1  | V       |
|              |                          | $I_O = 500$ mA   |      |      | 1.2  |         |
|              |                          | $I_O = 800$ mA   |      |      | 1.3  |         |
|              | Thermal regulation       | $T_a = 25$ °C, 30ms Pulse  |      | 0.01 | 0.1  | %/W     |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 15. Electrical characteristics of LD1117#33C**  
(refer to the test circuits,  $T_J = -40$  to  $125\text{ }^\circ\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified).

| Symbol       | Parameter                | Test condition  | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|---|------|------|------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 5.3\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$   | 3.24 | 3.3  | 3.36 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 4.75$ to $10\text{ V}$   | 3.16 |      | 3.44 | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 4.75$ to $15\text{ V}$ , $I_O = 0\text{ mA}$  |      | 1    | 30   | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 4.75\text{ V}$ , $I_O = 0$ to $800\text{ mA}$   |      | 1    | 30   | mV            |
| $\Delta V_O$ | Temperature stability    |   |      | 0.5  |      | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^\circ\text{C}$   |      | 0.3  |      | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$   |      |      | 15   | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 15\text{ V}$   |      | 5    | 10   | mA            |
| $I_O$        | Output current           | $V_{in} = 8.3\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$  | 800  | 950  | 1300 | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^\circ\text{C}$  |      | 100  |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^\circ\text{C}$<br>$V_{in} = 6.3\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60   | 75   |      | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$ , $T_J = 0$ to $125\text{ }^\circ\text{C}$  |      | 1    | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$ , $T_J = 0$ to $125\text{ }^\circ\text{C}$  |      | 1.05 | 1.15 |               |
|              |                          | $I_O = 800\text{ mA}$ , $T_J = 0$ to $125\text{ }^\circ\text{C}$  |      | 1.10 | 1.2  |               |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$   |      |      | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$   |      |      | 1.2  |               |
|              |                          | $I_O = 800\text{ mA}$   |      |      | 1.3  |               |
|              | Thermal regulation       | $T_a = 25\text{ }^\circ\text{C}$ , 30ms Pulse   |      | 0.01 | 0.1  | %/W           |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 16. Electrical characteristics of LD1117#50C**  
(refer to the test circuits,  $T_J = -40$  to  $125$  °C,  $C_O = 10$   $\mu$ F, unless otherwise specified).

| Symbol       | Parameter                | Test condition   | Min. | Typ. | Max. | Unit    |
|--------------|--------------------------|--|------|------|------|---------|
| $V_O$        | Output voltage           | $V_{in} = 7$ V, $I_O = 10$ mA, $T_J = 25$ °C   | 4.9  | 5    | 5.1  | V       |
| $V_O$        | Output voltage           | $I_O = 0$ to 800 mA, $V_{in} = 6.5$ to 15 V  | 4.8  |      | 5.2  | V       |
| $\Delta V_O$ | Line regulation          | $V_{in} = 6.5$ to 15 V, $I_O = 0$ mA   |      | 1    | 50   | mV      |
| $\Delta V_O$ | Load regulation          | $V_{in} = 6.5$ V, $I_O = 0$ to 800 mA  |      | 1    | 50   | mV      |
| $\Delta V_O$ | Temperature stability    |  |      | 0.5  |      | %       |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125$ °C   |      | 0.3  |      | %       |
| $V_{in}$     | Operating input voltage  | $I_O = 100$ mA   |      |      | 15   | V       |
| $I_d$        | Quiescent current        | $V_{in} \leq 15$ V   |      | 5    | 10   | mA      |
| $I_O$        | Output current           | $V_{in} = 10$ V, $T_J = 25$ °C   | 800  | 950  | 1300 | mA      |
| eN           | Output noise voltage     | B = 10Hz to 10kHz, $T_J = 25$ °C   |      | 100  |      | $\mu$ V |
| SVR          | Supply voltage rejection | $I_O = 40$ mA, $f = 120$ Hz, $T_J = 25$ °C<br>$V_{in} = 8$ V, $V_{ripple} = 1$ V <sub>PP</sub> | 60   | 75   |      | dB      |
| $V_d$        | Dropout voltage          | $I_O = 100$ mA, $T_J = 0$ to $125$ °C  |      | 1    | 1.1  | V       |
|              |                          | $I_O = 500$ mA, $T_J = 0$ to $125$ °C  |      | 1.05 | 1.15 |         |
|              |                          | $I_O = 800$ mA, $T_J = 0$ to $125$ °C  |      | 1.10 | 1.2  |         |
| $V_d$        | Dropout voltage          | $I_O = 100$ mA   |      |      | 1.1  | V       |
|              |                          | $I_O = 500$ mA   |      |      | 1.2  |         |
|              |                          | $I_O = 800$ mA   |      |      | 1.3  |         |
|              | Thermal regulation       | $T_a = 25$ °C, 30ms Pulse  |      | 0.01 | 0.1  | %/W     |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Table 17. Electrical characteristics of LD1117C (adjustable)**  
(refer to the test circuits,  $T_J = -40$  to  $125$  °C,  $C_O = 10$   $\mu$ F, unless otherwise specified).

| Symbol           | Parameter                     | Test condition   | Min.  | Typ.  | Max.  | Unit    |
|------------------|-------------------------------|--|-------|-------|-------|---------|
| $V_{ref}$        | Reference voltage             | $V_{in} - V_O = 2$ V, $I_O = 10$ mA, $T_J = 25$ °C   | 1.225 | 1.25  | 1.275 | V       |
| $V_{ref}$        | Reference voltage             | $I_O = 10$ to $800$ mA, $V_{in} - V_O = 1.4$ to $10$ V   | 1.2   |       | 1.3   | V       |
| $\Delta V_O$     | Line regulation               | $V_{in} - V_O = 1.5$ to $13.75$ V, $I_O = 10$ mA   |       |       | 1     | %       |
| $\Delta V_O$     | Load regulation               | $V_{in} - V_O = 3$ V, $I_O = 10$ to $800$ mA   |       |       | 1     | %       |
| $\Delta V_O$     | Temperature stability         |  |       | 0.5   |       | %       |
| $\Delta V_O$     | Long term stability           | 1000 hrs, $T_J = 125$ °C   |       | 0.3   |       | %       |
| $V_{in}$         | Operating input voltage       |  |       |       | 15    | V       |
| $I_{adj}$        | Adjustment pin current        | $V_{in} \leq 15$ V   |       | 60    | 120   | $\mu$ A |
| $\Delta I_{adj}$ | Adjustment pin current change | $V_{in} - V_O = 1.4$ to $10$ V, $I_O = 10$ to $800$ mA   |       | 1     | 10    | $\mu$ A |
| $I_{O(min)}$     | Minimum load current          | $V_{in} = 15$ V  |       | 2     | 5     | mA      |
| $I_O$            | Output current                | $V_{in} - V_O = 5$ V, $T_J = 25$ °C  | 800   | 950   | 1300  | mA      |
| eN               | Output noise (% $V_O$ )       | $B = 10$ Hz to $10$ kHz, $T_J = 25$ °C   |       | 0.003 |       | %       |
| SVR              | Supply voltage rejection      | $I_O = 40$ mA, $f = 120$ Hz, $T_J = 25$ °C<br>$V_{in} - V_O = 3$ V, $V_{ripple} = 1$ V <sub>PP</sub> | 60    | 75    |       | dB      |
| $V_d$            | Dropout voltage               | $I_O = 100$ mA, $T_J = 0$ to $125$ °C  |       | 1     | 1.1   | V       |
|                  |                               | $I_O = 500$ mA, $T_J = 0$ to $125$ °C  |       | 1.05  | 1.15  |         |
|                  |                               | $I_O = 800$ mA, $T_J = 0$ to $125$ °C  |       | 1.10  | 1.2   |         |
| $V_d$            | Dropout voltage               | $I_O = 100$ mA   |       |       | 1.1   | V       |
|                  |                               | $I_O = 500$ mA   |       |       | 1.2   |         |
|                  |                               | $I_O = 800$ mA   |       |       | 1.3   |         |
|                  | Thermal regulation            | $T_a = 25$ °C, 30ms Pulse  |       | 0.01  | 0.1   | %/W     |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

# 6 Typical application

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

Figure 5. Negative supply

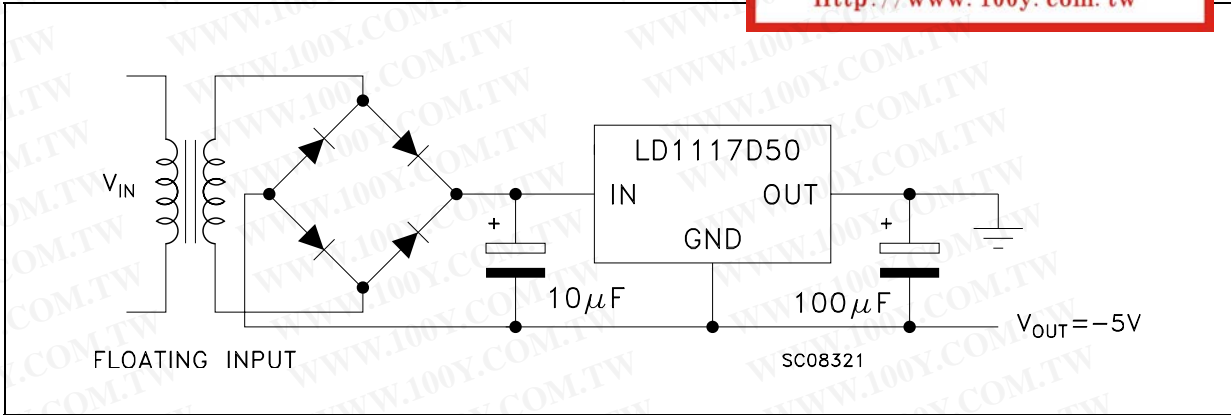


Figure 6. Active terminator for SCSI-2 BUS

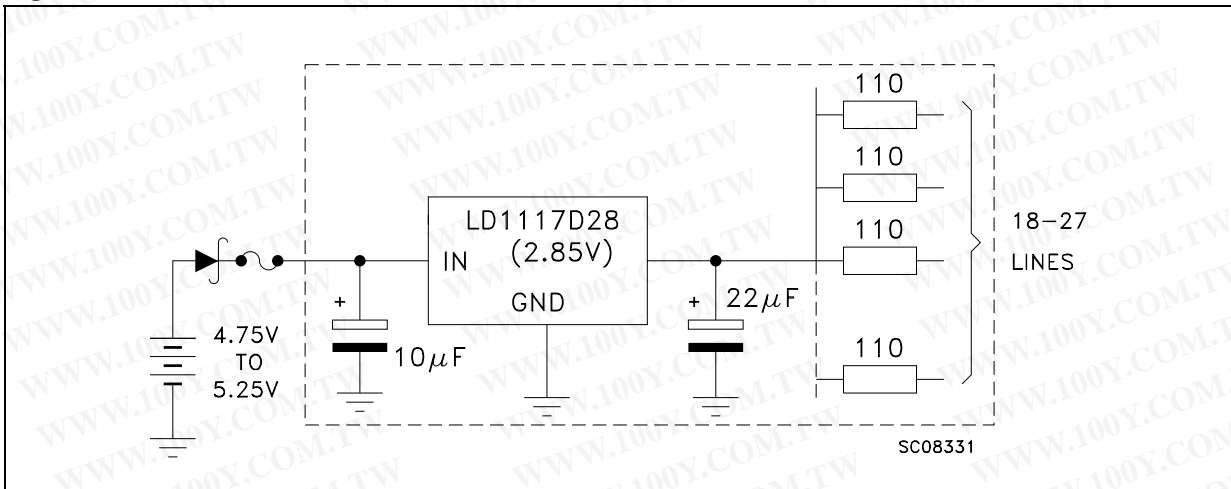


Figure 7. Circuit for increasing output voltage

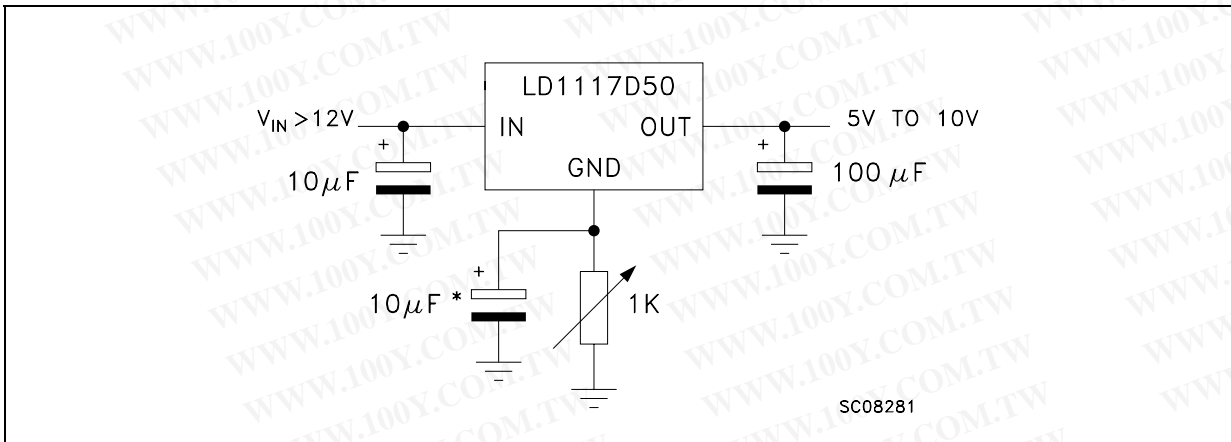


Figure 8. Voltage regulator with reference

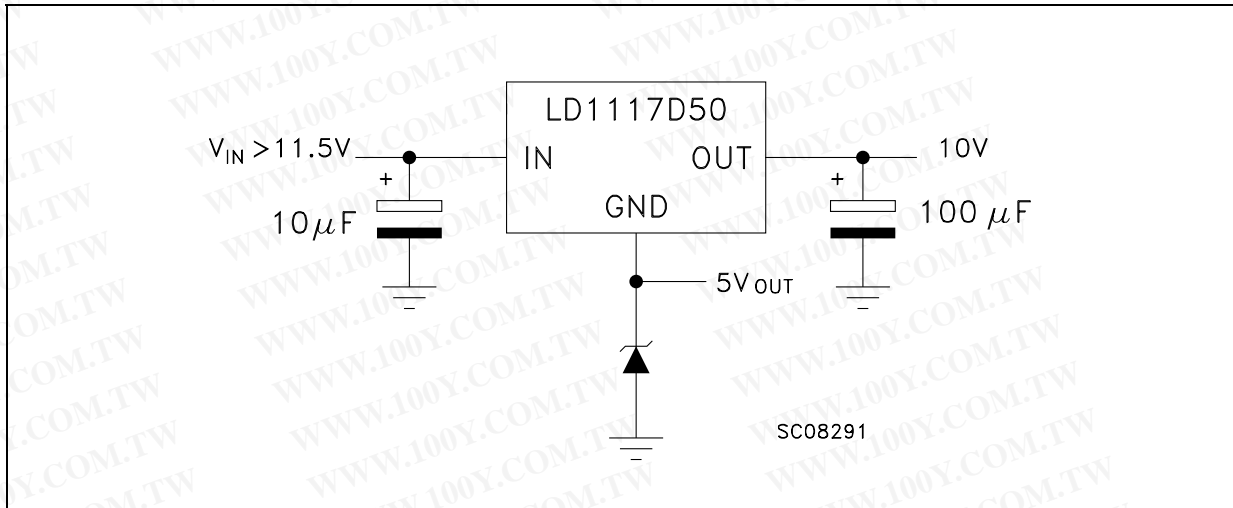
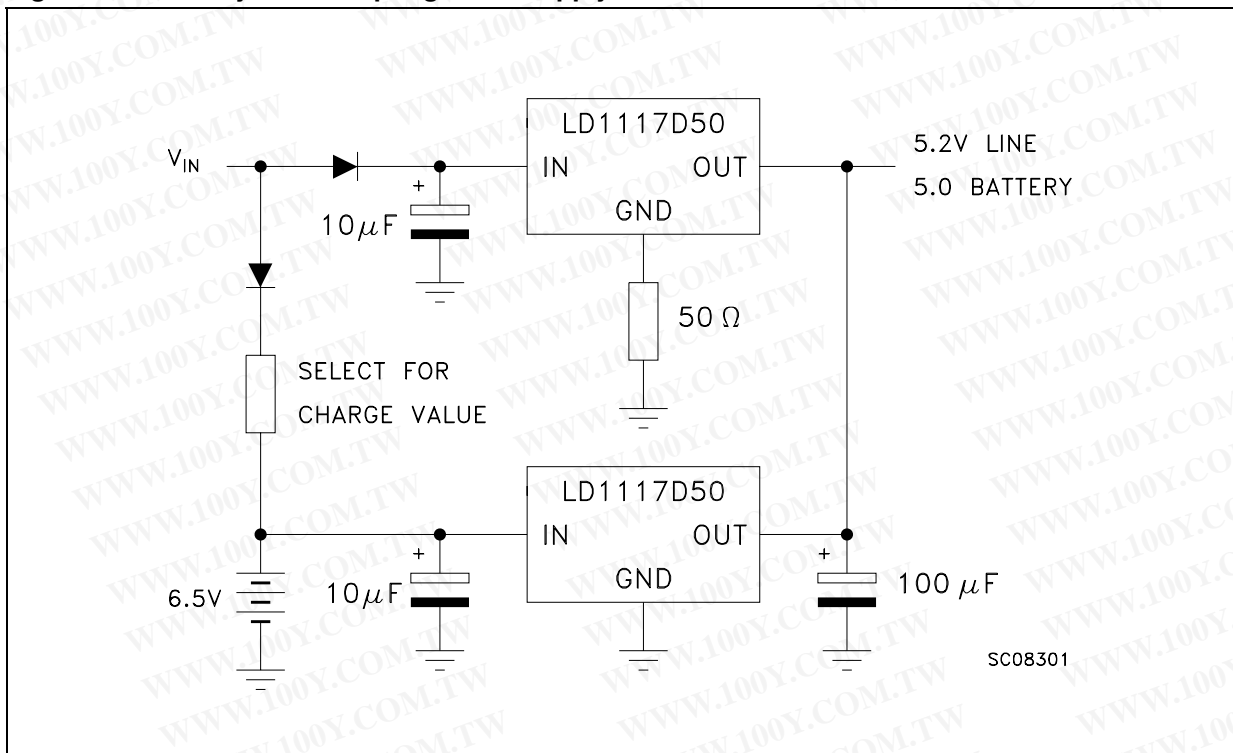


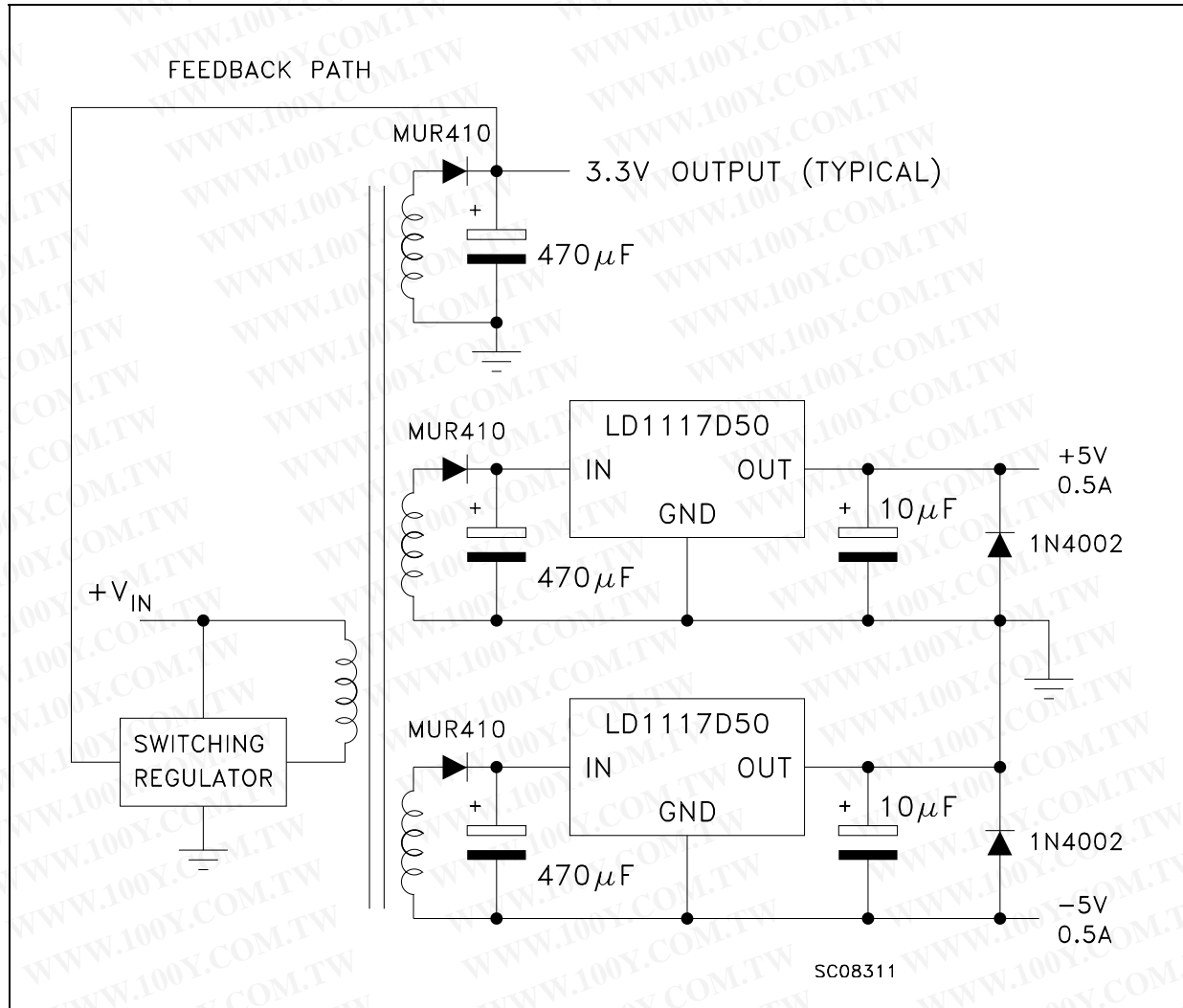
Figure 9. Battery backed-up regulated supply



勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)



Figure 10. Post-regulated dual supply



勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

## 7 LD1117 adjustable: application note

The LD1117 Adjustable has a thermal stabilized  $1.25 \pm 0.012$  V reference voltage between the OUT and ADJ pins.  $I_{ADJ}$  is 60  $\mu$ A typ. (120  $\mu$ A max.) and  $\Delta I_{ADJ}$  is 1  $\mu$ A typ. (5  $\mu$ A max.).

R1 is normally fixed to 120  $\Omega$ . From *Figure 10* we obtain:

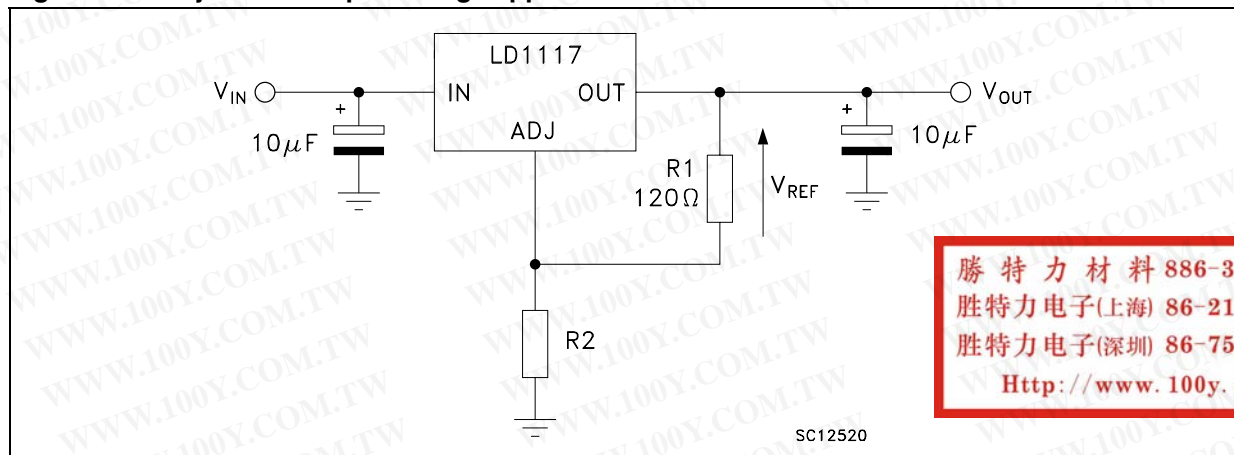
$$V_{OUT} = V_{REF} + R2 (I_{ADJ} + I_{R1}) = V_{REF} + R2 (I_{ADJ} + V_{REF} / R1) = V_{REF} (1 + R2 / R1) + R2 \times I_{ADJ}$$

In normal application R2 value is in the range of few k $\Omega$ , so the  $R2 \times I_{ADJ}$  product could not be considered in the  $V_{OUT}$  calculation; then the above expression becomes:

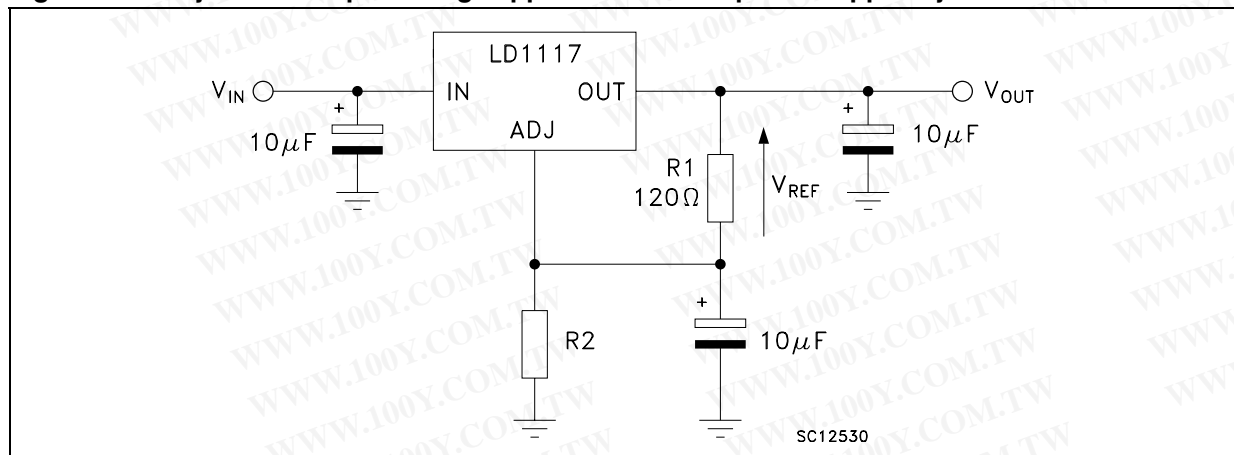
$$V_{OUT} = V_{REF} (1 + R2 / R1).$$

In order to have the better load regulation it is important to realize a good Kelvin connection of R1 and R2 resistors. In particular R1 connection must be realized very close to OUT and ADJ pin, while R2 ground connection must be placed as near as possible to the negative Load pin. Ripple rejection can be improved by introducing a 10  $\mu$ F electrolytic capacitor placed in parallel to the R2 resistor (see *Figure 11*).

**Figure 11. Adjustable output voltage application**



**Figure 12. Adjustable output voltage application with improved ripple rejection**



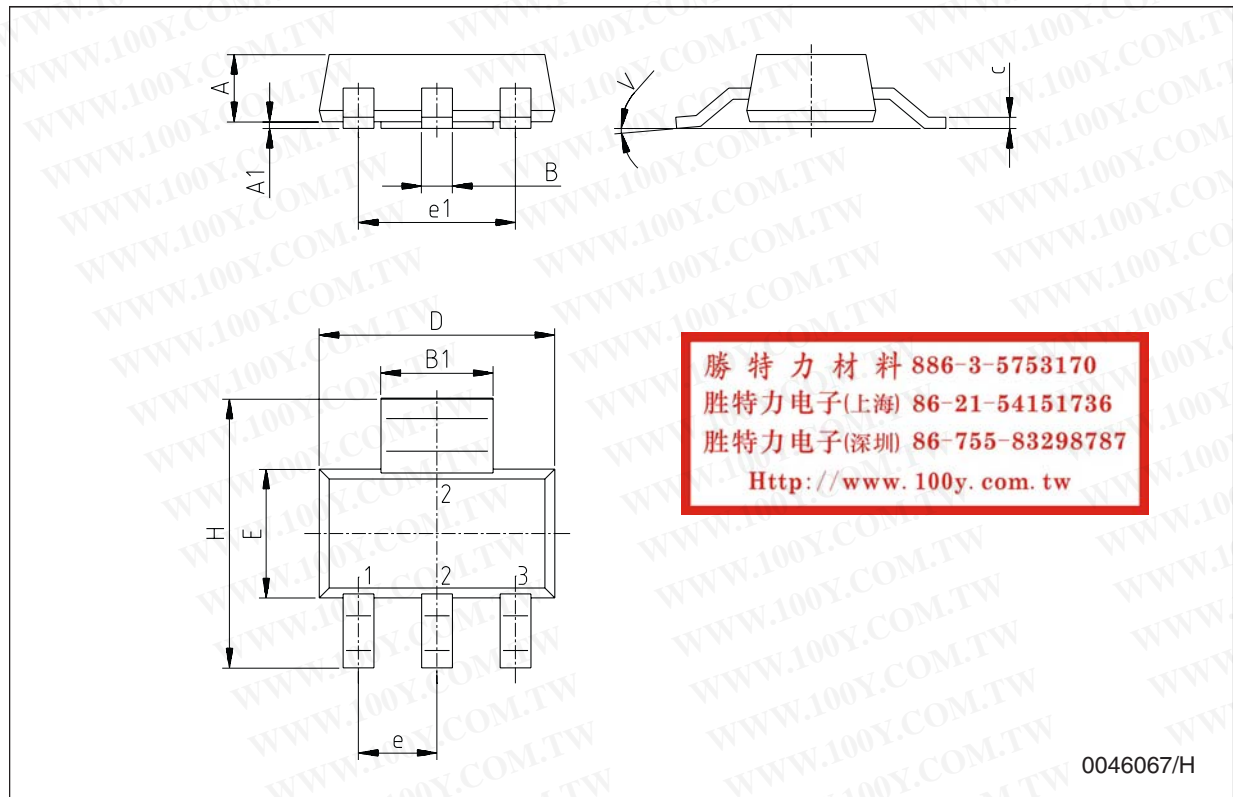
## 8 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com).

勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-54151736  
勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**SOT-223 mechanical data**

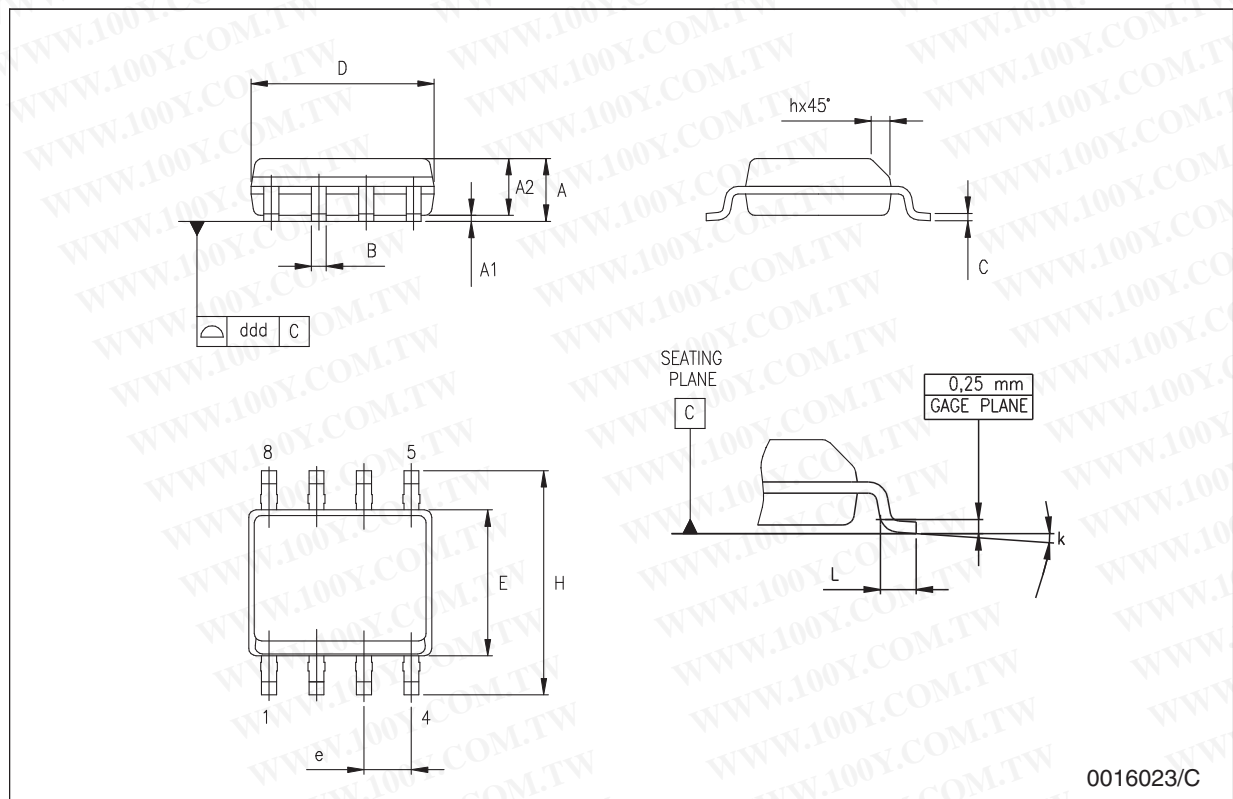
| Dim. | mm.  |      |      | mils. |       |       |
|------|------|------|------|-------|-------|-------|
|      | Min. | Typ. | Max. | Min.  | Typ.  | Max.  |
| A    |      |      | 1.8  |       |       | 70.9  |
| A1   | 0.02 |      | 0.1  | 0.8   |       | 3.9   |
| B    | 0.6  | 0.7  | 0.85 | 23.6  | 27.6  | 33.5  |
| B1   | 2.9  | 3    | 3.15 | 114.2 | 118.1 | 124.0 |
| c    | 0.24 | 0.26 | 0.35 | 9.4   | 10.2  | 13.8  |
| D    | 6.3  | 6.5  | 6.7  | 248.0 | 255.9 | 263.8 |
| e    |      | 2.3  |      |       | 90.6  |       |
| e1   |      | 4.6  |      |       | 181.1 |       |
| E    | 3.3  | 3.5  | 3.7  | 129.9 | 137.8 | 145.7 |
| H    | 6.7  | 7    | 7.3  | 263.8 | 275.7 | 287.5 |
| V    |      |      | 10°  |       |       | 10°   |



0046067/H

**SO-8 mechanical data**

| Dim. | mm.       |      |      | inch. |       |       |
|------|-----------|------|------|-------|-------|-------|
|      | Min.      | Typ. | Max. | Min.  | Typ.  | Max.  |
| A    | 1.35      |      | 1.75 | 0.053 |       | 0.069 |
| A1   | 0.10      |      | 0.25 | 0.04  |       | 0.010 |
| A2   | 1.10      |      | 1.65 | 0.043 |       | 0.065 |
| B    | 0.33      |      | 0.51 | 0.013 |       | 0.020 |
| C    | 0.19      |      | 0.25 | 0.007 |       | 0.010 |
| D    | 4.80      |      | 5.00 | 0.189 |       | 0.197 |
| E    | 3.80      |      | 4.00 | 0.150 |       | 0.157 |
| e    |           | 1.27 |      |       | 0.050 |       |
| H    | 5.80      |      | 6.20 | 0.228 |       | 0.244 |
| h    | 0.25      |      | 0.50 | 0.010 |       | 0.020 |
| L    | 0.40      |      | 1.27 | 0.016 |       | 0.050 |
| k    | 8° (max.) |      |      |       |       |       |
| ddd  |           |      | 0.1  |       |       | 0.04  |

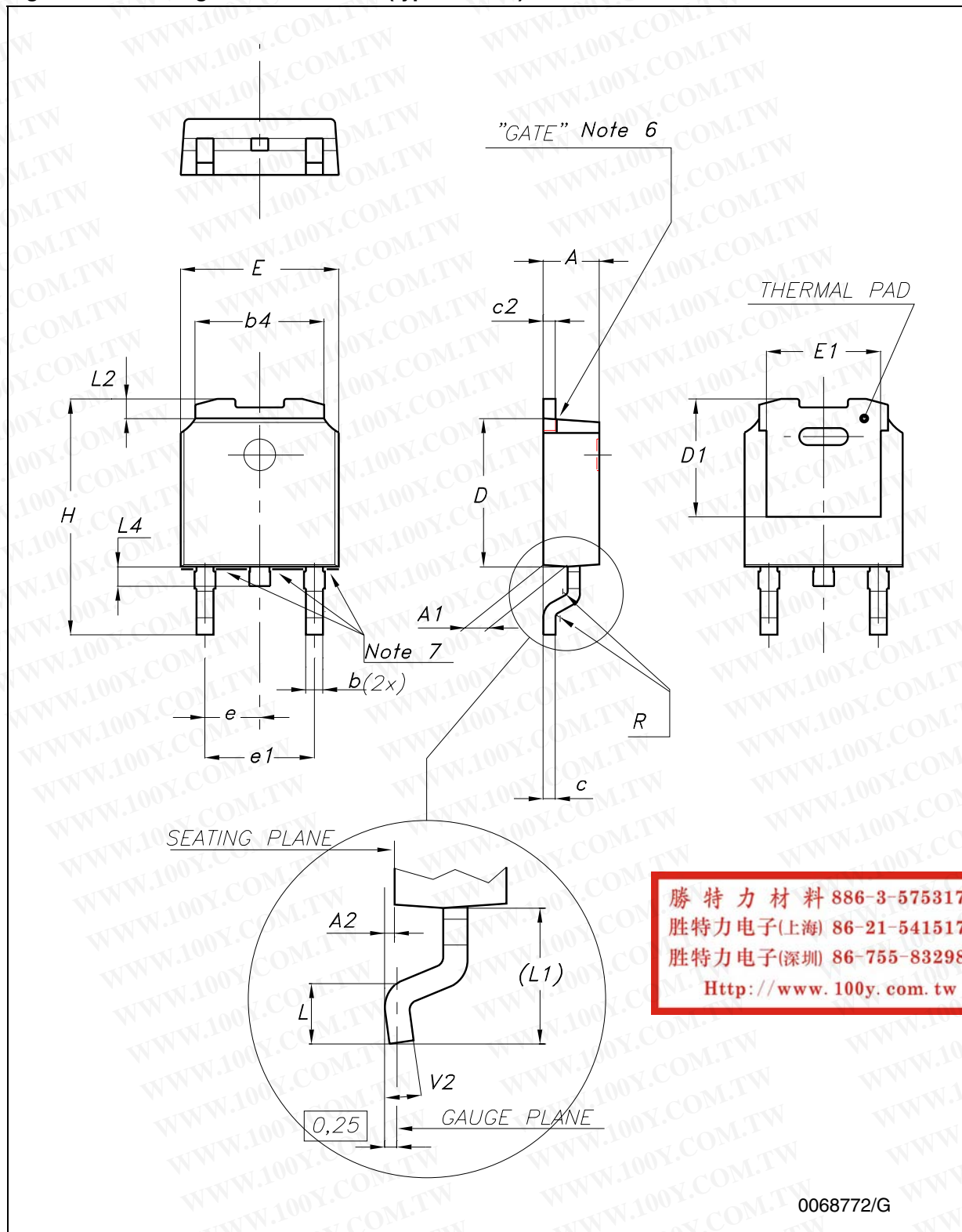


0016023/C



**勝特力材料 886-3-5753170**  
**勝特力电子(上海) 86-21-54151736**  
**勝特力电子(深圳) 86-755-83298787**  
[Http://www.100y.com.tw](http://www.100y.com.tw)

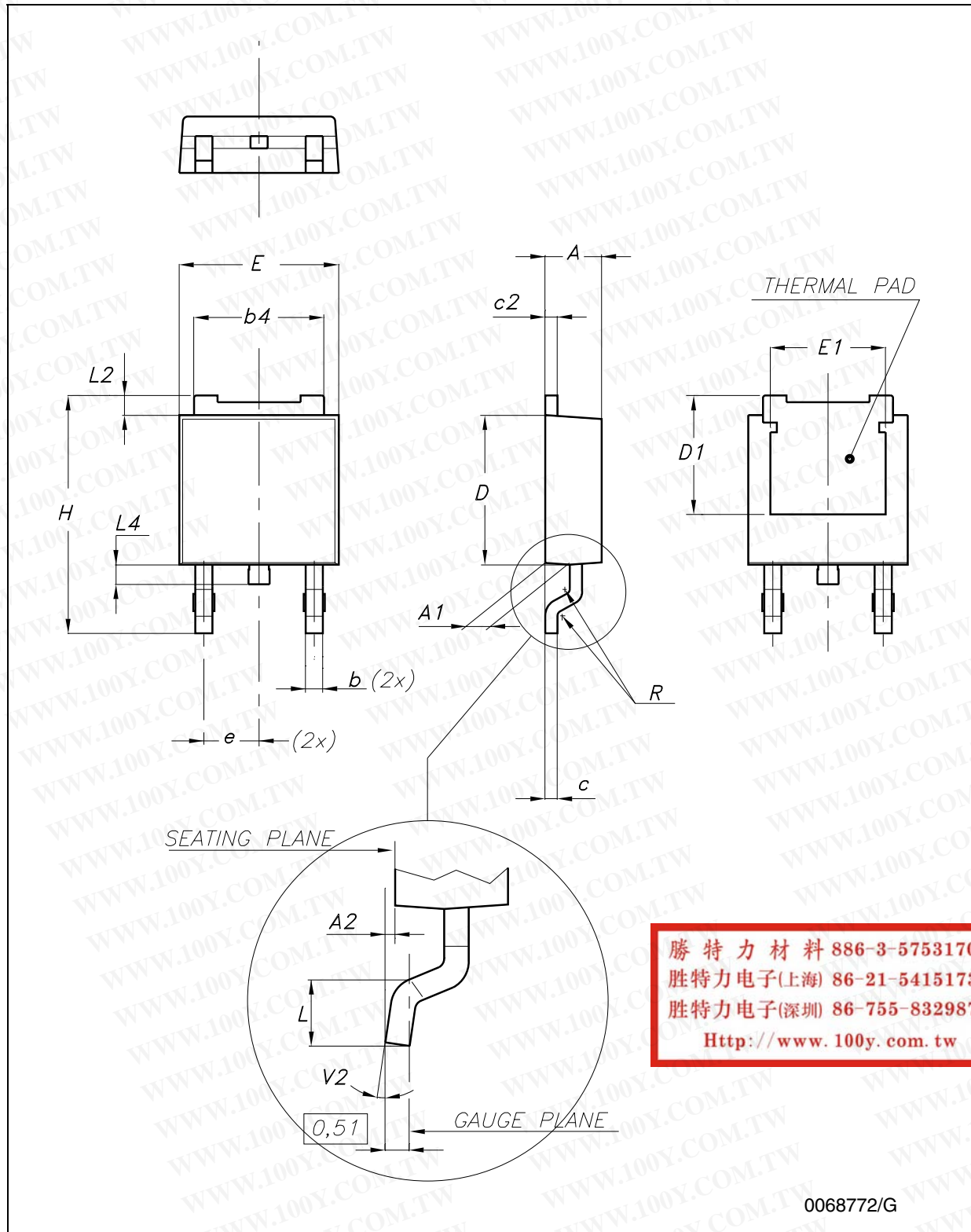
Figure 13. Drawing dimension DPAK (type STD-ST)



勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

0068772/G

Figure 14. Drawing dimension DPAK (type FUJITSU-SUBCON.)



勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

0068772/G

Figure 15. Drawing dimension DPAK (type IDS-SUBCON.)

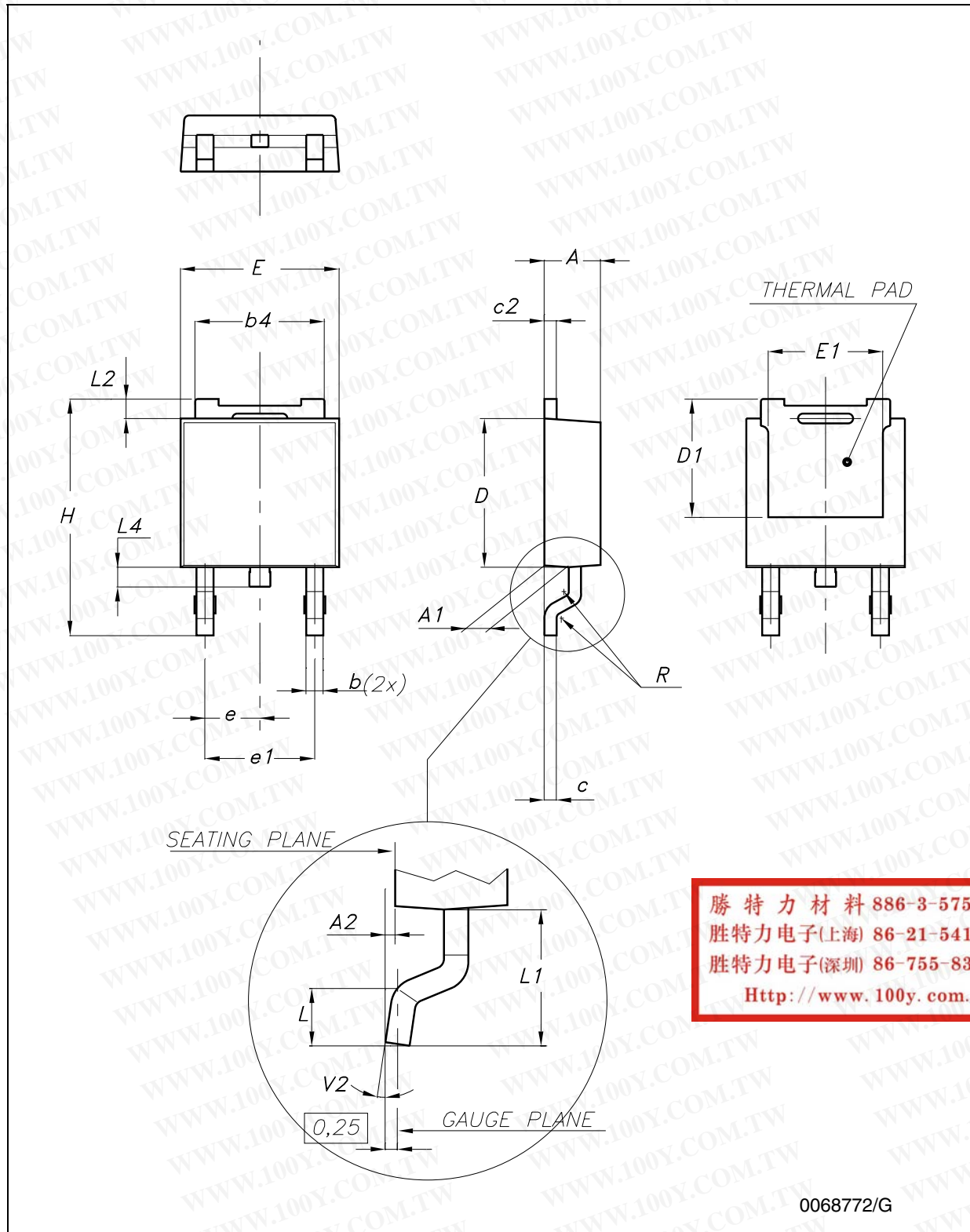




Table 18. DPAK mechanical data

| Dim. | TYPE STD-ST |      |       | TYPE FUJITSU-SUBCON. |      |       | TYPE IDS-SUBCON |      |       |
|------|-------------|------|-------|----------------------|------|-------|-----------------|------|-------|
|      | mm.         |      |       | mm.                  |      |       | mm.             |      |       |
|      | Min.        | Typ. | Max.  | Min.                 | Typ. | Max.  | Min.            | Typ. | Max.  |
| A    | 2.20        |      | 2.40  | 2.25                 | 2.30 | 2.35  | 2.19            |      | 2.38  |
| A1   | 0.90        |      | 1.10  | 0.96                 |      | 1.06  | 0.89            |      | 1.14  |
| A2   | 0.03        |      | 0.23  | 0                    |      | 0.10  | 0.03            |      | 0.23  |
| b    | 0.64        |      | 0.90  | 0.76                 |      | 0.86  | 0.64            |      | 0.88  |
| b4   | 5.20        |      | 5.40  | 5.28                 |      | 5.38  | 5.21            |      | 5.46  |
| c    | 0.45        |      | 0.60  | 0.46                 |      | 0.56  | 0.46            |      | 0.58  |
| c2   | 0.48        |      | 0.60  | 0.46                 |      | 0.56  | 0.46            |      | 0.58  |
| D    | 6.00        |      | 6.20  | 6.05                 |      | 6.15  | 5.97            |      | 6.22  |
| D1   |             | 5.10 |       | 5.27                 |      | 5.47  |                 | 5.20 |       |
| E    | 6.40        |      | 6.60  | 6.55                 | 6.60 | 6.65  | 6.35            |      | 6.73  |
| E1   |             | 4.70 |       |                      | 4.77 |       |                 | 4.70 |       |
| e    |             | 2.28 |       | 2.23                 | 2.28 | 2.33  |                 | 2.28 |       |
| e1   | 4.40        |      | 4.60  |                      |      |       | 4.51            |      | 4.61  |
| H    | 9.35        |      | 10.10 | 9.90                 |      | 10.30 | 9.40            |      | 10.42 |
| L    | 1.00        |      |       | 1.40                 |      | 1.60  | 0.90            |      |       |
| L1   |             | 2.80 |       |                      |      |       | 2.50            |      | 2.65  |
| L2   |             | 0.80 |       | 1.03                 |      | 1.13  | 0.89            |      | 1.27  |
| L4   | 0.60        |      | 1.00  | 0.70                 |      | 0.90  | 0.64            |      | 1.02  |
| R    |             | 0.20 |       |                      | 0.40 |       |                 | 0.20 |       |
| V2   | 0°          |      | 8°    | 0°                   |      | 8°    | 0°              |      | 8°    |

Note: The DPAK package coming from the two subcontractors (Fujitsu and IDS) are fully compatible with the ST's package suggested footprint.

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

Figure 16. DPAK footprint recommended data

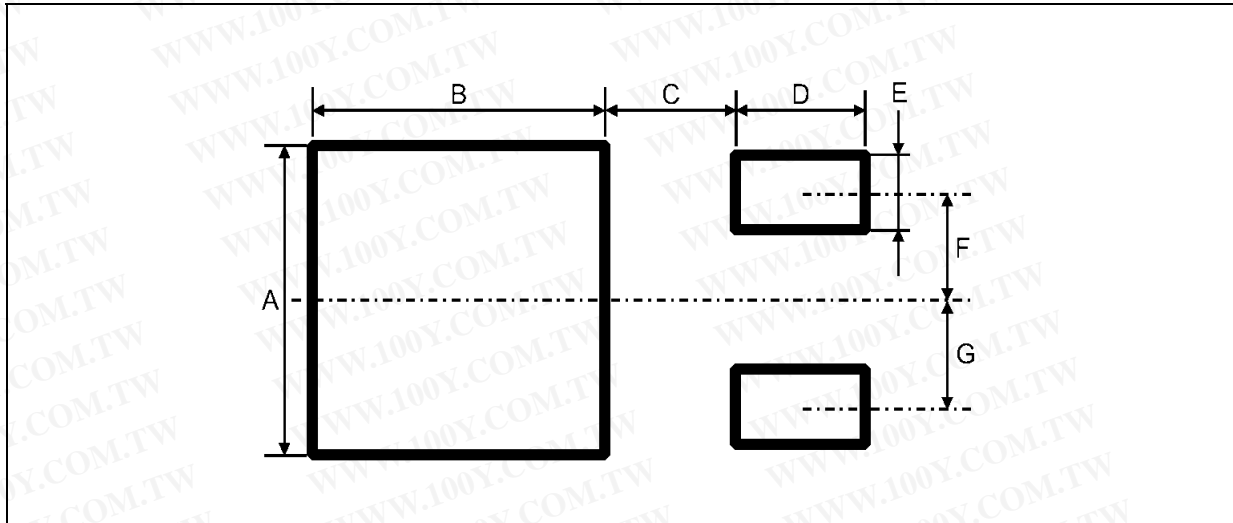


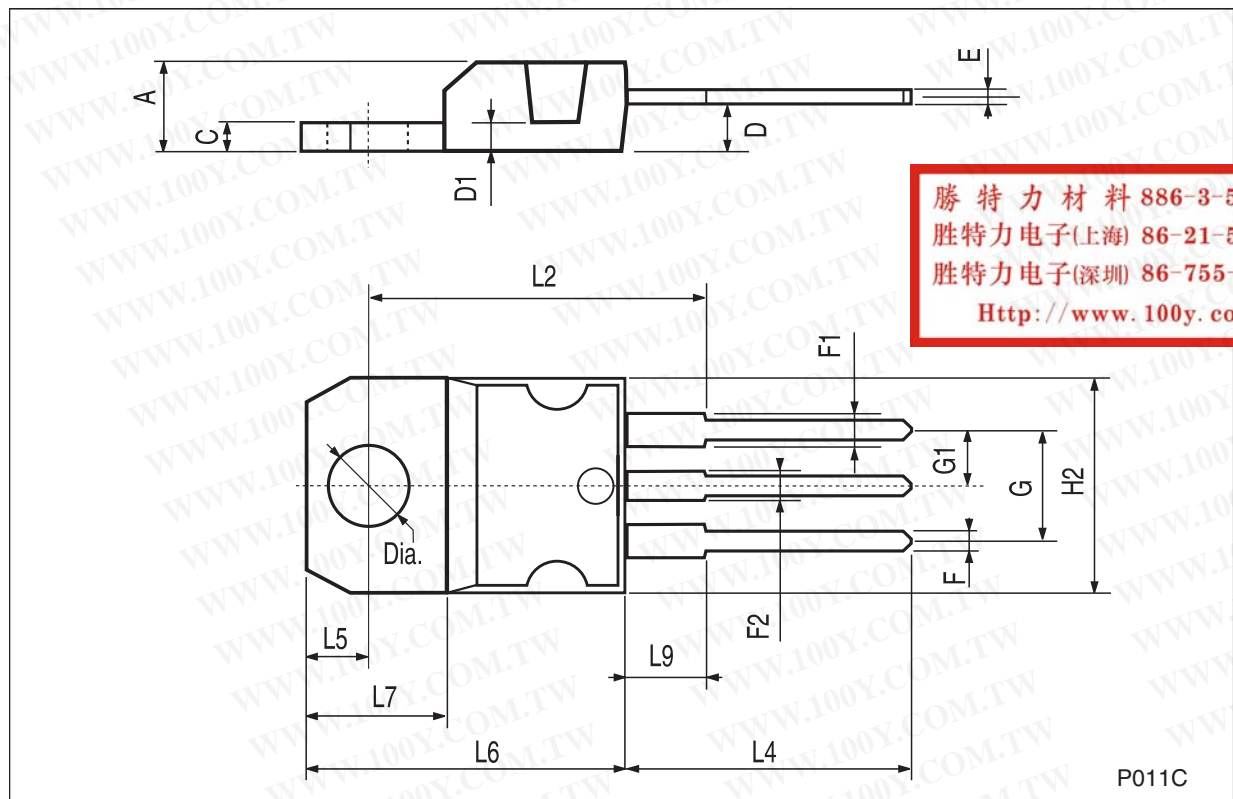
Table 19. Footprint data

|   | VALUES |       |
|---|--------|-------|
|   | mm.    | inch. |
| A | 6.70   | 0.264 |
| B | 6.70   | 0.64  |
| C | 1.8    | 0.070 |
| D | 3.0    | 0.118 |
| E | 1.60   | 0.063 |
| F | 2.30   | 0.091 |
| G | 2.30   | 0.091 |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

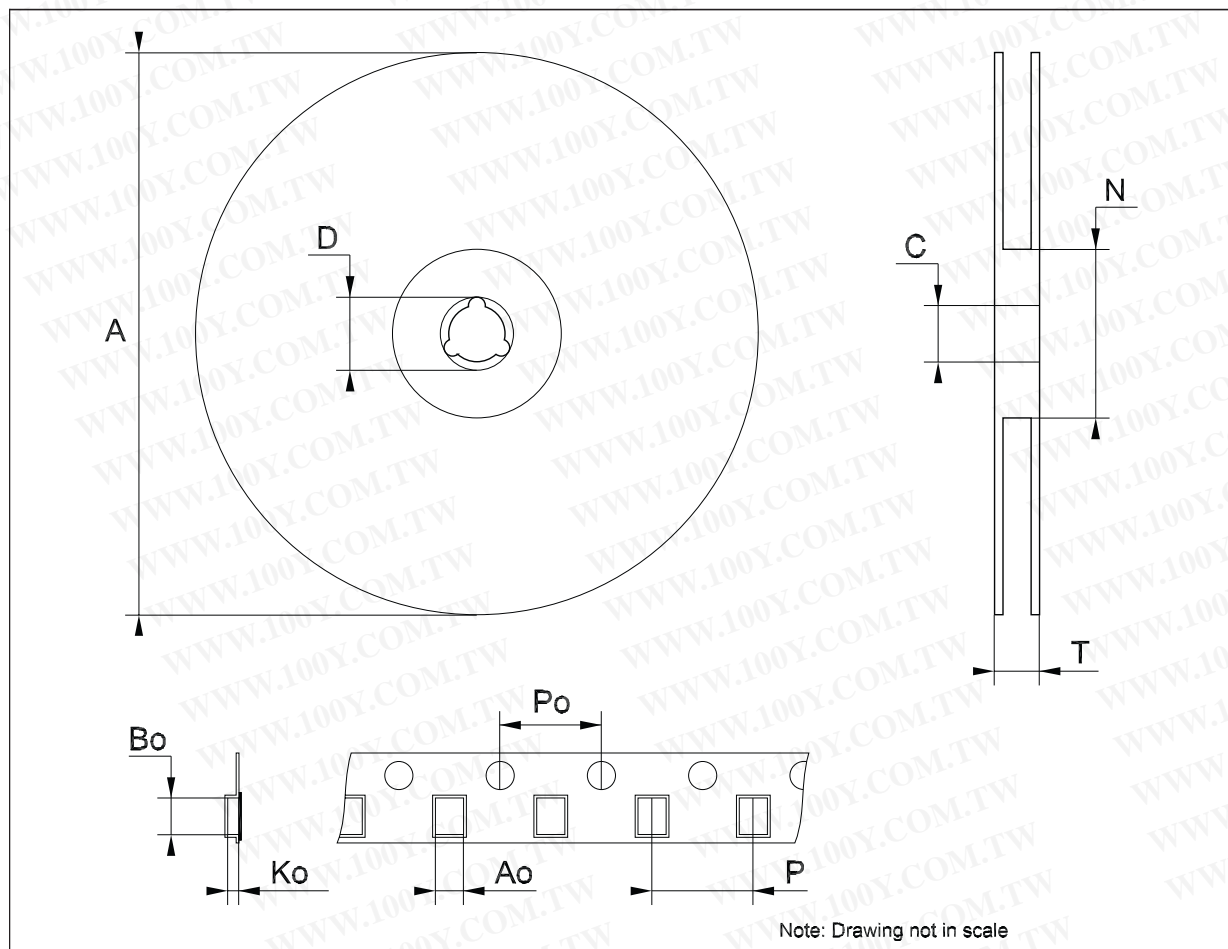
**TO-220 mechanical data**

| Dim. | mm.   |      |       | inch. |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | Min.  | Typ. | Max.  | Min.  | Typ.  | Max.  |
| A    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| C    | 1.23  |      | 1.32  | 0.048 |       | 0.051 |
| D    | 2.40  |      | 2.72  | 0.094 |       | 0.107 |
| D1   |       | 1.27 |       |       | 0.050 |       |
| E    | 0.49  |      | 0.70  | 0.019 |       | 0.027 |
| F    | 0.61  |      | 0.88  | 0.024 |       | 0.034 |
| F1   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| F2   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| G    | 4.95  |      | 5.15  | 0.194 |       | 0.203 |
| G1   | 2.4   |      | 2.7   | 0.094 |       | 0.106 |
| H2   | 10.0  |      | 10.40 | 0.393 |       | 0.409 |
| L2   |       | 16.4 |       |       | 0.645 |       |
| L4   | 13.0  |      | 14.0  | 0.511 |       | 0.551 |
| L5   | 2.65  |      | 2.95  | 0.104 |       | 0.116 |
| L6   | 15.25 |      | 15.75 | 0.600 |       | 0.620 |
| L7   | 6.2   |      | 6.6   | 0.244 |       | 0.260 |
| L9   | 3.5   |      | 3.93  | 0.137 |       | 0.154 |
| DIA. | 3.75  |      | 3.85  | 0.147 |       | 0.151 |



Tape & reel SOT223 mechanical data

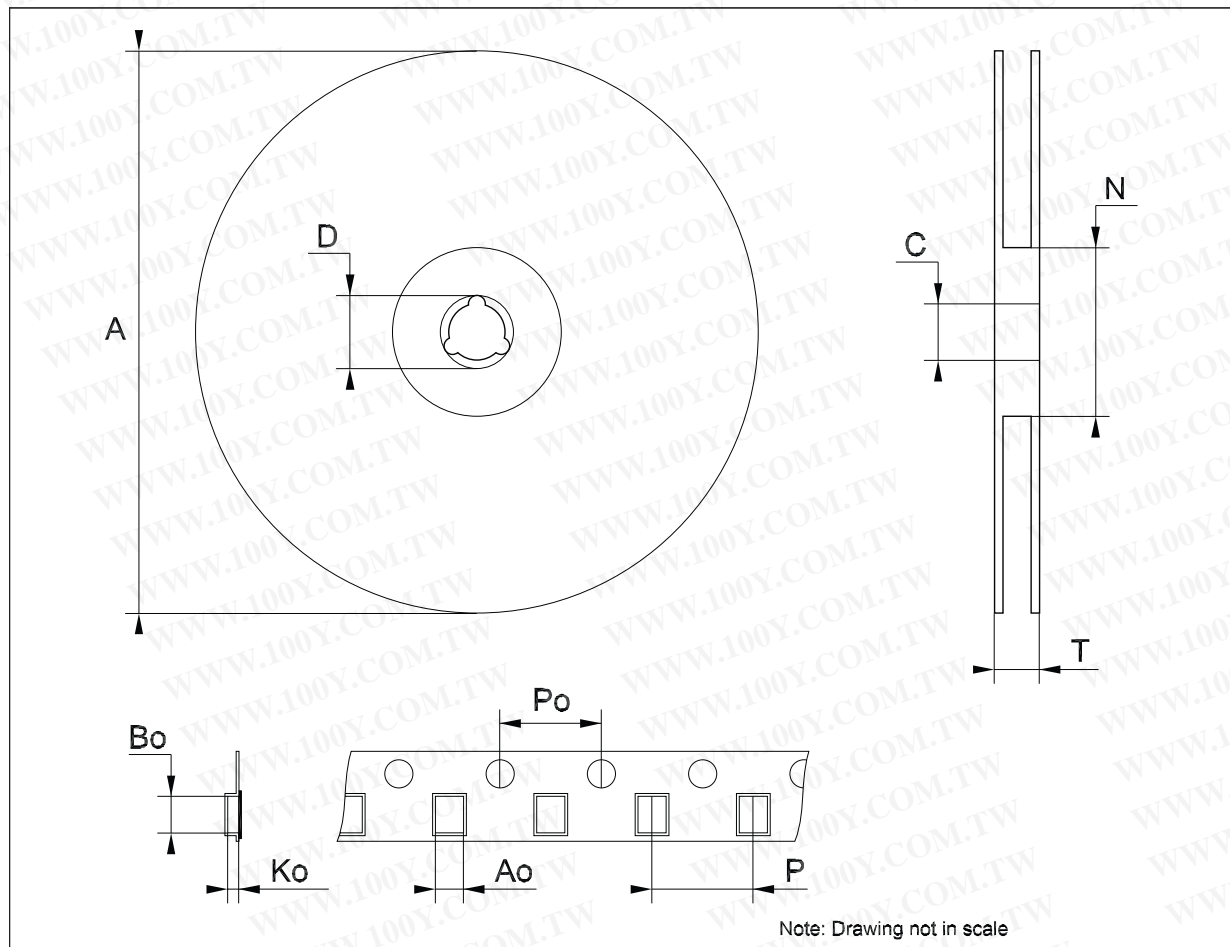
| Dim. | mm.  |      |      | inch. |       |        |
|------|------|------|------|-------|-------|--------|
|      | Min. | Typ. | Max. | Min.  | Typ.  | Max.   |
| A    |      |      | 330  |       |       | 12.992 |
| C    | 12.8 | 13.0 | 13.2 | 0.504 | 0.512 | 0.519  |
| D    | 20.2 |      |      | 0.795 |       |        |
| N    | 60   |      |      | 2.362 |       |        |
| T    |      |      | 14.4 |       |       | 0.567  |
| Ao   | 6.73 | 6.83 | 6.93 | 0.265 | 0.269 | 0.273  |
| Bo   | 7.32 | 7.42 | 7.52 | 0.288 | 0.292 | 0.296  |
| Ko   | 1.78 |      | 2    | 0.070 |       | 0.078  |
| Po   | 3.9  | 4.0  | 4.1  | 0.153 | 0.157 | 0.161  |
| P    | 7.9  | 8.0  | 8.1  | 0.311 | 0.315 | 0.319  |



Note: Drawing not in scale

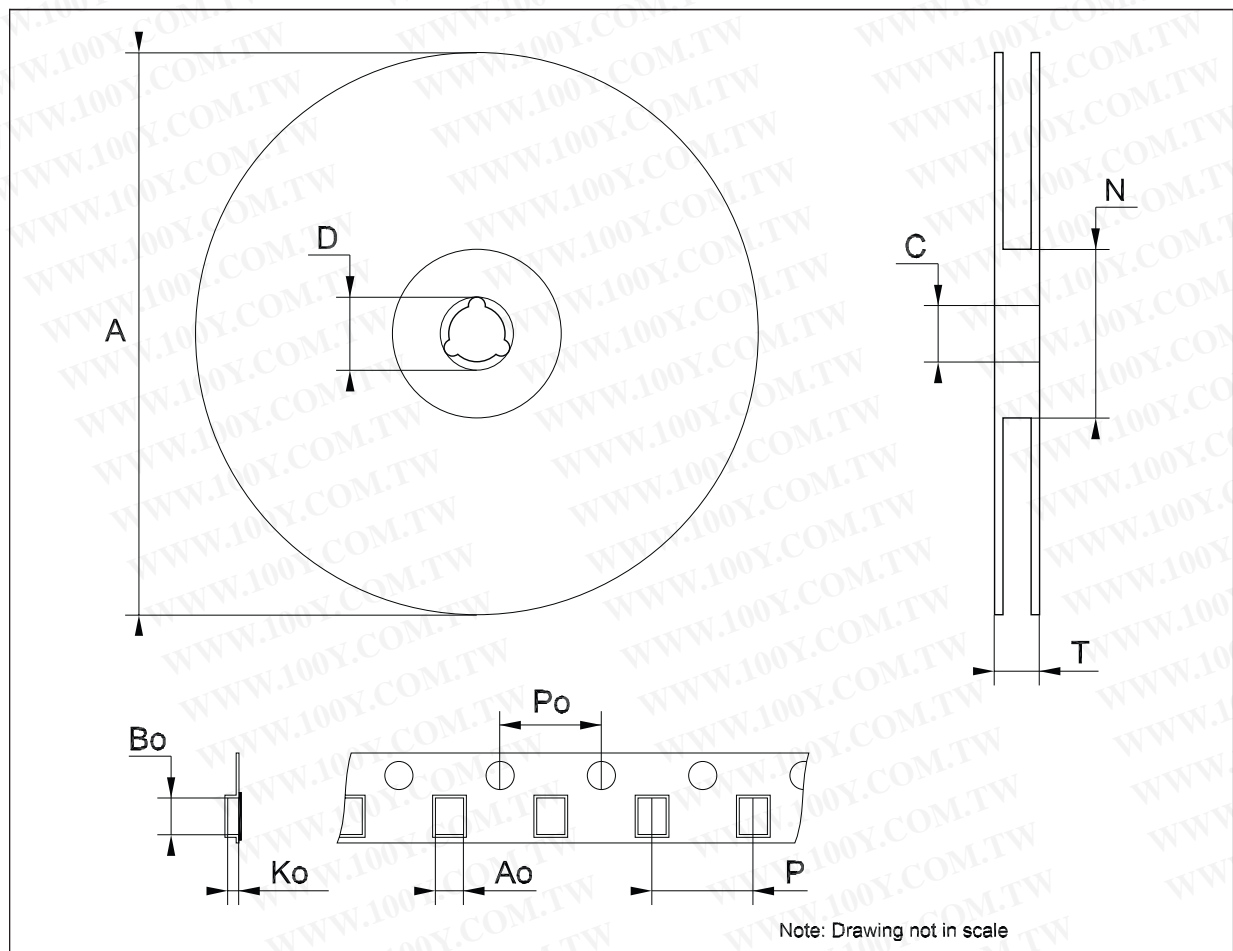
## Tape &amp; reel SO-8 mechanical data

| Dim. | mm.  |      |      | inch. |      |        |
|------|------|------|------|-------|------|--------|
|      | Min. | Typ. | Max. | Min.  | Typ. | Max.   |
| A    |      |      | 330  |       |      | 12.992 |
| C    | 12.8 |      | 13.2 | 0.504 |      | 0.519  |
| D    | 20.2 |      |      | 0.795 |      |        |
| N    | 60   |      |      | 2.362 |      |        |
| T    |      |      | 22.4 |       |      | 0.882  |
| Ao   | 8.1  |      | 8.5  | 0.319 |      | 0.335  |
| Bo   | 5.5  |      | 5.9  | 0.216 |      | 0.232  |
| Ko   | 2.1  |      | 2.3  | 0.082 |      | 0.090  |
| Po   | 3.9  |      | 4.1  | 0.153 |      | 0.161  |
| P    | 7.9  |      | 8.1  | 0.311 |      | 0.319  |



**Tape & reel DPAK-PPAK mechanical data**

| Dim. | mm.   |       |       | inch. |       |        |
|------|-------|-------|-------|-------|-------|--------|
|      | Min.  | Typ.  | Max.  | Min.  | Typ.  | Max.   |
| A    |       |       | 330   |       |       | 12.992 |
| C    | 12.8  | 13.0  | 13.2  | 0.504 | 0.512 | 0.519  |
| D    | 20.2  |       |       | 0.795 |       |        |
| N    | 60    |       |       | 2.362 |       |        |
| T    |       |       | 22.4  |       |       | 0.882  |
| Ao   | 6.80  | 6.90  | 7.00  | 0.268 | 0.272 | 0.276  |
| Bo   | 10.40 | 10.50 | 10.60 | 0.409 | 0.413 | 0.417  |
| Ko   | 2.55  | 2.65  | 2.75  | 0.100 | 0.104 | 0.105  |
| Po   | 3.9   | 4.0   | 4.1   | 0.153 | 0.157 | 0.161  |
| P    | 7.9   | 8.0   | 8.1   | 0.311 | 0.315 | 0.319  |



Note: Drawing not in scale

**勝特力材料 886-3-5753170**  
**勝特力电子(上海) 86-21-54151736**  
**勝特力电子(深圳) 86-755-83298787**  
[Http://www.100y.com.tw](http://www.100y.com.tw)



## 9 Order code

Table 20. Order code

| Part numbers |                             |                            |               |                           |                      |
|--------------|-----------------------------|----------------------------|---------------|---------------------------|----------------------|
| SOT-223      | SO-8                        | DPAK                       | DPAK (T&R)    | TO-220                    | Output voltage       |
| LD1117S12TR  | LD1117D12TR <sup>(1)</sup>  | LD1117DT12 <sup>(1)</sup>  | LD1117DT12TR  |                           | 1.2 V                |
| LD1117S12CTR | LD1117D12CTR <sup>(1)</sup> | LD1117DT12C <sup>(1)</sup> |               | LD1117V12C <sup>(1)</sup> | 1.2 V                |
| LD1117S18TR  | LD1117D18TR <sup>(1)</sup>  |                            | LD1117DT18TR  | LD1117V18                 | 1.8 V                |
| LD1117S18CTR | LD1117D18CTR <sup>(1)</sup> |                            | LD1117DT18CTR | LD1117V18C <sup>(1)</sup> | 1.8 V                |
| LD1117S25TR  | LD1117D25TR <sup>(1)</sup>  |                            | LD1117DT25TR  | LD1117V25                 | 2.5 V                |
| LD1117S25CTR | LD1117D25CTR <sup>(1)</sup> |                            | LD1117DT25CTR | LD1117V25C                | 2.5 V                |
| LD1117S28TR  |                             |                            | LD1117DT28TR  |                           | 2.85 V               |
| LD1117S30TR  |                             |                            |               |                           | 3 V                  |
| LD1117S33TR  | LD1117D33TR                 |                            | LD1117DT33TR  | LD1117V33                 | 3.3 V                |
| LD1117S33CTR | LD1117D33CTR                |                            | LD1117DT33CTR | LD1117V33C                | 3.3 V                |
| LD1117S50TR  |                             |                            | LD1117DT50TR  | LD1117V50                 | 5 V                  |
| LD1117S50CTR |                             |                            | LD1117DT50CTR |                           | 5 V                  |
| LD1117STR    | LD1117DTR <sup>(1)</sup>    |                            | LD1117DTTR    | LD1117V                   | ADJ from 1.25 to 15V |
| LD1117SC-R   | LD1117DC-R <sup>(1)</sup>   | LD1117DTC <sup>(1)</sup>   | LD1117DTC-R   | LD1117VC <sup>(1)</sup>   | ADJ from 1.25 to 15V |

1. Available on request.

勝特力材料 886-3-5753170  
 胜特力电子(上海) 86-21-54151736  
 胜特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

## 10 Revision history

**Table 21. Document revision history**

| Date        | Revision | Changes   |
|-------------|----------|---|
| 22-Sep-2004 | 15       | Add new Part Number #12C; Typing Error: Note on table 2.      |
| 25-Oct-2004 | 16       | Add $V_{ref}$ Reference Voltage on Table 12.                  |
| 18-Jul-2005 | 17       | The DPAK Mechanical Data has been updated.                    |
| 25-Nov-2005 | 18       | The TO220FM Package has been removed.                         |
| 14-Dec-2005 | 19       | The $T_{op}$ on Table 2 has been updated.                     |
| 06-Dec-2006 | 20       | DPAK mechanical data has been updated and add footprint data. |
| 05-Apr-2007 | 21       | Order codes updated.  |
| 30-Nov-2007 | 22       | Added <a href="#">Table 1</a> .                               |
| 16-Apr-2008 | 23       | Modified: <a href="#">Table 20 on page 39</a> .               |

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)



勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-54151736  
勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2008 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)