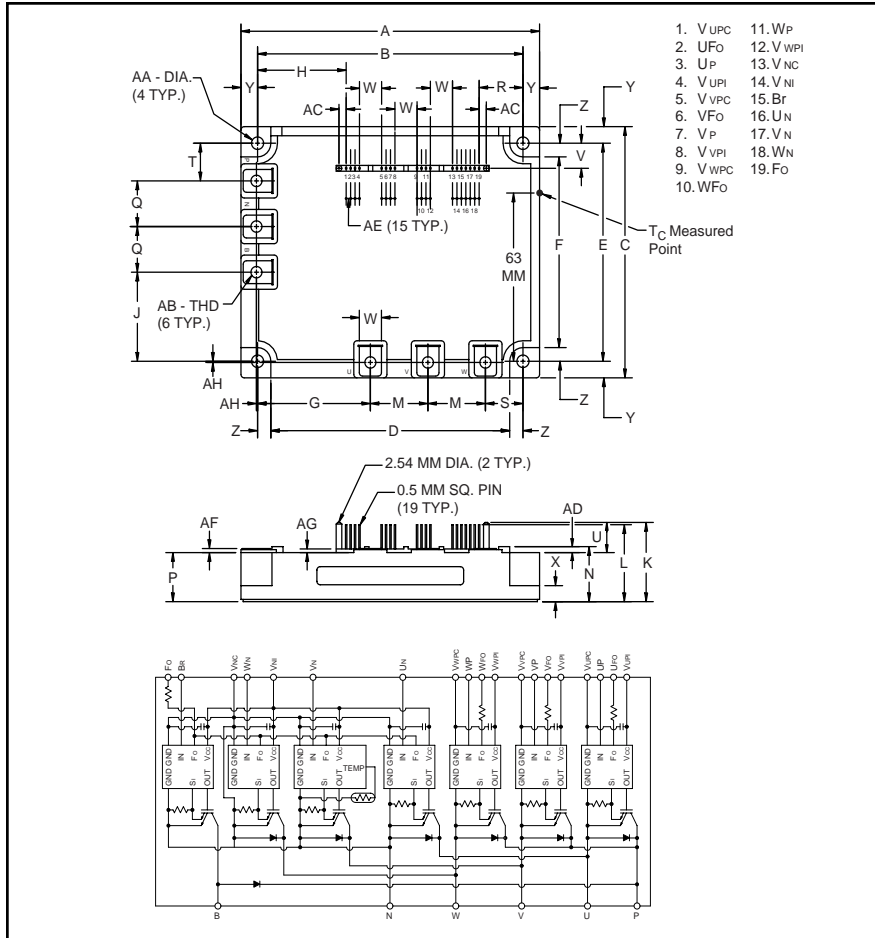


### Intellimod™ Module Three Phase + Brake IGBT Inverter Output 200 Amperes/600 Volts



#### 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. PM200RSD060 is a 600V, 200 Ampere Intellimod™ Intelligent Power Module.

#### 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	1.56	39.5
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	0.85	21.5
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	0.30	7.7
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

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

**PM200RSD060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**200 Amperes/600 Volts**

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

Characteristics	Symbol	PM200RSD060	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)	—	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, 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, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_C$	200	Amperes
Peak Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	400	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 ( $T_C = 25^\circ\text{C}$ )	$P_C$	595	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, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_C$	75	Amperes
Peak Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	150	Amperes
FWDi Rated DC Reverse Voltage ( $T_C = 25^\circ\text{C}$ )	$V_{\text{R(DC)}}$	600	Volts
FWDi Forward Current ( $T_C = 25^\circ\text{C}$ )	$I_F$	75	Amperes
Collector Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_C$	312	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 ( $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ , $W_P-V_{\text{WPC}}$ , $U_N-V_N$ , $W_N-B_r-V_{\text{NC}}$ )	$V_{\text{CIN}}$	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

**PM200RSD060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**200 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	$I_{CES}$	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C},$ $V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C},$ $V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	—	10	mA
Diode Forward Voltage	$V_{EC}$	$-I_C = 200\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 200\text{A},$ $T_j = 25^\circ\text{C}$	—	1.70	2.3	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 200\text{A},$ $T_j = 125^\circ\text{C}$	—	1.70	2.3	Volts
Inductive Load Switching Times	$t_{on}$	$V_D = 15\text{V}, V_{CIN} = 0 \sim 15\text{V}$ $V_{CC} = 300\text{V}, I_C = 200\text{A}$ $T_j = 125^\circ\text{C}$	0.4	0.8	2.0	$\mu\text{S}$
	$t_{rr}$		—	0.15	0.3	$\mu\text{S}$
	$t_{C(on)}$		—	0.4	1.0	$\mu\text{S}$
	$t_{off}$		—	2.0	2.9	$\mu\text{S}$
	$t_{C(off)}$		—	0.6	1.2	$\mu\text{S}$
<b>IGBT Brake Sector</b>						
Collector Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C},$ $V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C},$ $V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	—	10	mA
FWDi Forward Voltage	$V_{FM}$	$I_F = 75\text{A}$	—	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A},$ $T_j = 25^\circ\text{C}$	—	2.35	2.80	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A},$ $T_j = 125^\circ\text{C}$	—	2.55	3.05	Volts

**PM200RSD060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**200 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	$T_j = -20^\circ\text{C}$	—	—	690	Amperes
		$T_j = 25^\circ\text{C}$	351	413	570	Amperes
		$T_j = 125^\circ\text{C}$	310	—	—	Amperes
Over Current Trip Level Brake Part	OC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	115	161	—	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	—	560	—	Amperes
Short Circuit Trip Level Brake Part			—	241	—	Amperes
Over Current Delay Time	$t_{\text{off}}(\text{OC})$	$V_D = 15\text{V}$	—	10	—	$\mu\text{S}$
Over Temperature Protection ( $V_D = 15\text{V}$ )	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	$I_D$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{N1}-V_{\text{NC}}$	—	60	82	mA
		$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{XP1}}-V_{\text{XPC}}$	—	15	20	mA
Thermal Voltage ON	$V_{\text{th(on)}}$	Applied between	1.2	1.5	1.8	Volts
Thermal Voltage OFF	$V_{\text{th(off)}}$	$U_P, V_P, W_P, U_N, V_N, W_N, B_r-V_{\text{NC}}$	1.7	2.0	2.3	Volts
Input ON Threshold Voltage	$V_{\text{CIN(on)}}$	Applied between	—	—	0.8	Volts
Input OFF Threshold Voltage	$V_{\text{CIN(off)}}$	$U_P, V_P, W_P, U_N, V_N, W_N, B_r-V_{\text{NC}}$	4.0	—	—	Volts
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

\*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.

**PM200RSD060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**200 Amperes/600 Volts**

## Thermal Characteristics

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.21	°C/Watt
Inverter Part	$R_{th(j-c)F}$	Each FWDi	—	—	0.35	°C/Watt
	$R_{th(j-c)Q}$	Each IGBT*	—	—	0.13**	°C/Watt
	$R_{th(j-c)F}$	Each FWDi*	—	—	0.21**	°C/Watt
	Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.40
Brake Part	$R_{th(j-c)F}$	Each FWDi	—	—	1.10	°C/Watt
	$R_{th(j-c)Q}$	Each IGBT*	—	—	0.27**	°C/Watt
	$R_{th(j-c)F}$	Each FWDi*	—	—	0.47**	°C/Watt
	Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.018

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

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

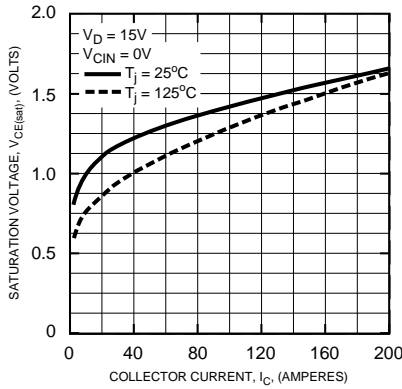
## Recommended Conditions for Use

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 ± 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 ~ $V_D$	Volts
PWM Input Frequency	$f_{PWM}$	Using Application Circuit	5 ~ 20	kHz
Minimum Dead Time	$t_{DEAD}$	Input Signal	≥ 2.0	μS
		$I_F = 12mA$	≥ 2.5	μS

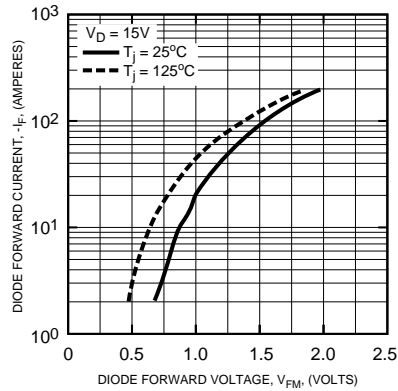
\*\*\* With ripple satisfying the following conditions:  $dv/dt$  swing ≤ ±5V/μs, Variation ≤ 2V peak to peak.

**PM200RSD060**  
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**200 Amperes/600 Volts**

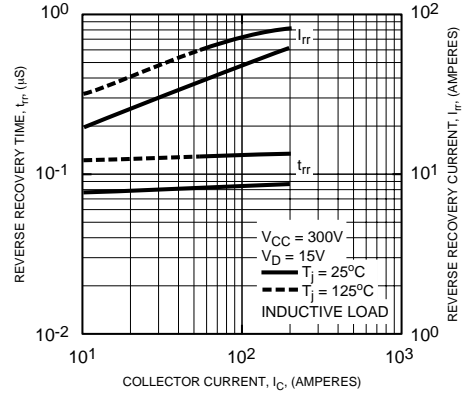
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL) (INVERTER PART)**



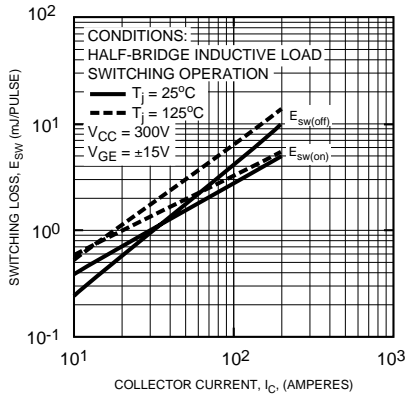
**DIODE FORWARD CHARACTERISTICS (INVERTER PART)**



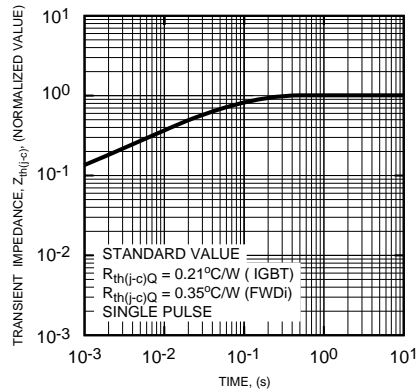
**REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)**



**SWITCHING LOSS CHARACTERISTICS**



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



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

