

## N-Channel Enhancement Mode MOSFET

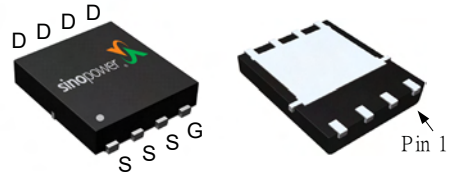
### Features

- 30V/99A<sup>a</sup>  
 $R_{DS(ON)}=2.7m\Omega(max.)@V_{GS}=10V$   
 $R_{DS(ON)}=3.5m\Omega(max.)@V_{GS}=4.5V$
- 100% UIS + R<sub>g</sub> Tested
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)
- Moisture Sensitivity Level MSL1 (per JEDEC J-STD-020D)

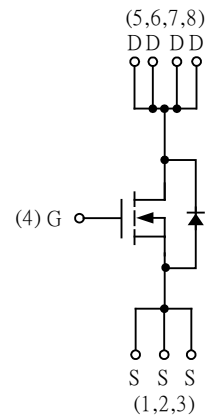
### Applications

- Power Management in Desktop Computer or DC/DC Converters.
- Power Load Switch.
- Notebook Battery Management.

### Pin Description




DFN5x6A-8\_EP



N-Channel MOSFET

### Ordering and Marking Information

<p>SM4532NQ <span style="border: 1px solid black; padding: 2px;">  </span><span style="border: 1px solid black; padding: 2px;">  </span><span style="border: 1px solid black; padding: 2px;">  </span>-<span style="border: 1px solid black; padding: 2px;">  </span><span style="border: 1px solid black; padding: 2px;">  </span><span style="border: 1px solid black; padding: 2px;">  </span></p> <p style="margin-left: 100px;">└── Assembly Material  └── Handling Code  └── Temperature Range  └── Package Code</p>	<p>Package Code  KP : DFN5x6A-8_EP</p> <p>Operating Junction Temperature Range  C : -55 to 150 °C</p> <p>Handling Code  TR : Tape &amp; Reel</p> <p>Assembly Material  G : Halogen and Lead Free Device</p>
<p>SM4532NQ KP :</p>	<div style="border: 1px solid black; padding: 5px; display: inline-block;">  </div> <p style="margin-left: 100px;">XXXXX - Lot Code</p>

Note : SINOPOWER lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. SINOPOWER lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020D for MSL classification at lead-free peak reflow temperature. SINOPOWER defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

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<http://www.100y.com.tw>

SINOPOWER reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

**Absolute Maximum Ratings** ( $T_A=25^{\circ}\text{C}$  Unless Otherwise Noted)

Symbol	Parameter		Rating	Unit
<b>Common Ratings</b>				
$V_{DSS}$	Drain-Source Voltage		30	V
$V_{GSS}$	Gate-Source Voltage		$\pm 12$	
$T_J$	Maximum Junction Temperature		150	$^{\circ}\text{C}$
$T_{STG}$	Storage Temperature Range		-55 to 150	
$I_S$	Diode Continuous Forward Current	$T_C=25^{\circ}\text{C}$	36.7	A
$I_D$	Continuous Drain Current	$T_C=25^{\circ}\text{C}$	99 <sup>a</sup>	A
		$T_C=100^{\circ}\text{C}$	62 <sup>a</sup>	
$I_{DM}^b$	Pulsed Drain Current	$T_C=25^{\circ}\text{C}$	212	
$P_D$	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	40	W
		$T_C=100^{\circ}\text{C}$	16	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady state	3.1	$^{\circ}\text{C}/\text{W}$
$I_D$	Continuous Drain Current	$T_A=25^{\circ}\text{C}$	23	A
		$T_A=70^{\circ}\text{C}$	18.8	
$I_{DM}^b$	Pulsed Drain Current	$T_A=25^{\circ}\text{C}$	94	
$P_D$	Maximum Power Dissipation	$T_A=25^{\circ}\text{C}$	2.27	W
		$T_A=70^{\circ}\text{C}$	1.45	
$R_{\theta JA}^c$	Thermal Resistance-Junction to Ambient	$t \leq 10\text{s}$	24	$^{\circ}\text{C}/\text{W}$
		Steady state	55	
$I_{AS}^d$	Avalanche Current, Single pulse	$L=0.1\text{mH}$	29	A
$E_{AS}^d$	Avalanche Energy, Single pulse	$L=0.1\text{mH}$	42	mJ

Note a : Calculated continuous current based on maximum allowable junction temperature. Bonding wire limitation current is 53A.

Note b : Pulse width is limited by maximum junction temperature.

Note c : Surface mounted on  $1\text{in}^2$  pad area, steady state  $t = 999\text{s}$ .

Note d : UIS tested and pulse width limited by maximum junction temperature (initial temperature  $T_J=25^{\circ}\text{C}$ ).

**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

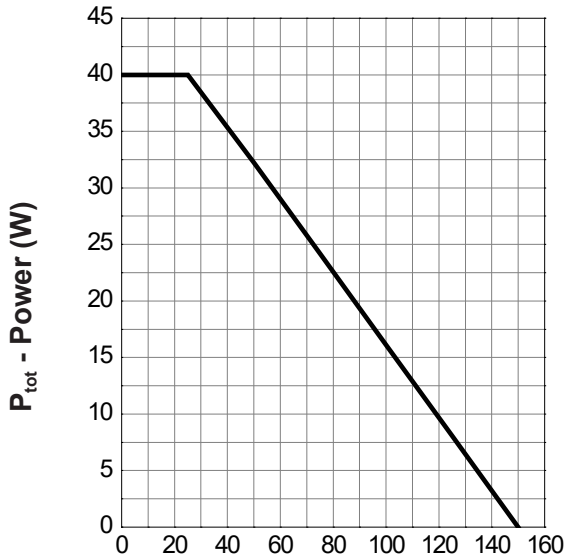
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	30	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=24V, V_{GS}=0V$	-	-	1	$\mu A$
		$T_J=85^\circ C$	-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1.1	1.5	1.9	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	$\pm 100$	nA
$R_{DS(ON)}^e$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=20A$	-	2.3	2.7	m $\Omega$
		$T_J=125^\circ C$	-	3.1	-	
		$V_{GS}=4.5V, I_{DS}=12A$	-	2.9	3.5	
Gfs	Forward Transconductance	$V_{DS}=10V, I_{DS}=5A$	-	15.4	-	S
<b>Diode Characteristics</b>						
$V_{SD}^e$	Diode Forward Voltage	$I_{SD}=20A, V_{GS}=0V$	-	0.8	1.1	V
$t_{rr}$	Reverse Recovery Time	$I_{SD}=20A, di_{SD}/dt=100A/\mu s$	-	23.9	-	ns
$t_a$	Charge Time		-	11.5	-	
$t_b$	Discharge Time		-	12.4	-	
$Q_{rr}$	Reverse Recovery Charge		-	12.6	-	
<b>Dynamic Characteristics<sup>f</sup></b>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	-	0.9	2.2	$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=15V,$ Frequency=1.0MHz	-	1845	2400	pF
$C_{oss}$	Output Capacitance		-	505	-	
$C_{riss}$	Reverse Transfer Capacitance		-	70	-	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=15V, R_L=15\Omega,$ $I_{DS}=1A, V_{GEN}=10V,$ $R_G=1\Omega$	-	15	27	ns
$t_r$	Turn-on Rise Time		-	10	18	
$t_{d(OFF)}$	Turn-off Delay Time		-	39.2	71	
$t_f$	Turn-off Fall Time		-	28.1	51	
<b>Gate Charge Characteristics<sup>f</sup></b>						
$Q_g$	Total Gate Charge	$V_{DS}=15V, V_{GS}=10V,$ $I_{DS}=20A$	-	30	42	nC
$Q_g$	Total Gate Charge	$V_{DS}=15V, V_{GS}=4.5V,$ $I_{DS}=20A$	-	14.4	-	
$Q_{gth}$	Threshold Gate Charge		-	3	-	
$Q_{gs}$	Gate-Source Charge		-	4.9	-	
$Q_{gd}$	Gate-Drain Charge		-	4.4	-	

Note e : Pulse test ; pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

Note f : Guaranteed by design, not subject to production testing.

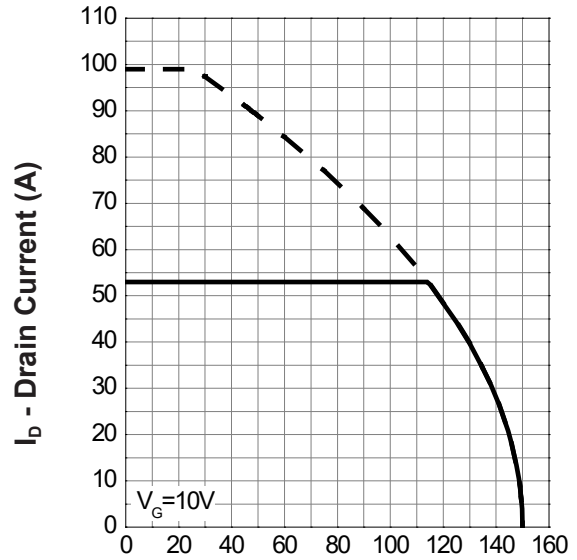
Typical Operating Characteristics

Power Dissipation



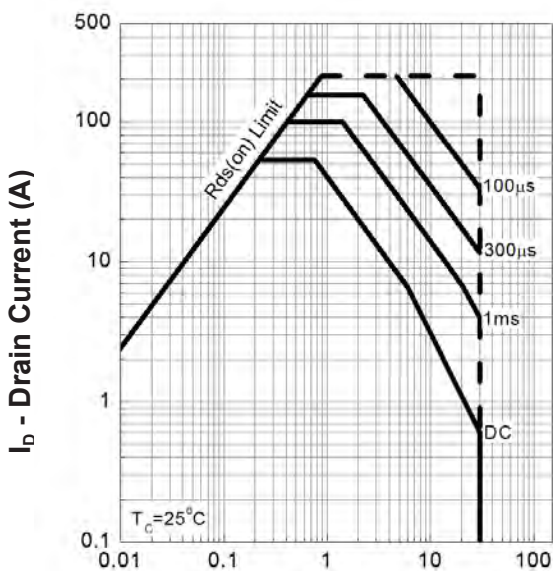
T<sub>c</sub> - Case Temperature (°C)

Drain Current



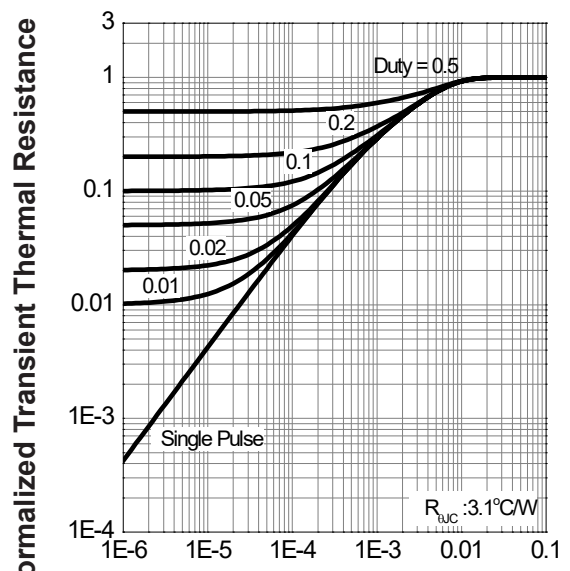
T<sub>c</sub> - Case Temperature (°C)

Safe Operation Area



V<sub>DS</sub> - Drain - Source Voltage (V)

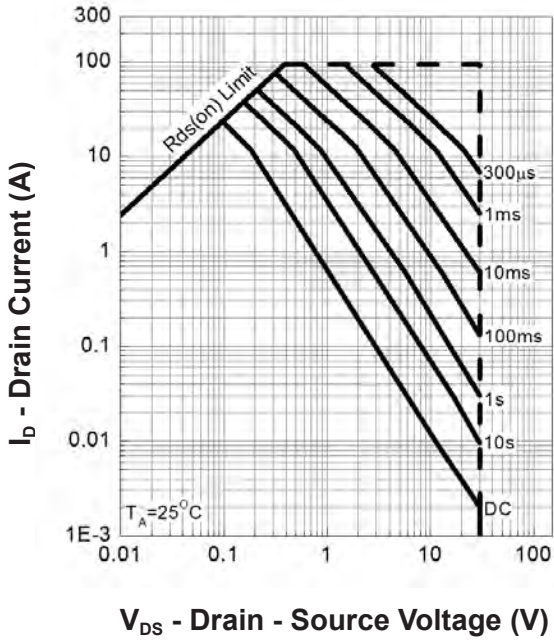
Thermal Transient Impedance



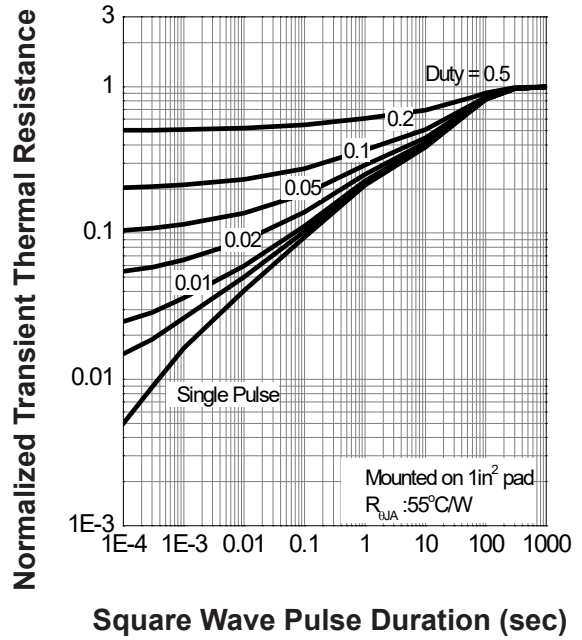
Square Wave Pulse Duration (sec)

Typical Operating Characteristics(Cont.)

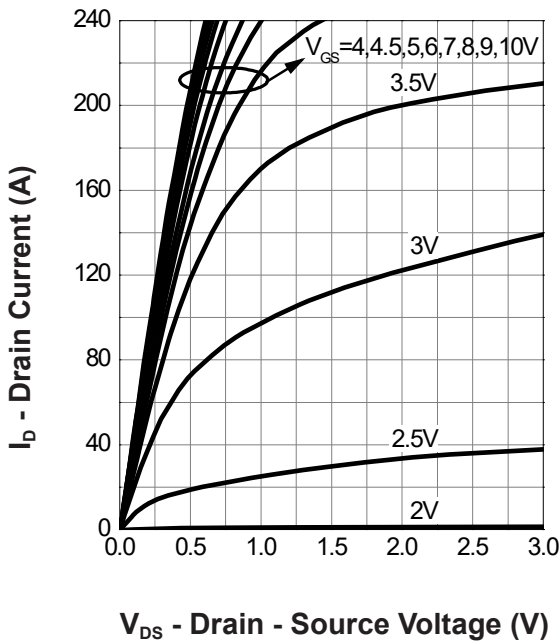
Safe Operation Area



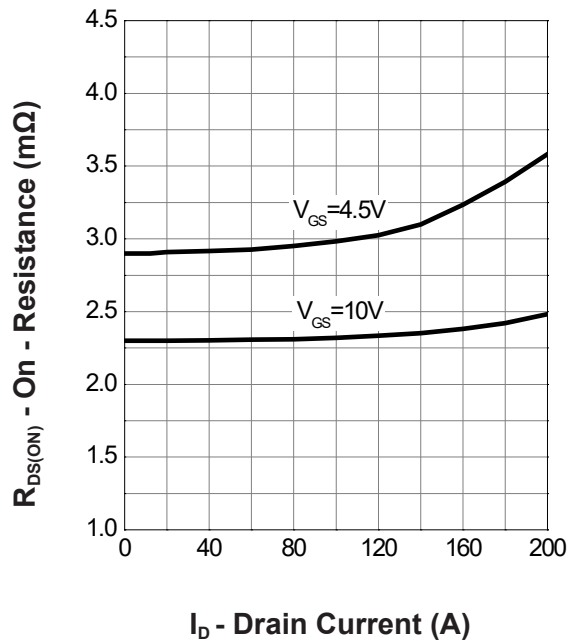
Thermal Transient Impedance



Output Characteristics

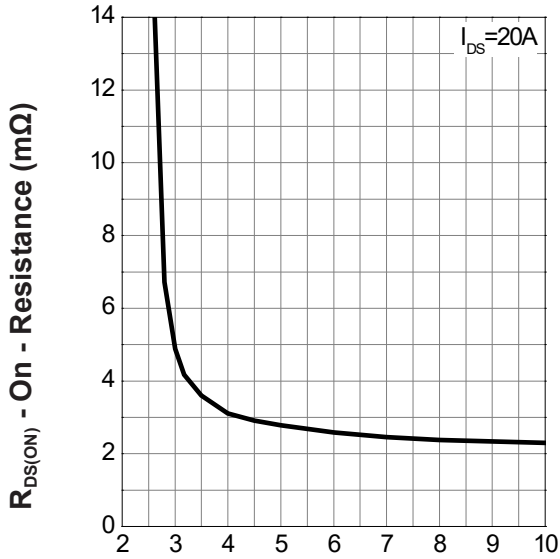


Drain-Source On Resistance



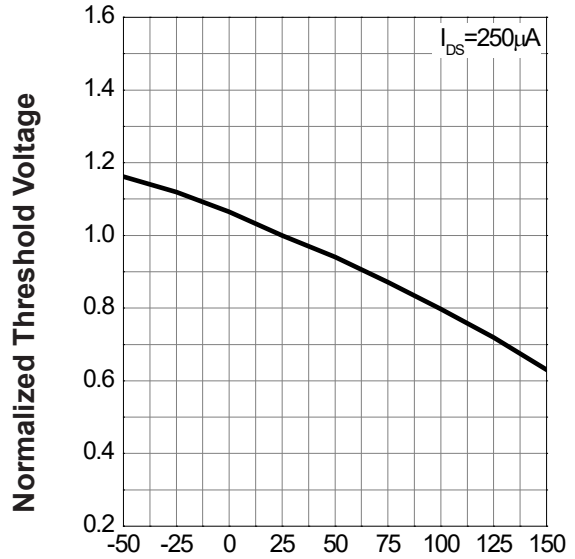
Typical Operating Characteristics(Cont.)

Gate-Source On Resistance



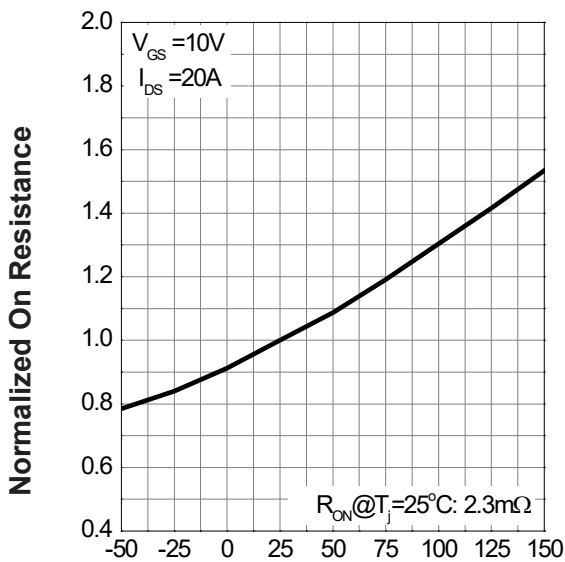
V<sub>GS</sub> - Gate - Source Voltage (V)

Gate Threshold Voltage



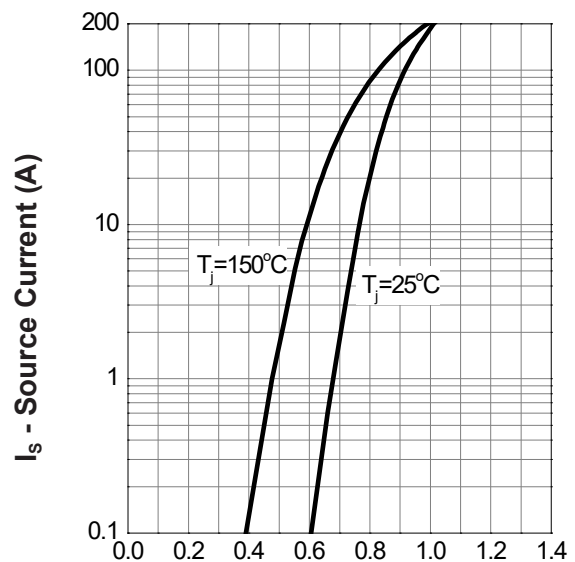
T<sub>J</sub> - Junction Temperature (°C)

Drain-Source On Resistance



T<sub>J</sub> - Junction Temperature (°C)

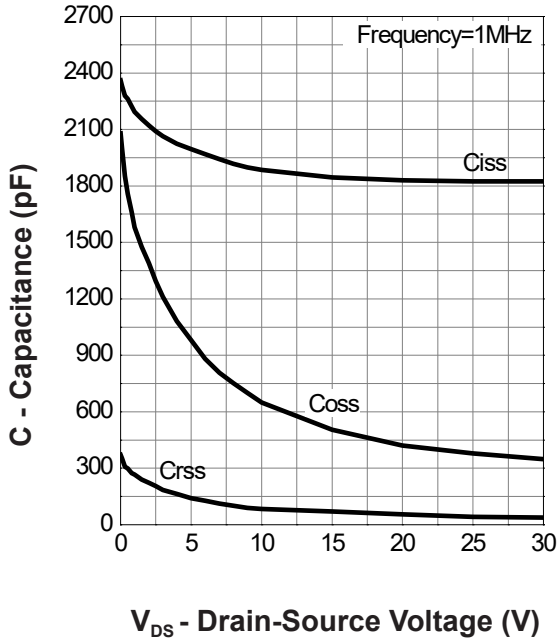
Source-Drain Diode Forward



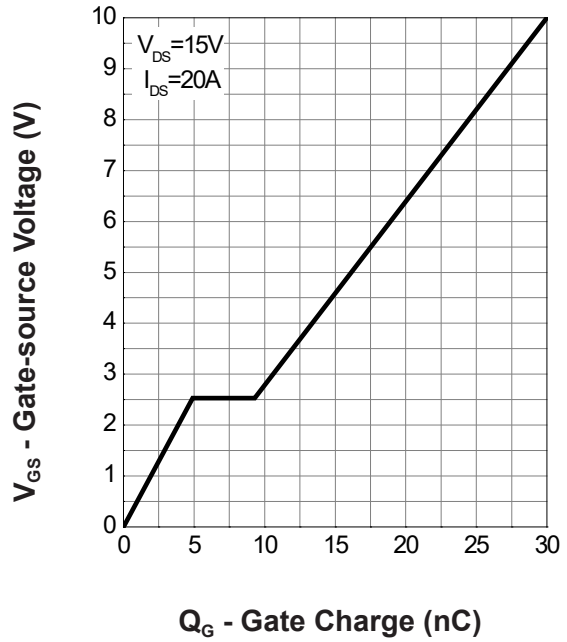
V<sub>SD</sub> - Source - Drain Voltage (V)

Typical Operating Characteristics(Cont.)

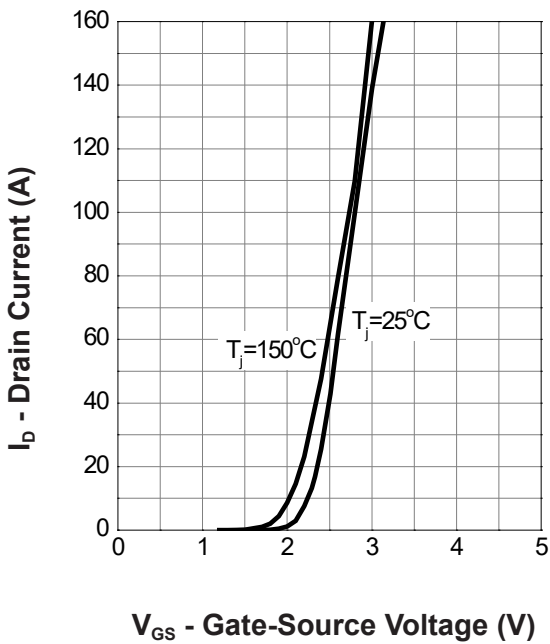
Capacitance



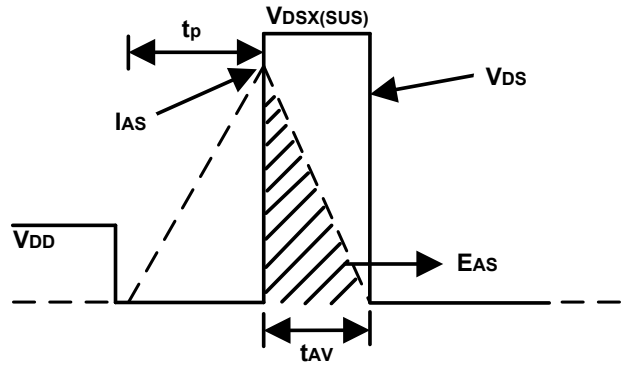
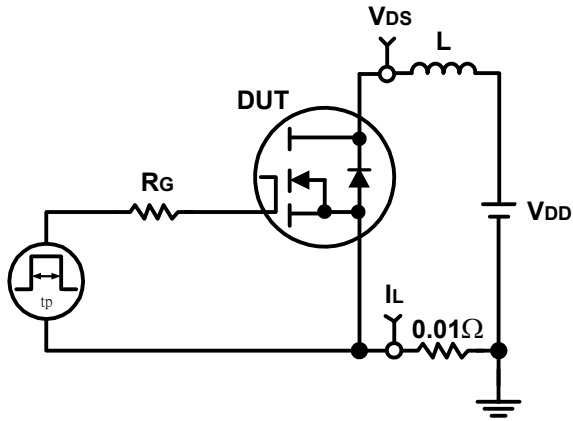
Gate Charge



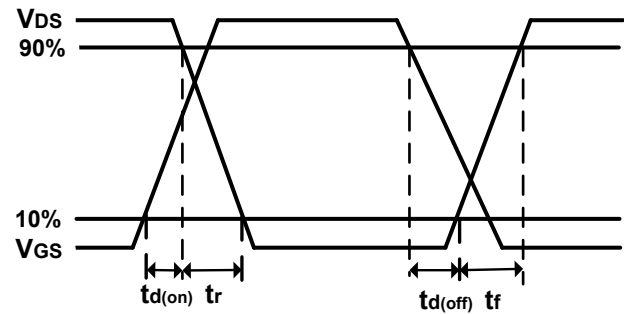
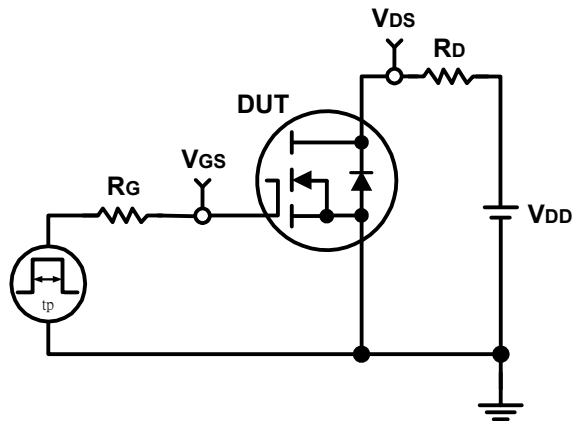
Transfer Characteristics



Avalanche Test Circuit and Waveforms



Switching Time Test Circuit and Waveforms





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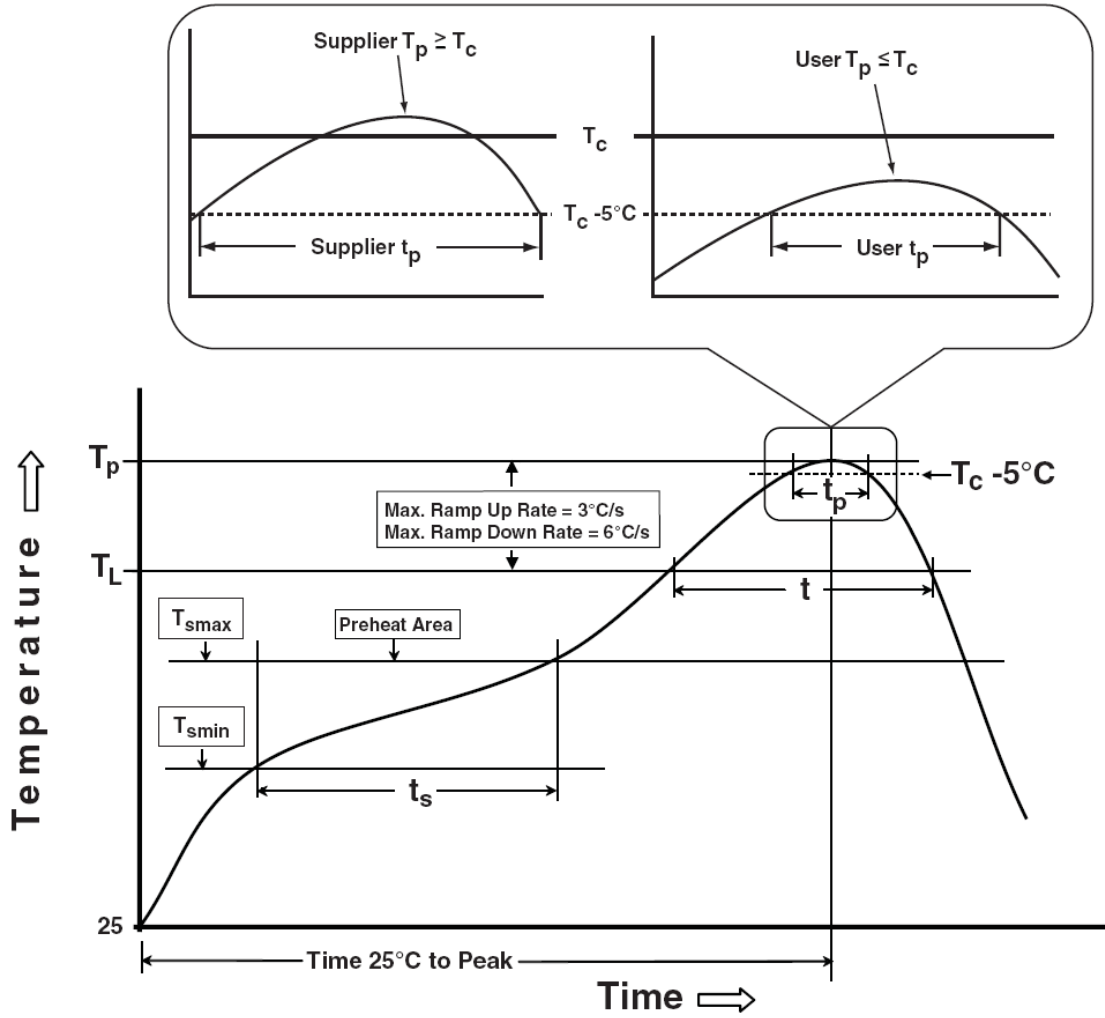
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Classification Profile



## Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
<b>Preheat &amp; Soak</b>		
Temperature min ( $T_{smin}$ )	100 °C	150 °C
Temperature max ( $T_{smax}$ )	150 °C	200 °C
Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60-120 seconds	60-120 seconds
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3 °C/second max.	3°C/second max.
Liquidous temperature ( $T_L$ )	183 °C	217 °C
Time at liquidous ( $t_L$ )	60-150 seconds	60-150 seconds
Peak package body Temperature ( $T_p$ )*	See Classification Temp in table 1	See Classification Temp in table 2
Time ( $t_p$ )** within 5°C of the specified classification temperature ( $T_c$ )	20** seconds	30** seconds
Average ramp-down rate ( $T_p$ to $T_{smax}$ )	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.		
** Tolerance for time at peak profile temperature ( $t_p$ ) is defined as a supplier minimum and a user maximum.		

Table 1. SnPb Eutectic Process – Classification Temperatures ( $T_c$ )

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures ( $T_c$ )

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350-2000	Volume mm <sup>3</sup> >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

## Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HTRB	JESD-22, A108	1000 Hrs, 80% of VDS max @ $T_{jmax}$
HTGB	JESD-22, A108	1000 Hrs, 100% of VGS max @ $T_{jmax}$
PCT	JESD-22, A102	168 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -65°C~150°C

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## Customer Service

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