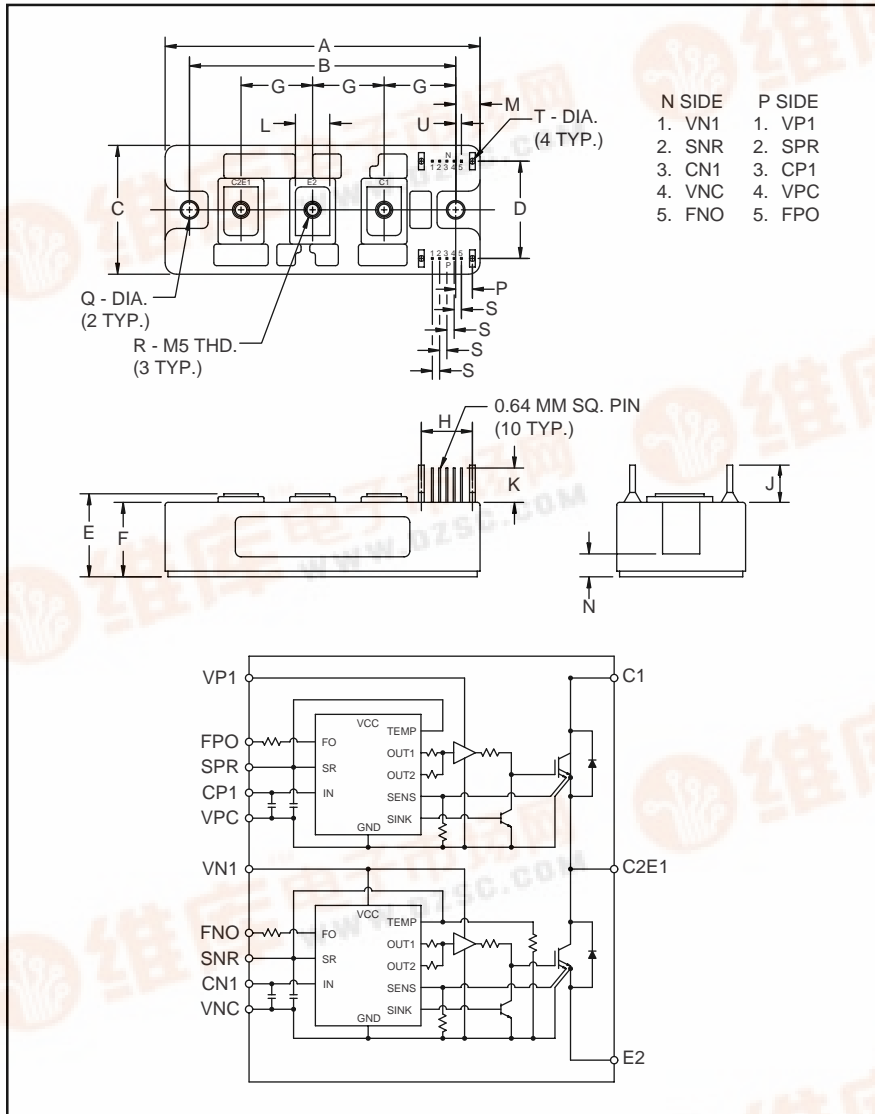




Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

## PM100DSA120

**Intellimod™ Module**  
**Single Phase**  
**IGBT Inverter Output**  
**100 Amperes/1200 Volts**



### 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 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. PM100DSA120 is a 1200V, 100 Ampere Intellimod™ Intelligent Power Module.

### Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.33	110.0
B	3.66±0.010	93.0±0.25
C	1.77	45.0
D	1.34	34.0
E	1.14 +0.04/-0.02	29.0 +1/-0.5
F	1.02	26.0
G	0.98	25.0
H	0.702	17.84
J	0.55	14.0
K	0.51	13.0

Dimensions	Inches	Millimeters
L	0.47	12.0
M	0.33	8.5
N	0.28	7.0
P	0.230	5.84
Q	0.22 Dia.	Dia. 5.5
R	M5 Metric	M5
S	0.100	2.54
T	0.08 Dia.	Dia. 2.0
U	0.08	2.0

Type	Current Rating Amperes	V <sub>CES</sub> Volts (x 10)
PM	100	120





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

Characteristics	Symbol	PM100DSA120	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	—	17	in-lb
Mounting Torque, M5 Main Terminal Screws	—	17	in-lb
Module Weight (Typical)	—	340	Grams
Supply Voltage Protected by OC and SC ( $V_D = 13.5 - 16.5\text{V}$ , Inverter Part)	$V_{\text{CC(prot.)}}$	800	Volts
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	$V_{\text{RMS}}$	2500	Volts

**Control Sector**

Supply Voltage Applied between ( $V_{P1}-V_{PC}$ , $V_{N1}-V_{NC}$ )	$V_D$	20	Volts
Input Voltage Applied between ( $C_{P1}-V_{PC}$ , $C_{N1}-V_{NC}$ )	$V_{\text{CIN}}$	10	Volts
Fault Output Supply Voltage (Applied between $F_{p0}-V_{pc}$ and $F_{n0}-V_{nc}$ )	$V_{\text{FO}}$	20	Volts
Fault Output Current	$I_{\text{FO}}$	20	mA

**IGBT Inverter Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ )	$V_{\text{CES}}$	1200	Volts
Collector Current, $\pm$	$I_C$	100	Amperes
Peak Collector Current, $\pm$	$I_{\text{CP}}$	200	Amperes
Supply Voltage (Applied between C1 - E2)	$V_{\text{CC}}$	900	Volts
Supply Voltage, Surge (Applied between C1 - E2)	$V_{\text{CC(surge)}}$	1000	Volts
Collector Dissipation	$P_C$	595	Watts



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**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	$-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$	145	230	—	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$	200	340	—	Amperes
Over Current Delay Time	$t_{\text{off}}(\text{OC})$	$V_D = 15\text{V}$	—	5	—	$\mu\text{S}$
Over Temperature Protection	OT	Trip Level	100	110	120	$^\circ\text{C}$
	$\text{OT}_R$	Reset Level	85	95	105	$^\circ\text{C}$
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 $V_{P1}-V_{PC}$ , $V_{N1}-V_{NC}$	13.5	15	16.5	Volts
Circuit Current	$I_D$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ , $V_{N1}-V_{NC}$	—	19	26	mA
		$V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ , $V_{\text{XP1}}-V_{\text{XPC}}$	—	19	26	mA
Input ON Threshold Voltage	$V_{\text{CIN}}(\text{on})$	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{\text{CIN}}(\text{off})$	$C_{P1}-V_{PC}$ , $C_{N1}-V_{NC}$	1.7	2.0	2.3	Volts
PWM Input Frequency	$f_{\text{PWM}}$	3- $\emptyset$ Sinusoidal	—	15	20	kHz
Fault Output Current	$I_{\text{FO}}(\text{H})$	$V_D = 15\text{V}$ , $V_{\text{FO}} = 15\text{V}$	—	—	0.01	mA
	$I_{\text{FO}}(\text{L})$	$V_D = 15\text{V}$ , $V_{\text{FO}} = 15\text{V}$	—	10	15	mA
Minimum Fault Output Pulse Width	$t_{\text{FO}}$	$V_D = 15\text{V}$	1.0	1.8	—	mS
SXR Terminal Output Voltage	$V_{\text{SXR}}$	$T_j \leq 125^\circ\text{C}$ , $R_{\text{in}} = 6.8 \text{ k}\Omega$ ( $S_{\text{PR}}$ , $S_{\text{NR}}$ )	4.5	5.1	5.6	Volts



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**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	$I_{CEX}$	$V_{CE} = V_{CEX}, T_j = 25^\circ\text{C}$	—	—	1	mA
		$V_{CE} = V_{CEX}, T_j = 125^\circ\text{C}$	—	—	10	mA
Diode Forward Voltage	$V_{FM}$	$-I_C = 100\text{A}, V_D = 15\text{V}, V_{CIN} = 5\text{V}$	—	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 100\text{A}$	—	2.3	3.2	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 100\text{A}, T_j = 125^\circ\text{C}$	—	2.1	2.9	Volts
Inductive Load Switching Times	$t_{on}$		0.5	1.4	2.5	$\mu\text{S}$
	$t_{rr}$	$V_D = 15\text{V}, V_{CIN} = 0 \sim 5\text{V}$	—	0.2	0.4	$\mu\text{S}$
	$t_{C(on)}$	$V_{CC} = 600\text{V}, I_C = 100\text{A}$	—	0.4	1.0	$\mu\text{S}$
	$t_{off}$	$T_j = 125^\circ\text{C}$	—	2.5	3.5	$\mu\text{S}$
	$t_{C(off)}$		—	0.6	1.1	$\mu\text{S}$

**Thermal Characteristics**

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.21	$^\circ\text{C/Watt}$
	$R_{th(j-c)D}$	Each FWDi	—	—	0.35	$^\circ\text{C/Watt}$
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.060	$^\circ\text{C/Watt}$

**Recommended Conditions for Use**

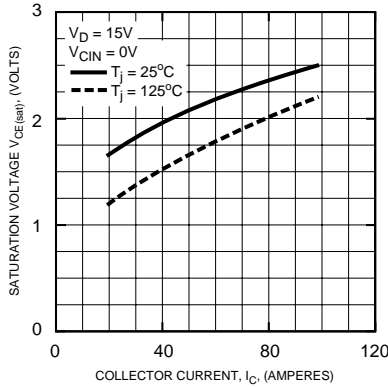
Characteristic	Symbol	Condition	Value	Units
Supply Voltage	$V_{CC}$	Applied across C1-E2 Terminals	0 ~ 800	Volts
	$V_D$	Applied between $V_{P1}-V_{PC}, V_{N1}-V_{NC}$	$15 \pm 1.5$	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between	0 ~ 0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$	$C_{P1}-V_{PC}, C_{N1}-V_{NC}$	$4.0 \sim V_{SXR}$	Volts
PWM Input Frequency	$f_{PWM}$	Using Application Circuit	5 ~ 20	kHz
Minimum Dead Time	$t_{DEAD}$	Input Signal	$\geq 3.5$	$\mu\text{S}$



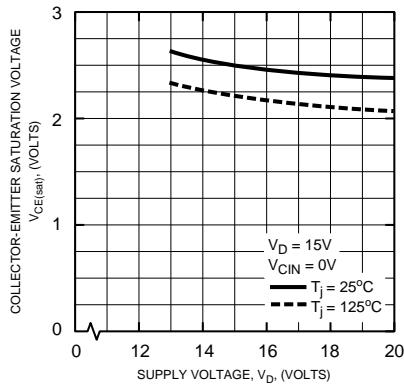
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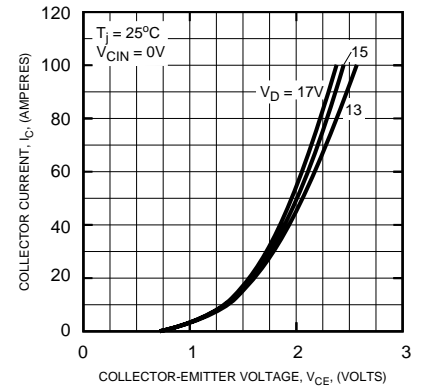
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



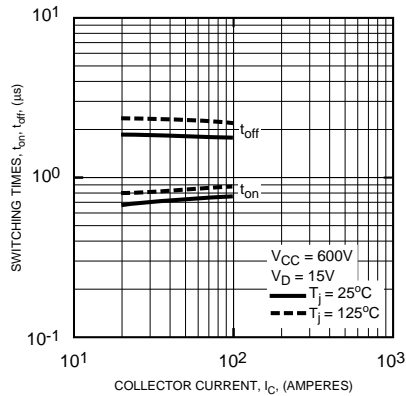
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



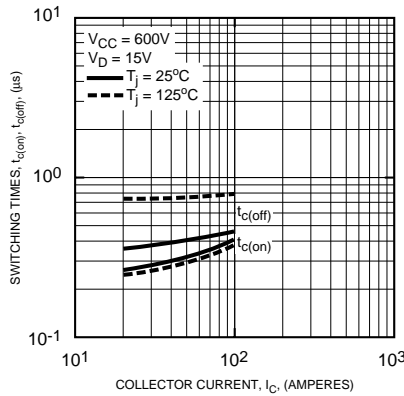
**OUTPUT CHARACTERISTICS (TYPICAL)**



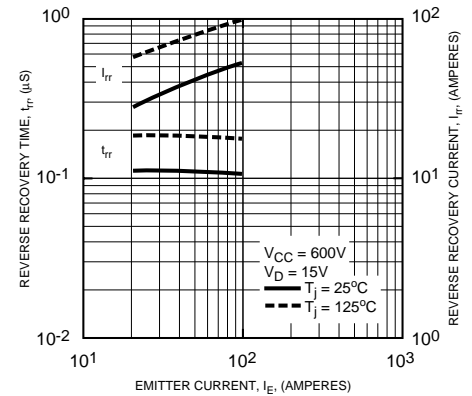
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



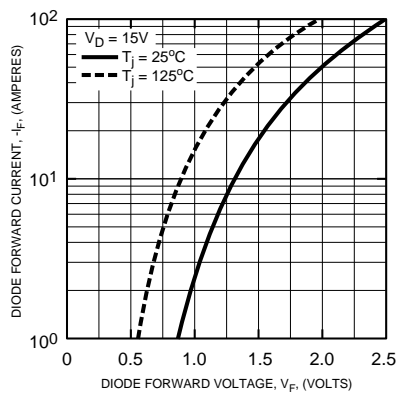
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



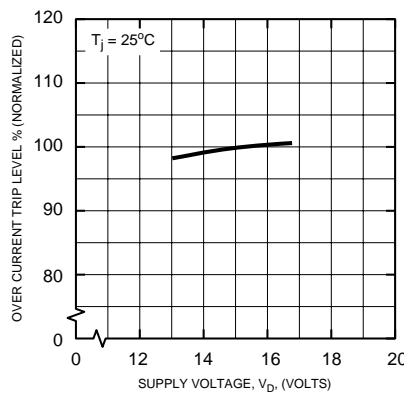
**REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)**



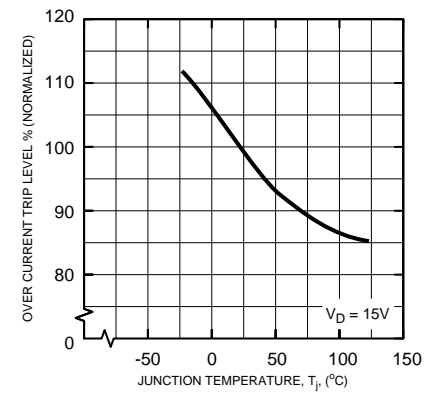
**DIODE FORWARD CHARACTERISTICS**



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



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

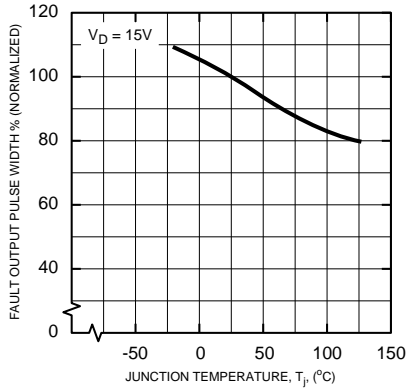




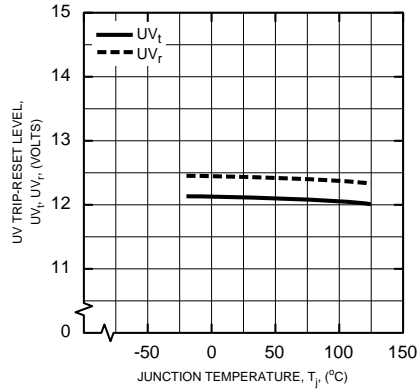
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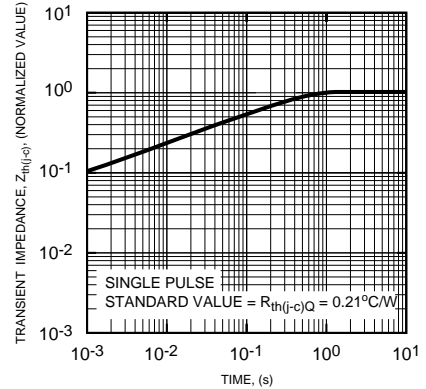
**FAULT OUTPUT PULSE WIDTH VS. TEMPERATURE (TYPICAL)**



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



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi)**

