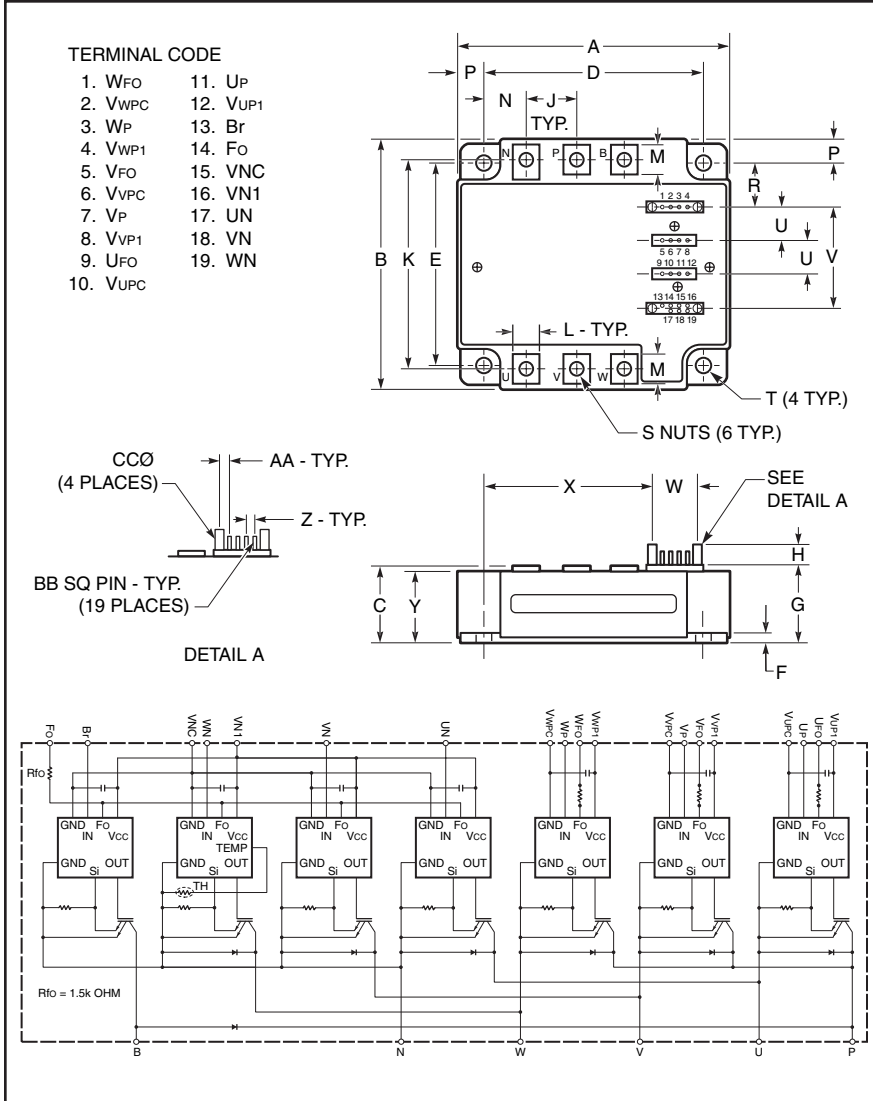


### Intellimod™ Module Three Phase + Brake IGBT Inverter Output 50 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.33	110.0
B	3.50	89.0
C	0.87 +0.04/-0.02	22.0 +1.0/-0.5
D	3.74±0.010	95.0±0.25
E	2.91±0.010	74.0±0.25
F	0.16	4.0
G	0.87	22.0
H	0.42	10.6
J	0.79	20.0
K	2.99±0.02	76.0±0.5
L	0.39	10.0
M	0.49	12.5
N	0.67	17.0

Dimensions	Inches	Millimeters
P	0.30	7.5
R	0.65	16.5
S	M5 Metric	M5
T	0.22 Dia.	Dia. 5.5
U	0.56±0.010	14.1±0.25
V	1.72±0.012	43.57±0.3
W	0.57±0.012	14.6±0.3
X	2.90	73.7
Y	0.78	19.7
Z	0.10±0.010	2.54±0.25
AA	1.37±0.010	3.49±0.25
BB	0.02 SQ	0.64 SQ
CC	0.12 +0.04/-0.02	3.0 +1.0/-0.5



#### Description:

Powerex Intellimod™ 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 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. PM50RVA120 is a 1200V, 50 Ampere Intellimod™ Intelligent Power Module.

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



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**PM50RVA120**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**50 Amperes/1200 Volts**

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

Characteristics	Symbol	PM50RVA120	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 (Typical)	—	17	in-lb
Mounting Torque, M5 Main Terminal Screws (Typical)	—	17	in-lb
Module Weight (Typical)	—	560	Grams
Supply Voltage (Applied between P - N)	$V_{\text{CC(surge)}}$	1000	Volts
Supply Voltage Protected by SC ( $V_D = 13.5 \sim 16.5\text{V}$ , Inverter Part, $T_j = 125^\circ\text{C}$ Start)	$V_{\text{CC(prot.)}}$	800	Volts
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	$V_{\text{RMS}}$	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 ( $U_P$ , $V_P$ , $W_P$ , $U_N$ , $V_N$ , $W_N$ , $B_r$ )	$V_{\text{CIN}}$	20	Volts
Fault Output Supply Voltage (Applied between $F_O-V_{\text{NC}}$ , $*F_O-V_{*PC}$ )	$V_{\text{FO}}$	20	Volts
Fault Output Current (Sink Current at $F_O$ Terminals)	$I_{\text{FO}}$	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, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_C$	50	Amperes
Peak Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	100	Amperes
Collector Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_C$	338	Watts

**Brake Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	1200	Volts
Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_C$	15	Amperes
Peak Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	30	Amperes
Collector Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_C$	134	Watts
FWDi Forward Current ( $T_C = 25^\circ\text{C}$ )	$I_F$	15	Amperes
FWDi Rated DC Reverse Voltage ( $T_C = 25^\circ\text{C}$ )	$V_{\text{R(DC)}}$	1200	Volts



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**PM50RVA120**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**50 Amperes/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 Brake Part	OC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	22	—	—	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	59	—	—	Amperes
Short Circuit Trip Level Brake Part			—	52	—	Amperes
Short Circuit Current Shut-off Time	$t_{\text{off(SC)}}$	$V_D = 15\text{V}$	—	10	—	$\mu\text{S}$
Over Temperature Protection	OT	Trip Level	111	118	125	$^\circ\text{C}$
( $V_D = 15\text{V}$ , Lower Arm)	$OT_r$	Reset Level	90	100	110	$^\circ\text{C}$
Supply Circuit Under Voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
( $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ )	$UV_r$	Reset Level	—	12.5	—	Volts
Supply Voltage	$V_D$	Applied between $V_{UP1}$ - $V_{UPC}$ , $V_{VP1}$ - $V_{VPC}$ , $V_{WP1}$ - $V_{WPC}$ , $V_{N1}$ - $V_{NC}$	—	15	—	Volts
Circuit Current	$I_D$	$V_D = 15\text{V}$ , $V_{CIN} = 15\text{V}$ , $V_{N1}$ - $V_{NC}$	—	44	60	mA
		$V_D = 15\text{V}$ , $V_{CIN} = 15\text{V}$ , $V_{XP1}$ - $V_{XPC}$	—	13	18	mA
Input ON Threshold Voltage	$V_{CIN(on)}$	Applied between $U_P$ - $V_{UPC}$ , $V_P$ - $V_{VPC}$ ,	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{CIN(off)}$	$W_P$ - $V_{WPC}$ , $U_N$ , $V_N$ , $W_N$ , $Br$ - $V_{NC}$	1.7	2.0	2.3	Volts
Fault Output Current	$I_{FO(H)}$	$V_D = 15\text{V}$ , $V_{FO} = 15\text{V}$	—	—	0.01	mA
	$I_{FO(L)}$	$V_D = 15\text{V}$ , $V_{FO} = 15\text{V}$	—	10	15	mA
Minimum Fault Output Pulse Width	$t_{FO}$	$V_D = 15\text{V}$	1.0	1.8	—	mS



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**50 Amperes/1200 Volts**

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
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**IGBT Inverter Sector**

Collector-Emitter Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, V_D = 15V, T_j = 25^\circ\text{C}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, V_D = 15V, T_j = 125^\circ\text{C}$	—	—	10.0	mA
FWDi Forward Voltage	$V_{EC}$	$-I_C = 50A, V_D = 15V, V_{CIN} = 15V$	—	2.50	3.50	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15V, V_{CIN} = 0V, I_C = 50A,$ Pulsed, $T_j = 25^\circ\text{C}$	—	2.65	3.30	Volts
		$V_D = 15V, V_{CIN} = 0V, I_C = 50A,$ Pulsed, $T_j = 125^\circ\text{C}$	—	2.75	3.35	Volts
Inductive Load Switching Times	$t_{on}$		0.4	0.9	2.3	$\mu\text{S}$
	$t_{rr}$	$V_D = 15V, V_{CIN} = 0V \sim 15V$	—	0.2	0.3	$\mu\text{S}$
	$t_{C(on)}$	$V_{CC} = 600V, I_C = 50A,$	—	0.4	1.0	$\mu\text{S}$
	$t_{off}$	$T_j = 125^\circ\text{C}$	—	2.4	3.4	$\mu\text{S}$
	$t_{C(off)}$		—	0.7	1.2	$\mu\text{S}$

**Brake Sector**

Collector-Emitter Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, V_D = 15V, T_j = 25^\circ\text{C}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, V_D = 15V, T_j = 125^\circ\text{C}$	—	—	10.0	mA
FWDi Forward Voltage	$V_{FM}$	$I_F = 15A$	—	2.50	3.50	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15V, V_{CIN} = 0V, I_C = 15A,$ $T_j = 25^\circ\text{C}$	—	2.50	3.30	Volts
		$V_D = 15V, V_{CIN} = 0V, I_C = 15A,$ $T_j = 125^\circ\text{C}$	—	2.20	3.20	Volts



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### Thermal Characteristics

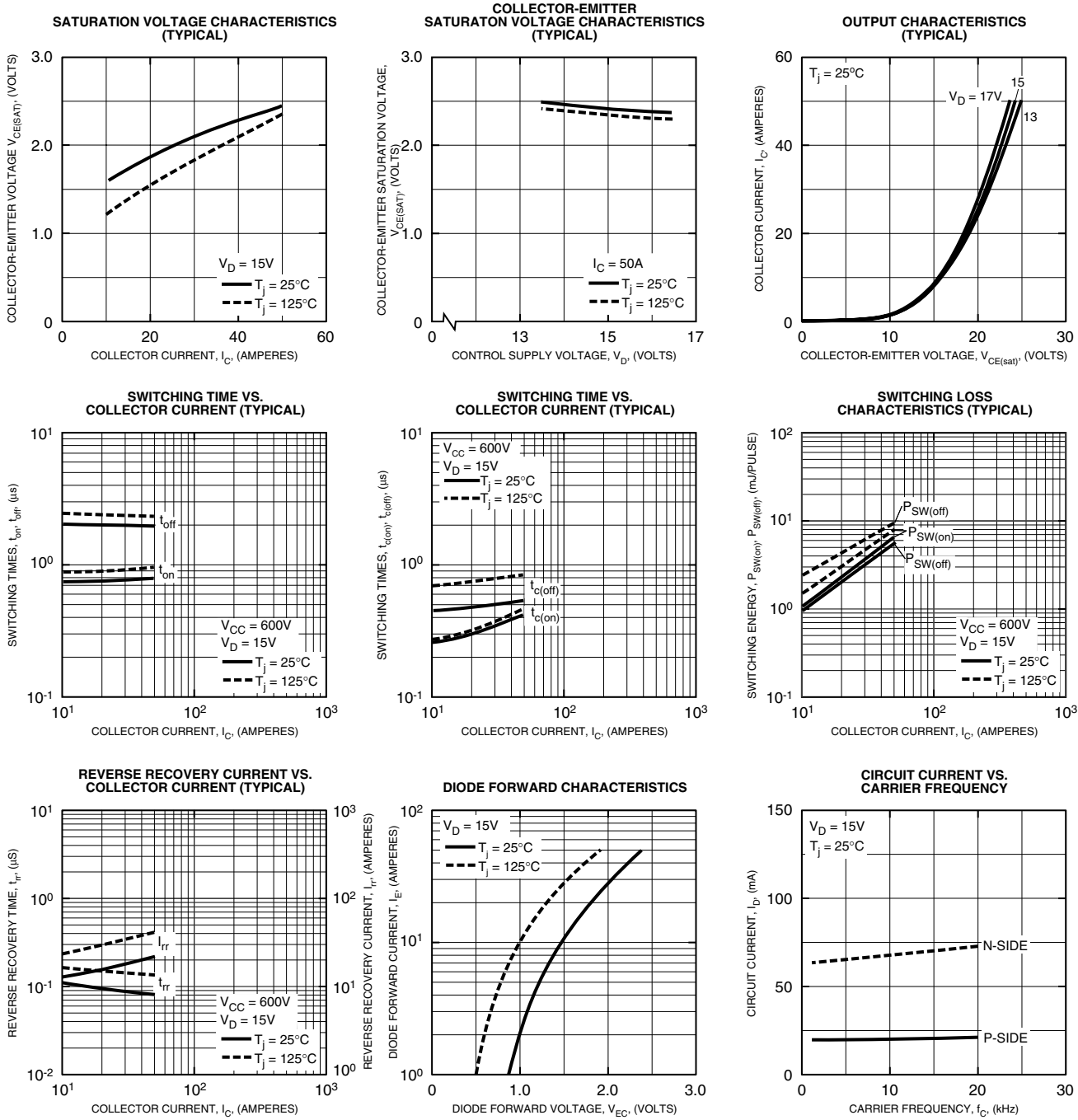
Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each Inverter IGBT	—	—	0.37	°C/Watt
	$R_{th(j-c)D}$	Each Inverter FWDi	—	—	0.70	°C/Watt
	$R_{th(j-c)Q}$	Each Brake IGBT	—	—	0.93	°C/Watt
	$R_{th(j-c)D}$	Each Brake FWDi Part	—	—	1.50	°C/Watt
Contact 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	$\leq 800$	Volts
	$V_{CE(surge)}$	Applied across C-E Terminals	$\leq 1000$	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	$\leq 0.8$	Volts
Input OFF Voltage	$V_{CIN(off)}$	$U_P, V_P, W_P, U_N, V_N, W_N, B_r$	$\geq 4.0$	Volts
Arm Shoot-Through Blocking Time	$t_{DEAD}$	For IPM's each Input Signal	$\geq 3.0$	$\mu S$

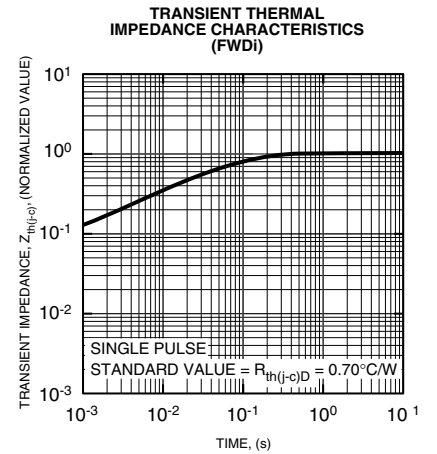
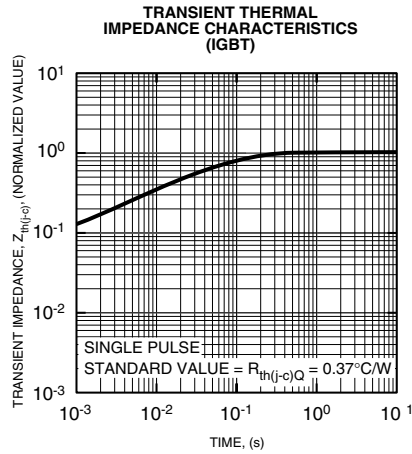
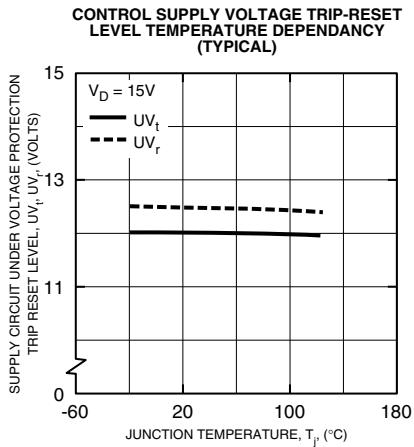
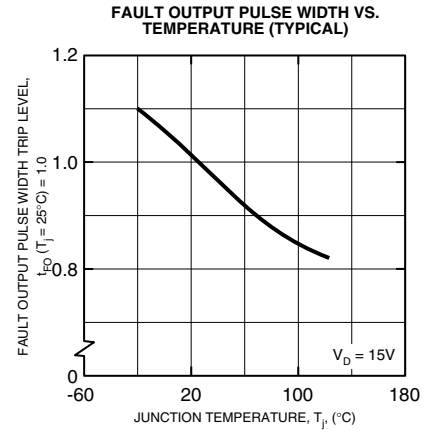
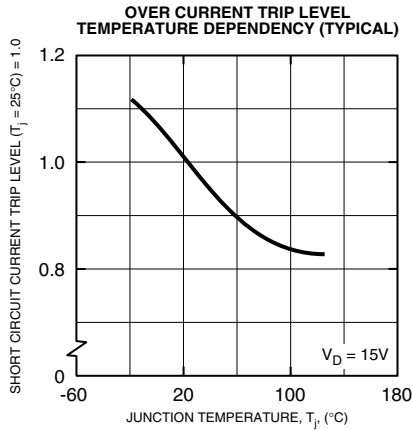
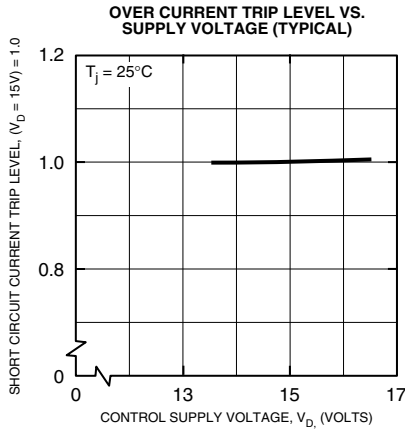
**PM50RVA120**  
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**Inverter Part**



**PM50RVA120**  
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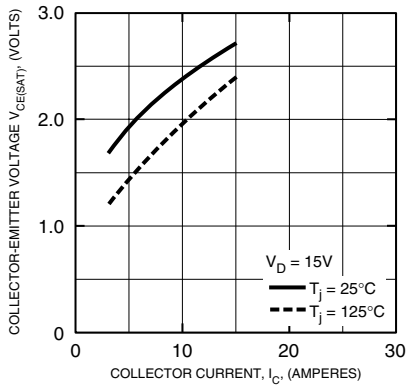
**Inverter Part**



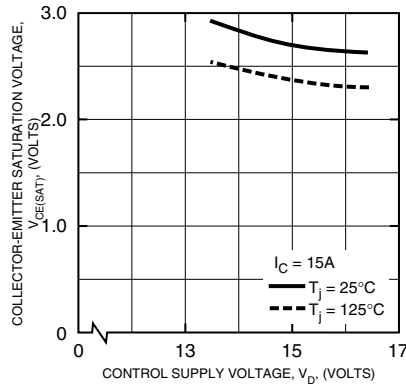
**PM50RVA120**  
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**Brake Part**

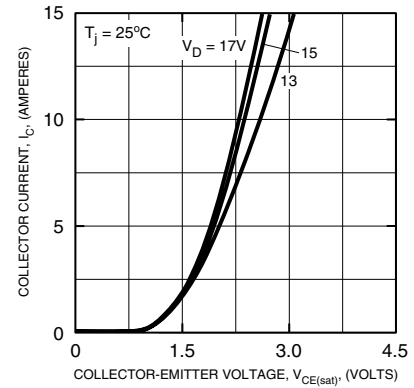
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



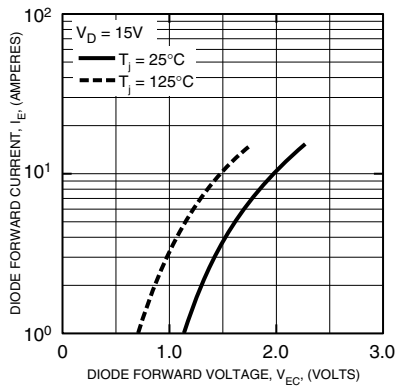
**COLLECTOR-EMITTER SATURATON VOLTAGE CHARACTERISTICS (TYPICAL)**



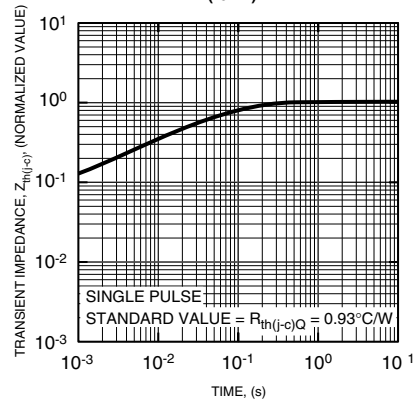
**OUTPUT CHARACTERISTICS (TYPICAL)**



**DIODE FORWARD CHARACTERISTICS**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWD)**

