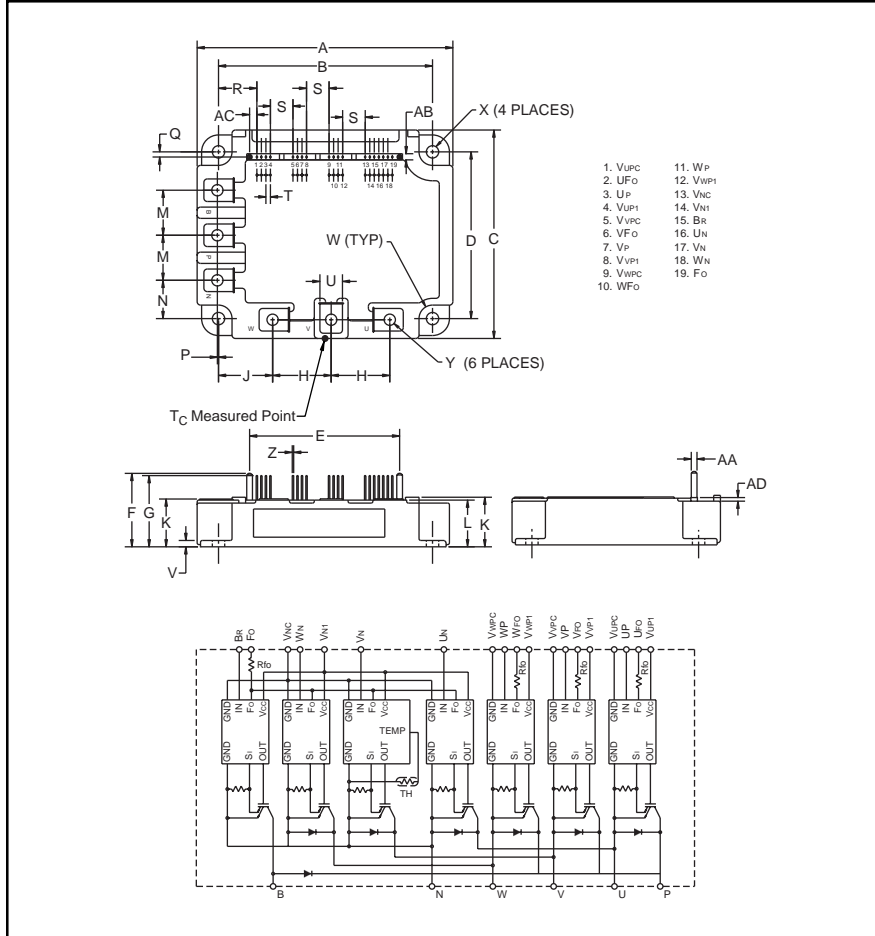


### Intellimod™ Module Three Phase + Brake IGBT Inverter Output 100 Amperes/600 Volts



#### 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
- Low Loss Using 4th Generation IGBT Chip

#### Applications:

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

#### Ordering Information:

Example: Select the complete part number from the table below -i.e. PM100RSD060 is a 600V, 100 Ampere Intellimod™ Intelligent Power Module.

#### Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters	Dimensions	Inches	Millimeters
A	4.33±0.04	110.0±1.0	Q	0.08±0.02	2.0±0.5
B	3.74±0.02	95.0±0.5	R	0.670	17.02
C	3.50±0.04	89.0±1.0	S	0.39	10.0
D	2.91±0.02	74.0±0.5	T	0.08	2.0
E	2.62	66.44	U	0.39	10.0
F	1.28	32.6	V	0.16	4.0
G	1.24	31.6	W	0.24 Rad.	Rad. 6.0
H	1.02	26.0	X	0.217 Dia.	M5.5
J	0.94	24.0	Y	0.197	M5
K	0.87 +0.04/-0.02	22.0 +1.0/-0.5	Z	0.2 Sq.	Sq. 0.5
L	0.84	21.2	AA	0.10	2.54
M	0.79	20.0	AB	0.18	4.5
N	0.69	17.5	AC	0.13	3.22
P	0.02±0.01	0.5±0.3	AD	0.06	1.6

Type	Current Rating Amperes	V <sub>CES</sub> Volts (x 10)
PM	100	60

**PM100RSD060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**100 Amperes/600 Volts**

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

Characteristics	Symbol	PM100RSD060	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	—	31	in-lb
Mounting Torque, M5 Main Terminal Screws	—	31	in-lb
Module Weight (Typical)	—	560	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, AC 1 minute, 60Hz Sinusoidal	$V_{\text{ISO}}$	2500	Volts

### IGBT Inverter Sector

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	600	Volts
Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_C$	100	Amperes
Peak Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	200	Amperes
Supply Voltage (Applied between P - N)	$V_{\text{CC}}$	400	Volts
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	500	Volts
Collector Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_C$	328	Watts

### IGBT Brake Sector

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	600	Volts
Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_C$	30	Amperes
Peak Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	60	Amperes
FWDi Rated DC Reverse Voltage ( $T_C = 25^\circ\text{C}$ )	$V_{\text{R(DC)}}$	600	Volts
FWDi Forward Current ( $T_C = 25^\circ\text{C}$ )	$I_F$	30	Amperes
Collector Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_C$	176	Watts

### 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 ( $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ , $W_P-V_{\text{WPC}}$ , $U_N-V_N$ , $W_N-B_1-V_{\text{NC}}$ )	$V_{\text{CIN}}$	20	Volts
Fault Output Supply Voltage (Applied between $F_O$ and $V_C$ )	$V_{\text{FO}}$	20	Volts
Fault Output Current ( $U_{\text{FO}}$ , $V_{\text{FO}}$ , $W_{\text{FO}}$ , $F_O$ )	$I_{\text{FO}}$	20	mA

**PM100RSD060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**100 Amperes/600 Volts**

## 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	$I_{CES}$	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C},$ $V_D = 15\text{V}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C},$ $V_D = 15\text{V}$	—	—	10	mA
Diode Forward Voltage	$V_{EC}$	$-I_C = 100\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 100\text{A},$ $T_j = 25^\circ\text{C}$	—	1.7	2.3	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 100\text{A},$ $T_j = 125^\circ\text{C}$	—	1.7	2.3	Volts
Inductive Load Switching Times	$t_{on}$	$V_D = 15\text{V}, V_{CIN} = 0 \sim 15\text{V}$ $V_{CC} = 300\text{V}, I_C = 100\text{A}$ $T_j = 125^\circ\text{C}$	0.8	1.2	2.4	$\mu\text{S}$
	$t_{rr}$		—	0.15	0.3	$\mu\text{S}$
	$t_{C(on)}$		—	0.4	1.0	$\mu\text{S}$
	$t_{off}$		—	2.4	3.3	$\mu\text{S}$
	$t_{C(off)}$		—	0.6	1.2	$\mu\text{S}$
<b>IGBT Brake Sector</b>						
Collector Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C},$ $V_D = 15\text{V}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C},$ $V_D = 15\text{V}$	—	—	10	mA
FWDi Forward Voltage	$V_{FM}$	$-I_F = 30\text{A}$	—	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 30\text{A},$ $T_j = 25^\circ\text{C}$	—	1.8	2.5	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 30\text{A},$ $T_j = 125^\circ\text{C}$	—	1.9	2.6	Volts

**PM100RSD060**  
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**Three Phase + Brake IGBT Inverter Output**  
**100 Amperes/600 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 ( $V_D = 15\text{V}$ )	OC	$T_j = -20^\circ\text{C}$	—	—	520	Amperes
		$T_j = 25^\circ\text{C}$	264	311	430	Amperes
		$T_j = 125^\circ\text{C}$	158	—	—	Amperes
Over Current Trip Level Brake Part	OC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	39	53	—	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	—	360	—	Amperes
Short Circuit Trip Level Brake Part			—	79	—	Amperes
Over Current Delay Time	$t_{\text{off}}(\text{OC})$	$V_D = 15\text{V}$	—	10	—	$\mu\text{S}$
Over Temperature Protection ( $V_D = 15\text{V}$ ) (Lower Arm)	OT	Trip Level	111	118	125	$^\circ\text{C}$
	$\text{OT}_R$	Reset Level	—	100	—	$^\circ\text{C}$
Supply Circuit Under Voltage Protection ( $-20 \leq T_j \leq 125^\circ\text{C}$ )	UV	Trip Level	11.5	12.0	12.5	Volts
	$\text{UV}_R$	Reset Level	—	12.5	—	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	$V_{\text{CIN(on)}}$	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{\text{CIN(off)}}$	$U_P, V_P, W_P, U_N, V_N, W_N, B_r-V_{\text{NC}}$	1.7	2.0	2.3	Volts
Fault Output Current*	$I_{\text{FO(H)}}$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$	—	—	0.01	mA
	$I_{\text{FO(L)}}$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$	—	10	15	mA
Minimum Fault Output Pulse Width*	$t_{\text{FO}}$	$V_D = 15\text{V}$	1.0	1.8	—	mS

\*Fault output is given only when the internal OC, SC, OT and UV protections schemes of either upper or lower device operate to protect it.

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**100 Amperes/600 Volts**

## Thermal Characteristics

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.38	°C/Watt
Inverter Part	$R_{th(j-c)F}$	Each FWDi	—	—	0.70	°C/Watt
	$R_{th(j-c)Q}$	Each IGBT*	—	—	0.23**	°C/Watt
	$R_{th(j-c)F}$	Each FWDi*	—	—	0.36**	°C/Watt
	Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.71
Brake Part	$R_{th(j-c)F}$	Each FWDi	—	—	1.66	°C/Watt
	$R_{th(j-c)Q}$	Each IGBT*	—	—	0.45**	°C/Watt
	$R_{th(j-c)F}$	Each FWDi*	—	—	0.96**	°C/Watt
	Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.027

\* $T_C$  measured point is just under chip.

\*\*If you use this value,  $R_{th(f-a)}$  should be measured just under the chips.

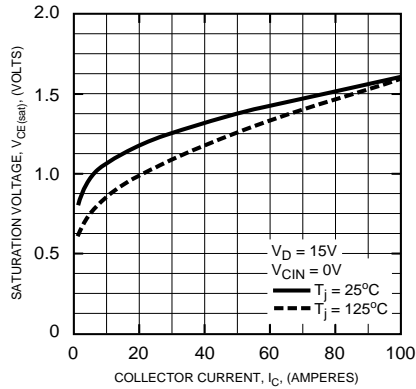
## Recommended Conditions for Use

Characteristic	Symbol	Condition	Value	Units
Supply Voltage	$V_{CC}$	Applied across P-N Terminals	0 ~ 400	Volts
Control Supply Voltage***	$V_D$	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	$V_{CIN(off)}$	$U_P, V_P, W_P, U_N, V_N, W_N, B_r$ - $V_{NC}$	$4.0 \sim V_D$	Volts
PWM Input Frequency	$f_{PWM}$	Using Application Circuit	5 ~ 20	kHz
Minimum Dead Time	$t_{DEAD}$	Input Signal	$\geq 2.5$	$\mu S$

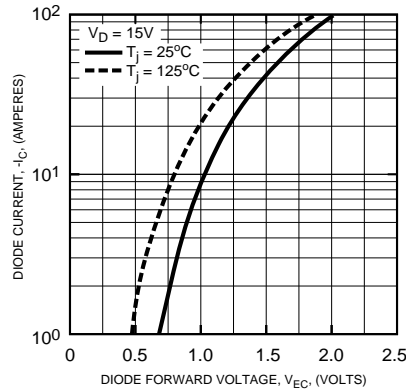
\*\*\* With ripple satisfying the following conditions:  $dv/dt$  swing  $\leq \pm 5V/\mu s$ , Variation  $\leq 2V$  peak to peak.

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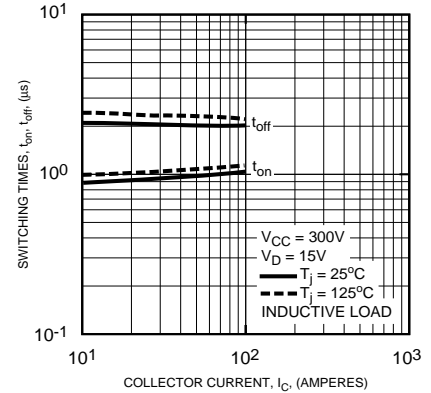
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL) (INVERTER PART)**



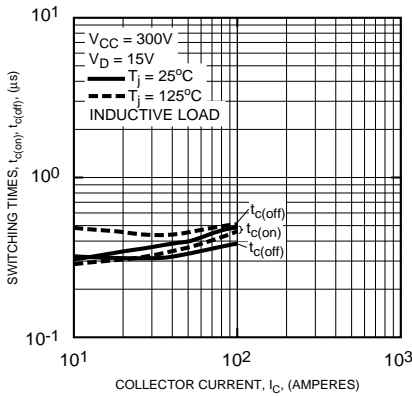
**DIODE FORWARD CHARACTERISTICS (INVERTER PART)**



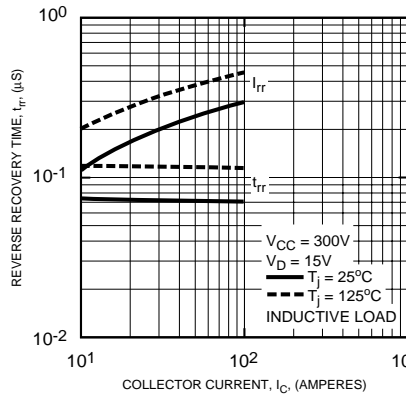
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



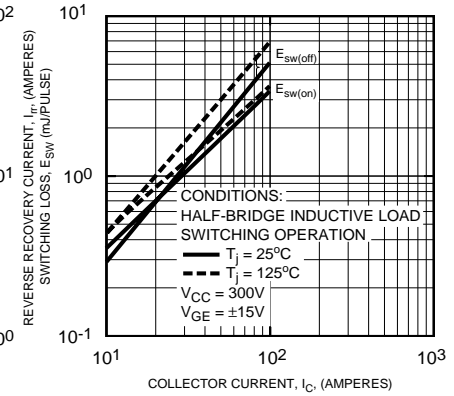
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



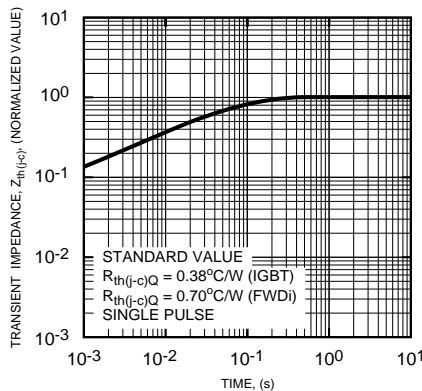
**REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)**



**SWITCHING LOSS CHARACTERISTICS**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi - INVERTER PART)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi - BRAKE PART)**

