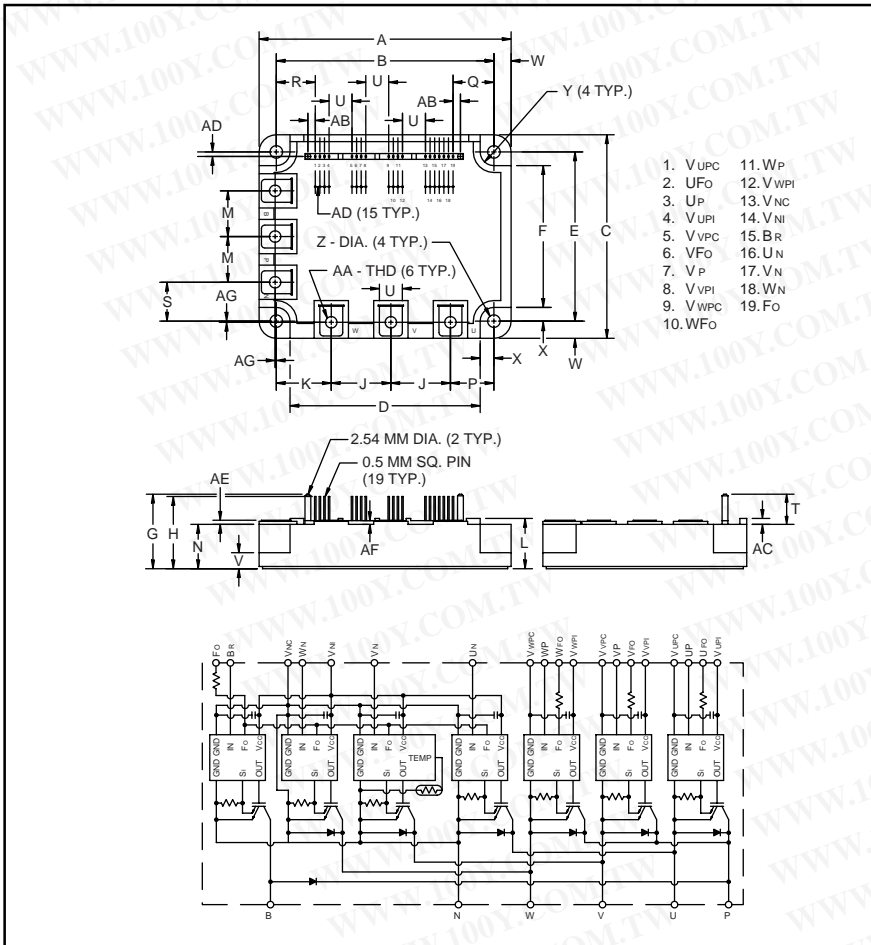


勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
 Http://www.100y.com.tw

MITSUBISHI INTELLIGENT POWER MODULES

# PM50RSA120

FLAT-BASE TYPE  
 INSULATED PACKAGE



### Description:

Mitsubishi Intelligent Power Modules are isolated base modules designed for power switching applications operating at frequencies to 20kHz. Built-in control circuits provide optimum gate drive and protection for the IGBT and free-wheel diode power devices.

### Features:

- Complete Output Power Circuit
- Gate Drive Circuit
- Protection Logic
  - Short Circuit
  - Over Current
  - Over Temperature
  - Under Voltage

### Applications:

- Inverters
- UPS
- Motion/Servo Control
- Power Supplies

### Ordering Information:

Example: Select the complete part number from the table below -i.e. PM50RSA120 is a 1200V, 50 Ampere Intelligent Power Module.

Type	Current Rating Amperes	V <sub>CES</sub> Volts (x 10)
PM	50	120

### Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.33±0.04	110.0±1.0
B	3.74±0.02	95.0±0.5
C	3.50±0.04	89.0±1.0
D	3.27	83.0
E	2.91±0.02	74.0±0.5
F	2.44	62.0
G	1.28	32.6
H	1.24	31.6
J	1.02	26.0
K	0.94	24.0
L	0.87 +0.06/-0.02	22.0 +1.5/-0.0
M	0.79	20.0
N	0.76	19.4
P	0.75	19.0
Q	0.708	17.98
R	0.670	17.02

Dimensions	Inches	Millimeters
S	0.67	17.0
T	0.52	13.2
U	0.39	10.0
V	0.28	7.0
W	0.30	7.5
X	0.24	6.0
Y	0.24 Rad.	Rad. 6.0
Z	0.22 Dia.	Dia. 5.5
AA	Metric M5	M5
AB	0.127	3.22
AC	0.10	2.6
AD	0.08	2.0
AE	0.07	1.8
AF	0.06	1.6
AG	0.02±0.01	0.5±0.3

**Absolute Maximum Ratings,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

Ratings	Symbol	PM50RSA120	Units
Power Device Junction Temperature	$T_j$	-20 to 150	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-40 to 125	$^\circ\text{C}$
Case Operating Temperature	$T_C$	-20 to 100	$^\circ\text{C}$
Mounting Torque, M5 Mounting Screws	—	1.47 ~ 1.96	N · m
Mounting Torque, M5 Main Terminal Screw	—	1.47 ~ 1.96	N · m
Module Weight (Typical)	—	550	Grams
Supply Voltage Protected by OC and SC ( $V_D = 13.5 - 16.5\text{V}$ , Inverter Part, $T_j = 125^\circ\text{C}$ )	$V_{\text{CC(prot.)}}$	800	Volts
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	$V_{\text{RMS}}$	2500	Volts

**Control Sector**

Supply Voltage (Applied between $V_{\text{UP1}}-V_{\text{UPC}}$ , $V_{\text{VP1}}-V_{\text{VPC}}$ , $V_{\text{WP1}}-V_{\text{WPC}}$ , $V_{\text{N1}}-V_{\text{NC}}$ )	$V_D$	20	Volts
Input Voltage (Applied between $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ , $W_P-V_{\text{WPC}}$ , $U_N \cdot V_N \cdot W_N \cdot B_r-V_{\text{NC}}$ )	$V_{\text{CIN}}$	20	Volts
Fault Output Supply Voltage Applied between ( $U_{\text{FO}}-V_{\text{UPC}}$ , $V_{\text{FO}}-V_{\text{VPC}}$ , $W_{\text{FO}}-V_{\text{WPC}}$ , $F_O-V_{\text{NC}}$ )	$V_{\text{FO}}$	20	Volts
Fault Output Current (Sink Current at $U_{\text{FO}}$ , $V_{\text{FO}}$ , $W_{\text{FO}}$ and $F_O$ Terminal)	$I_{\text{FO}}$	20	mA

**IGBT Inverter Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	1200	Volts
Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_C$	50	Amperes
Peak Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	100	Amperes
Supply Voltage (Applied between P - N)	$V_{\text{CC}}$	900	Volts
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	1000	Volts
Collector Dissipation	$P_C$	347	Watts

**Brake Sector**

Collector-Emitter Voltage	$V_{\text{CES}}$	1200	Volts
Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_C$	15	Amperes
Peak Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	30	Amperes
Supply Voltage (Applied between P - N)	$V_{\text{CC}}$	900	Volts
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	1000	Volts
Collector Dissipation	$P_C$	138	Watts
Diode Forward Current	$I_F$	15	Amperes
Diode DC Reverse Voltage	$V_{\text{R(DC)}}$	1200	Volts

Electrical and Mechanical Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>Control Sector</b>						
Over Current Trip Level Inverter Part	OC	$-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	59	112	—	Amperes
Over Current Trip Level Brake Part			22	50	—	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	—	183	—	Amperes
Short Circuit Trip Level Brake Part			—	95	—	Amperes
Over Current Delay Time	$t_{\text{off}}(\text{OC})$	$V_D = 15\text{V}$	—	10	—	$\mu\text{s}$
Over Temperature Protection	OT	Trip Level	111	118	125	$^\circ\text{C}$
	$\text{OT}_r$	Reset Level	—	100	—	$^\circ\text{C}$
Supply Circuit Under Voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
	$\text{UV}_r$	Reset Level	—	12.5	—	Volts
Supply Voltage	$V_D$	Applied between $V_{\text{UP1}}-V_{\text{UPC}}$ , $V_{\text{VP1}}-V_{\text{VPC}}$ , $V_{\text{WP1}}-V_{\text{WPC}}$ , $V_{\text{N1}}-V_{\text{NC}}$	13.5	15	16.5	Volts
Circuit Current	$I_D$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{N1}}-V_{\text{NC}}$	—	44	60	mA
		$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{XP1}}-V_{\text{XPC}}$	—	13	18	mA
Input ON Threshold Voltage	$V_{\text{th(on)}}$	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{\text{th(off)}}$	$U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ , $W_P-V_{\text{WPC}}$ , $U_N \cdot V_N \cdot W_N \cdot B_r-V_{\text{NC}}$	1.7	2.0	2.3	Volts
PWM Input Frequency	$f_{\text{PWM}}$	3- $\phi$ Sinusoidal	—	15	20	kHz
Fault Output Current	$I_{\text{FO(H)}}$	$V_D = 15\text{V}$ , $V_{\text{FO}} = 15\text{V}$	—	—	0.01	mA
	$I_{\text{FO(L)}}$	$V_D = 15\text{V}$ , $V_{\text{FO}} = 15\text{V}$	—	10	15	mA
Minimum Fault Output Pulse Width	$t_{\text{FO}}$	$V_D = 15\text{V}$	1.0	1.8	—	ms

**Electrical and Mechanical Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>IGBT Inverter Sector</b>						
Collector Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C}$	—	—	10	mA
Emitter-Collector Voltage	$V_{EC}$	$-I_C = 50\text{A}, V_D = 15\text{V}, V_{CIN} = 5\text{V}$	—	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 50\text{A}$	—	2.5	3.5	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 50\text{A}, T_j = 125^\circ\text{C}$	—	2.2	3.2	Volts
Inductive Load Switching Times	$t_{on}$		0.5	1.0	2.5	$\mu\text{s}$
	$t_{rr}$	$V_D = 15\text{V}, V_{CIN} = 0 \leftrightarrow 15\text{V}$	—	0.15	0.3	$\mu\text{s}$
	$t_{C(on)}$	$V_{CC} = 600\text{V}, I_C = 50\text{A}$	—	0.4	1.0	$\mu\text{s}$
	$t_{off}$	$T_j = 125^\circ\text{C}$	—	2.0	3.0	$\mu\text{s}$
	$t_{C(off)}$		—	0.7	1.2	$\mu\text{s}$
<b>Brake Sector</b>						
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 15\text{A}, T_j = 25^\circ\text{C}$	—	2.8	3.8	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 15\text{A}, T_j = 125^\circ\text{C}$	—	2.2	3.2	Volts
Diode Forward Voltage	$V_{FM}$	$-I_C = 15\text{A}, V_D = 15\text{V}, V_{CIN} = 5\text{V}$	—	2.5	3.5	Volts
Collector Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C}$	—	—	1	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C}$	—	—	10	mA



**Thermal Characteristics**

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each Inverter IGBT	—	—	0.36	°C/Watt
	$R_{th(j-c)F}$	Each Inverter FWDi	—	—	1.0	°C/Watt
	$R_{th(c-f)Q}$	Each Brake IGBT	—	—	0.9	°C/Watt
	$R_{th(c-f)F}$	Each Brake FWDi	—	—	2.0	°C/Watt
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.027	°C/Watt

**Recommended Conditions for Use**

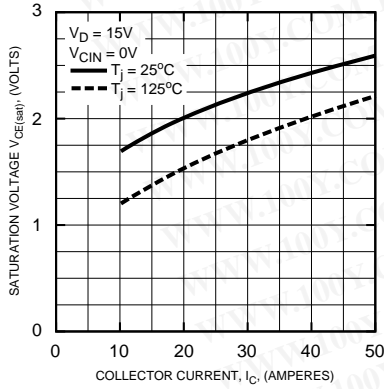
Characteristic	Symbol	Condition	Value	Units
Supply Voltage	$V_{CC}$	Applied across P-N Terminals	0 ~ 800	Volts
	$V_D$	Applied between $V_{UP1}$ - $V_{UPC}$ , $V_{N1}$ - $V_{NC}$ , $V_{VP1}$ - $V_{VPC}$ , $V_{WP1}$ - $V_{WPC}$	$15 \pm 1.5$	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between	0 ~ 0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$	$U_P$ - $V_{UPC}$ , $V_P$ - $V_{VPC}$ , $W_P$ - $V_{WPC}$ , $U_N$ · $V_N$ · $W_N$ · $B_r$ - $V_{NC}$	$4.0 \sim V_D$	Volts
PWM Input Frequency	$f_{PWM}$	Using Application Circuit	5 ~ 20	kHz
Minimum Dead Time	$t_{dead}$	Input Signal	$\geq 3$	$\mu s$

PM50RSA120

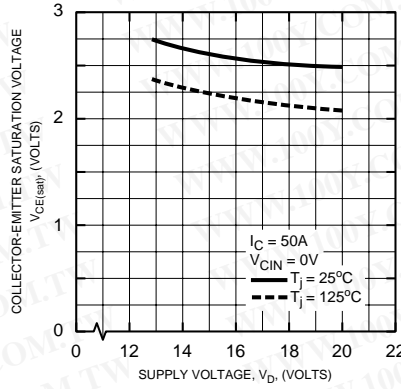
FLAT-BASE TYPE  
 INSULATED PACKAGE

Inverter Part

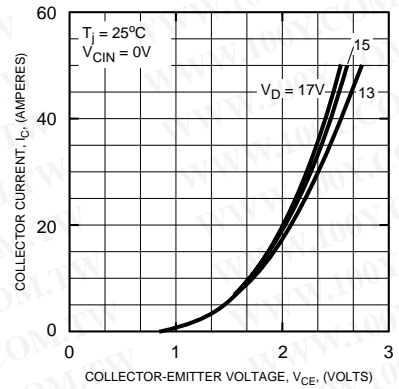
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



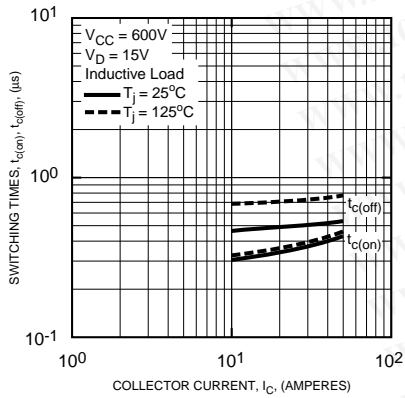
COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



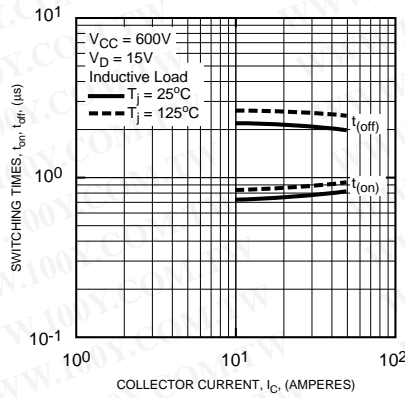
OUTPUT CHARACTERISTICS (TYPICAL)



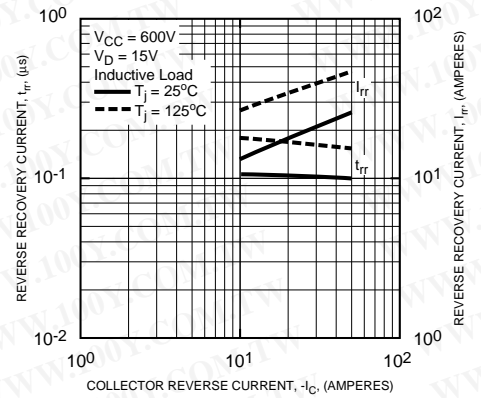
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



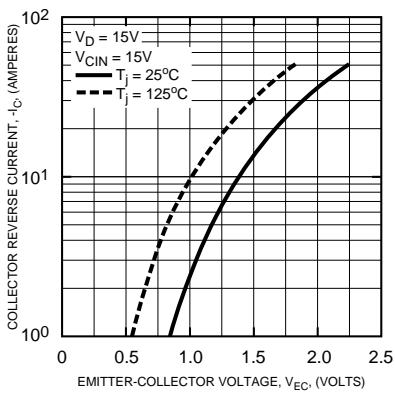
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



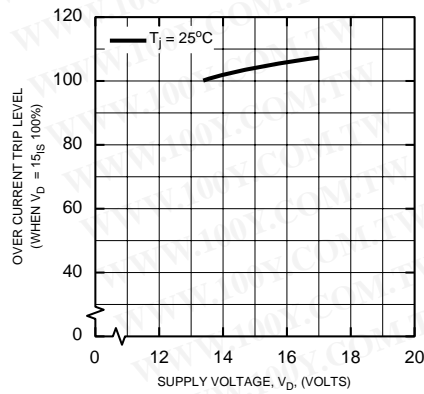
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



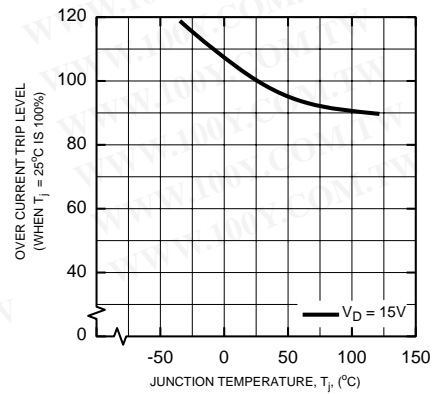
DIODE FORWARD CHARACTERISTICS



OVER CURRENT TRIP LEVEL VS. SUPPLY VOLTAGE (TYPICAL)

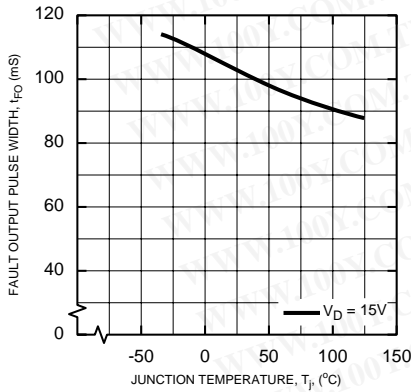


OVER CURRENT TRIP LEVEL VS. TEMPERATURE (TYPICAL)

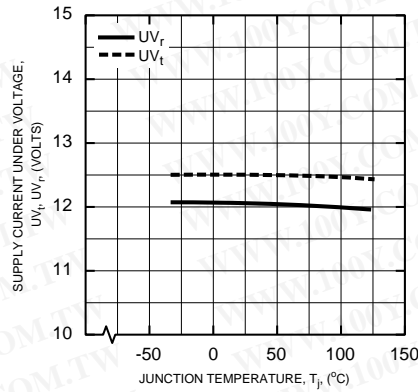


Inverter Part

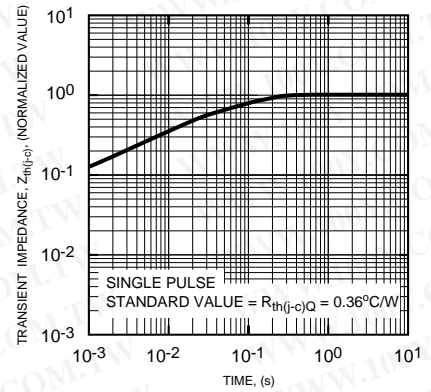
FAULT OUTPUT PULSE WIDTH VS. TEMPERATURE (TYPICAL)



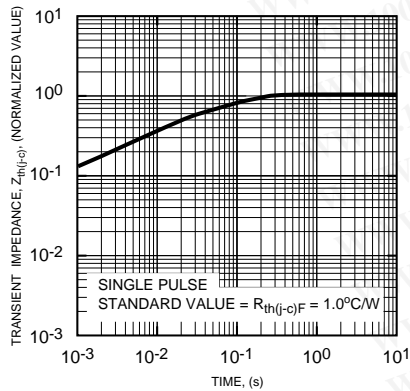
CONTROL SUPPLY VOLTAGE DROP PROTECTION VS. TEMPERATURE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each FWDi)



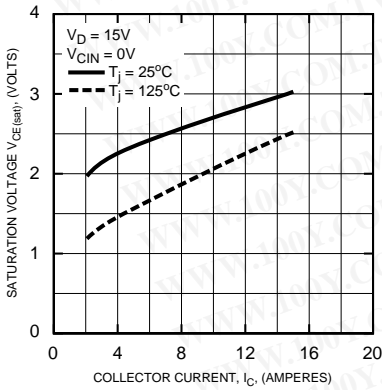
勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

PM50RSA120

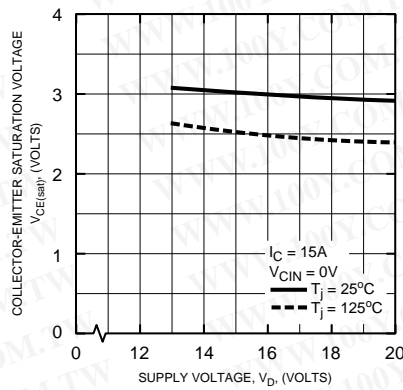
FLAT-BASE TYPE  
INSULATED PACKAGE

Brake Part

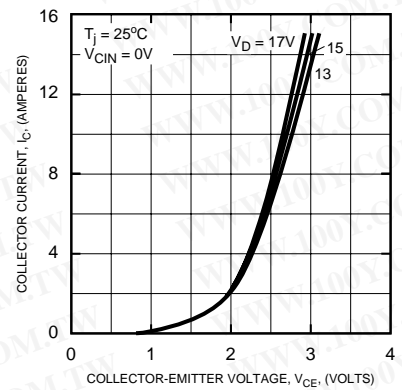
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



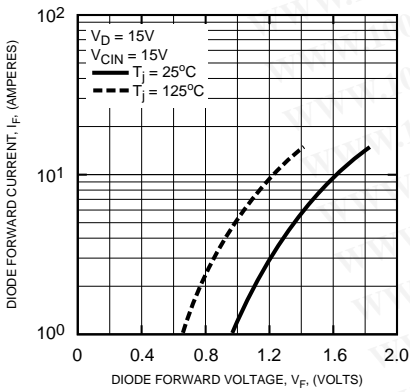
COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



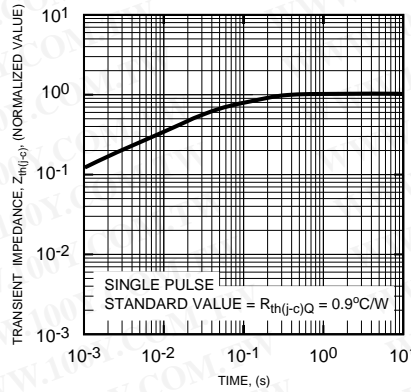
OUTPUT CHARACTERISTICS (TYPICAL)



DIODE FORWARD CHARACTERISTICS (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each FWDi)

