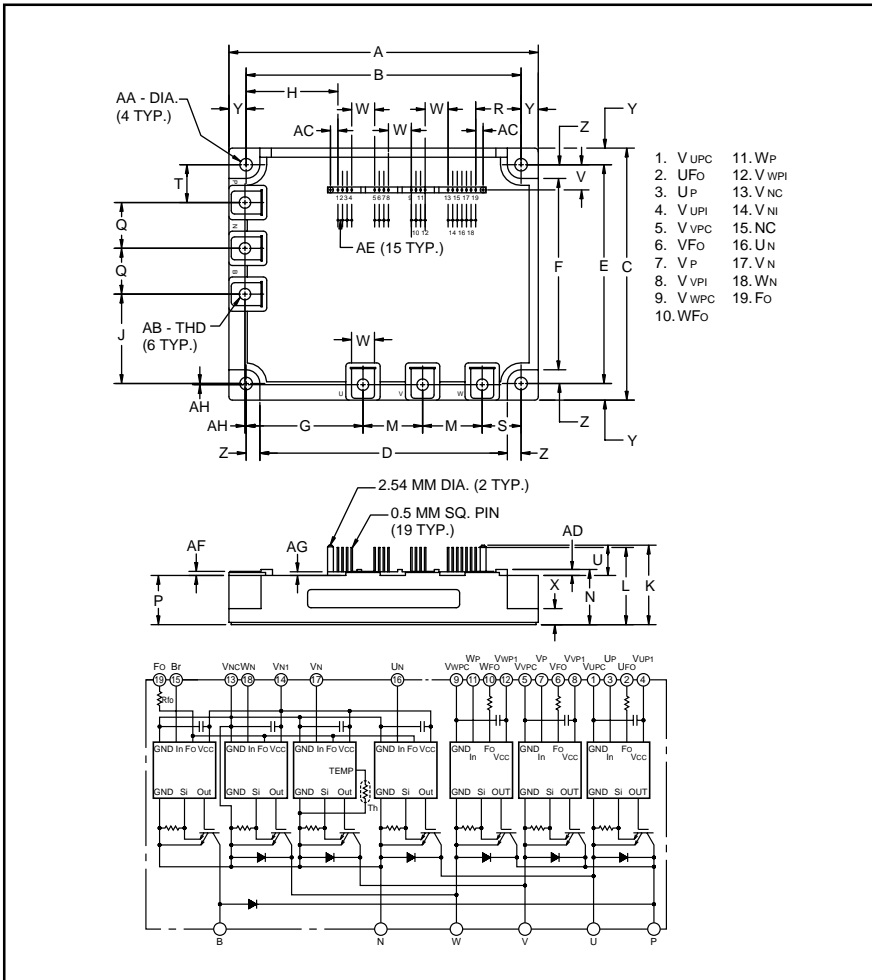


# PM200RSA060

FLAT-BASE TYPE  
INSULATED PACKAGE



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.31±0.04	135.0±1.0
B	4.74±0.02	120.5±0.5
C	4.33±0.04	110.0±1.0
D	4.27	10.5
E	3.76±0.02	95.5±0.5
F	3.29	83.5
G	2.01	51.0
H	1.602	40.68
J	1.54	39.0
K	1.37	34.7
L	1.33	33.7
M	1.02	26.0
N	0.95 +0.06/-0.0	24.1 +1.5/-0.0
P	0.84	21.3
Q	0.79	20.0
R	0.780	19.82

Dimensions	Inches	Millimeters
S	0.69	17.5
T	0.65	16.5
U	0.52	13.2
V	0.43	11.0
W	0.39	10.0
X	0.31	8.0
Y	0.285	7.25
Z	0.24	6.0
AA	0.22 Dia.	Dia. 5.5
AD	Metric M5	M5
AC	0.128	3.22
AD	0.10	2.6
AE	0.08	2.0
AF	0.07	1.8
AG	0.06	1.6
AH	0.02	0.5



**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. PM200RSA060 is a 600V, 200 Ampere Intelligent Power Module.

Type	Current Rating Amperes	V <sub>CES</sub> Volts (x 10)
PM	200	60

**PM200RSA060**FLAT-BASE TYPE  
INSULATED PACKAGE**Absolute Maximum Ratings,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

	Symbol	Ratings	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	$\text{N} \cdot \text{m}$
Mounting Torque, M5 Main Terminal Screw	—	1.47 ~ 1.96	$\text{N} \cdot \text{m}$
Module Weight (Typical)	—	920	Grams
Supply Voltage Protected by OC and SC ( $V_D = 13.5 - 16.5\text{V}$ , Inverter Part, $T_j = 125^\circ\text{C}$ )	$V_{\text{CC(prot.)}}$	400	Volts
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	$V_{\text{iso}}$	2500	$\text{V}_{\text{rms}}$

**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 of $U_{\text{FO}}$ , $V_{\text{FO}}$ , $W_{\text{FO}}$ and $F_O$ Terminal)	$I_{\text{FO}}$	20	mA

**IGBT Inverter Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	600	Volts
Collector Current, $\pm$	$I_C$	200	Amperes
Peak Collector Current, $\pm$	$I_{\text{CP}}$	400	Amperes
Supply Voltage (Applied between P - N)	$V_{\text{CC}}$	450	Volts
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	500	Volts
Collector Dissipation	$P_C$	595	Watts

**Brake Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	600	Volts
Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_C$	75	Amperes
Peak Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	150	Amperes
Supply Voltage (Applied between P - N)	$V_{\text{CC}}$	450	Volts
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	500	Volts
Collector Dissipation	$P_C$	370	Watts
Diode Forward Current	$I_F$	75	Amperes
Diode DC Reverse Voltage	$V_{\text{R(DC)}}$	600	Volts

**PM200RSA060**FLAT-BASE TYPE  
INSULATED PACKAGE**Electrical and Mechanical Characteristics, T<sub>j</sub> = 25°C unless otherwise specified**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>Control Sector</b>						
Over Current Trip Level Inverter Part	OC	-20°C ≤ T ≤ 125°C, V <sub>D</sub> = 15V	310	400	—	Amperes
Over Current Trip Level Brake Part			115	161	—	Amperes
Short Circuit Trip Level Inverter Part	SC	-20°C ≤ T ≤ 125°C, V <sub>D</sub> = 15V	—	560	—	Amperes
Short Circuit Trip Level Brake Part			—	241	—	Amperes
Over Current Delay Time	t <sub>off(OC)</sub>	V <sub>D</sub> = 15V	—	10	—	μs
Over Temperature Protection	OT	Trip Level	111	118	125	°C
	OT <sub>r</sub>	Reset Level	—	100	—	°C
Supply Circuit Under Voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
	UV <sub>r</sub>	Reset Level	—	12.5	—	Volts
Supply Voltage	V <sub>D</sub>	Applied between V <sub>UP1</sub> -V <sub>U<sub>PC</sub></sub> , V <sub>VP1</sub> -V <sub>V<sub>PC</sub></sub> , V <sub>WP1</sub> -V <sub>W<sub>PC</sub></sub> , V <sub>N1</sub> -V <sub>N<sub>C</sub></sub>	13.5	15	16.5	Volts
Circuit Current	I <sub>D</sub>	V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V, V <sub>N1</sub> -V <sub>N<sub>C</sub></sub>	—	52	72	mA
		V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V, V <sub>XP1</sub> -V <sub>X<sub>PC</sub></sub>	—	13	18	mA
Input ON Threshold Voltage	V <sub>th(on)</sub>	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	V <sub>th(off)</sub>	U <sub>P</sub> -V <sub>U<sub>PC</sub></sub> , V <sub>P</sub> -V <sub>V<sub>PC</sub></sub> , W <sub>P</sub> -V <sub>W<sub>PC</sub></sub> , U <sub>N</sub> · V <sub>N</sub> · W <sub>N</sub> · B <sub>r</sub> -V <sub>N<sub>C</sub></sub>	1.7	2.0	2.3	Volts
PWM Input Frequency	f <sub>PWM</sub>	3-φ Sinusoidal	—	15	20	kHz
Fault Output Current	I <sub>FO(H)</sub>	V <sub>D</sub> = 15V, V <sub>FO</sub> = 15V	—	—	0.01	mA
	I <sub>FO(L)</sub>	V <sub>D</sub> = 15V, V <sub>FO</sub> = 15V	—	10	15	mA
Minimum Fault Output Pulse Width	t <sub>FO</sub>	V <sub>D</sub> = 15V	1.0	1.8	—	ms

## PM200RSA060

FLAT-BASE TYPE  
INSULATED PACKAGEElectrical 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
Diode Forward Voltage	$V_{EC}$	$-I_C = 200\text{A}, V_D = 15\text{V}, V_{CIN} = 5\text{V}$	—	1.9	2.8	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, I_{CIN} = 0\text{V}, I_C = 200\text{A}$	—	1.8	2.7	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 200\text{A}, T_j = 125^\circ\text{C}$	—	1.75	2.63	Volts
Inductive Load Switching Times	$t_{on}$		0.4	0.8	2.0	$\mu\text{s}$
	$t_{rr}$	$V_D = 15\text{V}, V_{CIN} = 0 \leftrightarrow 15\text{V}$	—	0.15	0.3	$\mu\text{s}$
	$t_{C(on)}$	$V_{CC} = 300\text{V}, I_C = 200\text{A}$	—	0.4	1.0	$\mu\text{s}$
	$t_{off}$	$T_j = 125^\circ\text{C}$	—	2.0	2.9	$\mu\text{s}$
	$t_{C(off)}$		—	0.6	1.2	$\mu\text{s}$

## Brake Sector

Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A}, T_j = 25^\circ\text{C}$	—	1.8	2.7	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A}, T_j = 125^\circ\text{C}$	—	1.85	2.78	Volts
Diode Forward Voltage	$V_{FM}$	$I_F = 75\text{A}, V_D = 15\text{V}, V_{CIN} = 5\text{V}$	—	1.7	2.5	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	—	—	0.21	$^\circ\text{C/Watt}$
	$R_{th(j-c)F}$	Each Inverter FWDi	—	—	0.35	$^\circ\text{C/Watt}$
	$R_{th(j-c)Q}$	Brake IGBT	—	—	0.33	$^\circ\text{C/Watt}$
	$R_{th(j-c)F}$	Brake FWDi	—	—	0.80	$^\circ\text{C/Watt}$
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.018	$^\circ\text{C/Watt}$

## Recommended Conditions for Use

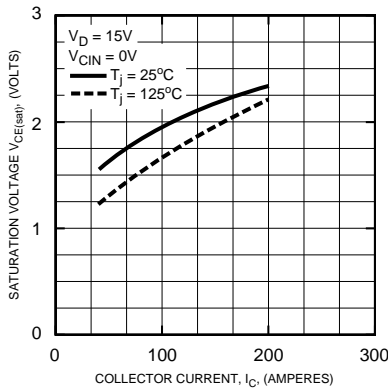
Characteristic	Symbol	Condition	Value	Units
Supply Voltage	$V_{CC}$	Applied across P-N Terminals	0 ~ 400	Volts
	$V_D$	Applied between $V_{UP1}-V_{UPC}, V_{N1}-V_{NC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}$	$15 \pm 1.5$	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between	0 ~ 0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$	$U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}, U_N \cdot V_N \cdot W_N \cdot B_r-V_{NC}$	$4.0 \sim V_D$	Volts
PWM Input Frequency	$f_{PWM}$	Using Application Circuit	5 ~ 20	kHz
Minimum Dead Time	$t_{DEAD}$	Input Signal	$\geq 2.5$	$\mu\text{s}$

# PM200RSA060

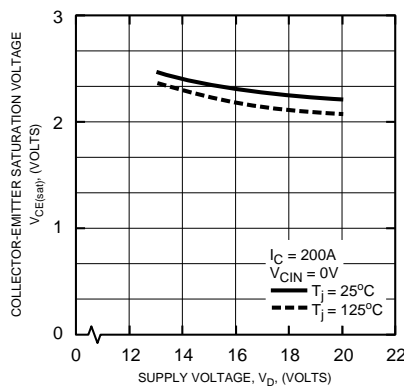
FLAT-BASE TYPE  
INSULATED PACKAGE

## Inverter Part

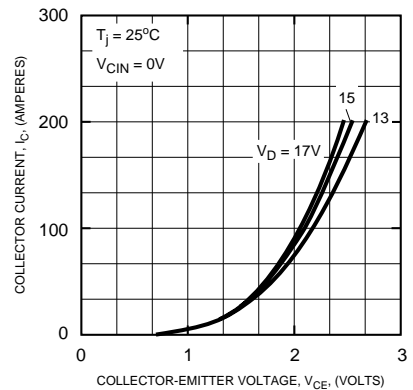
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



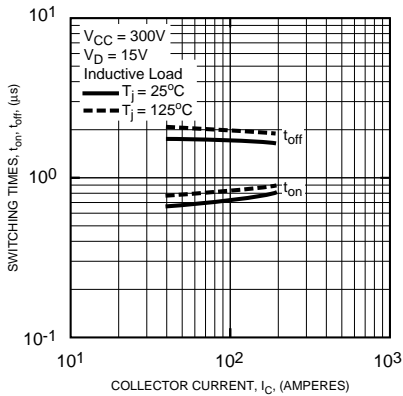
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



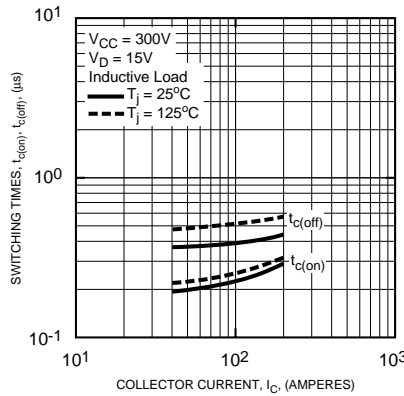
**OUTPUT CHARACTERISTICS (TYPICAL)**



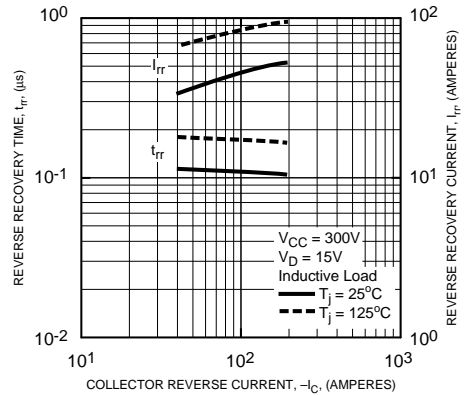
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



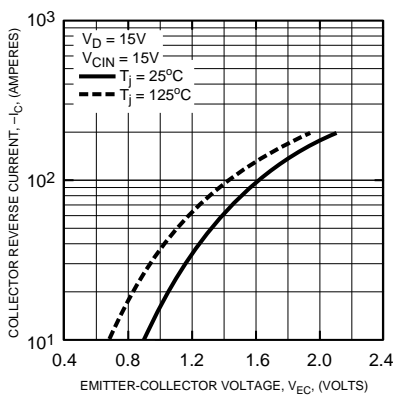
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



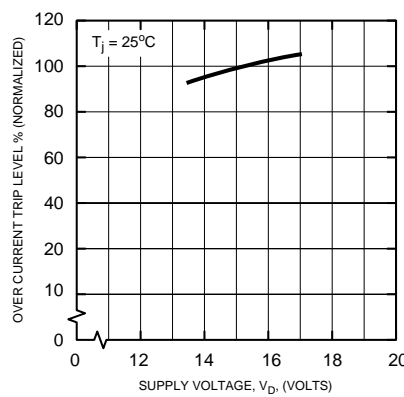
**REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)**



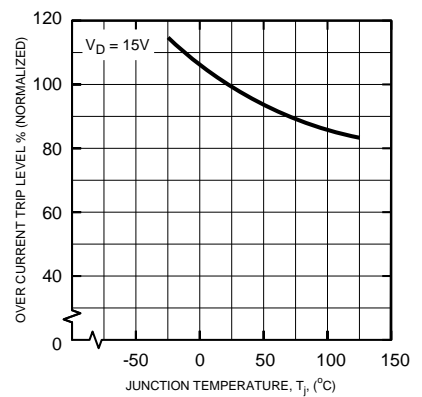
**DIODE FORWARD CHARACTERISTICS**



**OVER CURRENT TRIP LEVEL VS. SUPPLY VOLTAGE (TYPICAL)**



**OVER CURRENT TRIP LEVEL TEMPERATURE DEPENDENCY (TYPICAL)**

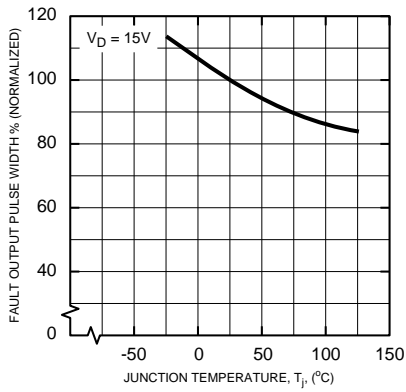


# PM200RSA060

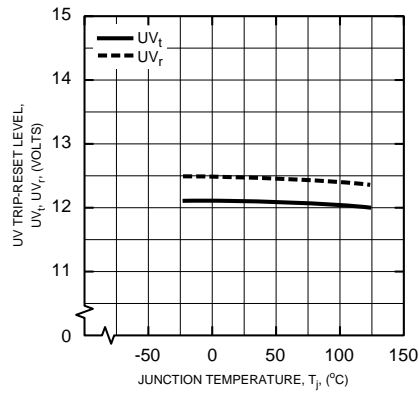
FLAT-BASE TYPE  
INSULATED PACKAGE

## Inverter Part

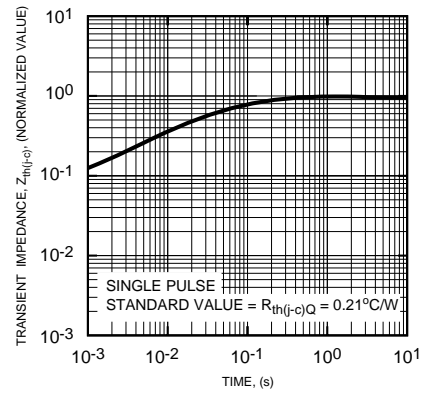
FAULT OUTPUT PULSE WIDTH VS. TEMPERATURE (TYPICAL)



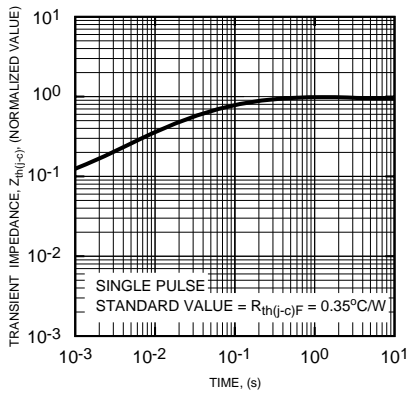
CONTROL SUPPLY VOLTAGE TRIP-RESET LEVEL TEMPERATURE DEPENDENCY (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each FWD)

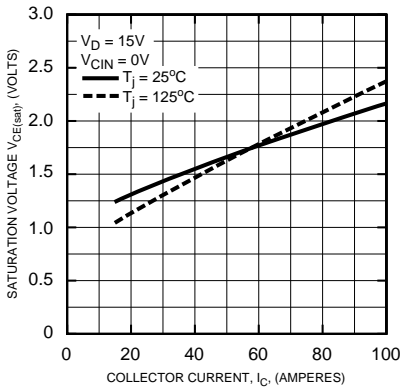


# PM200RSA060

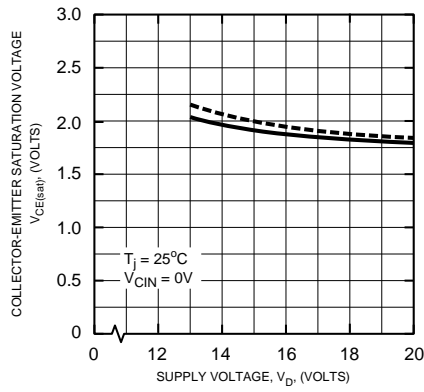
FLAT-BASE TYPE  
INSULATED PACKAGE

## Brake Part

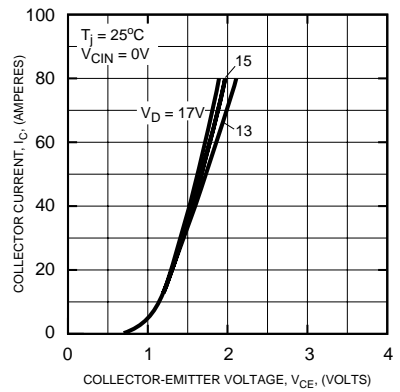
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



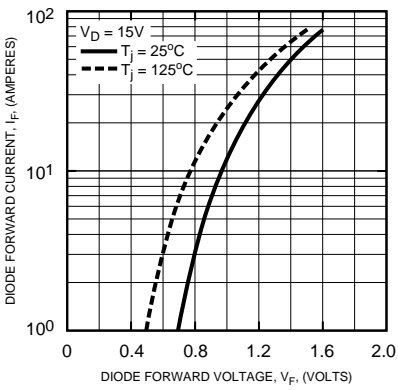
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



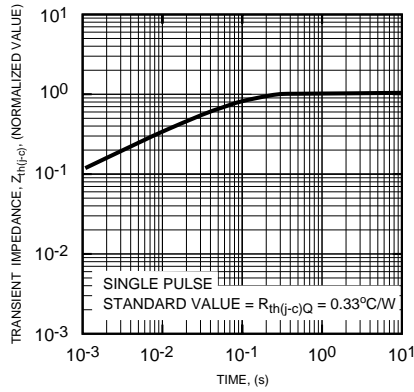
**OUTPUT CHARACTERISTICS (TYPICAL)**



**DIODE FORWARD CHARACTERISTICS**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWD)**

