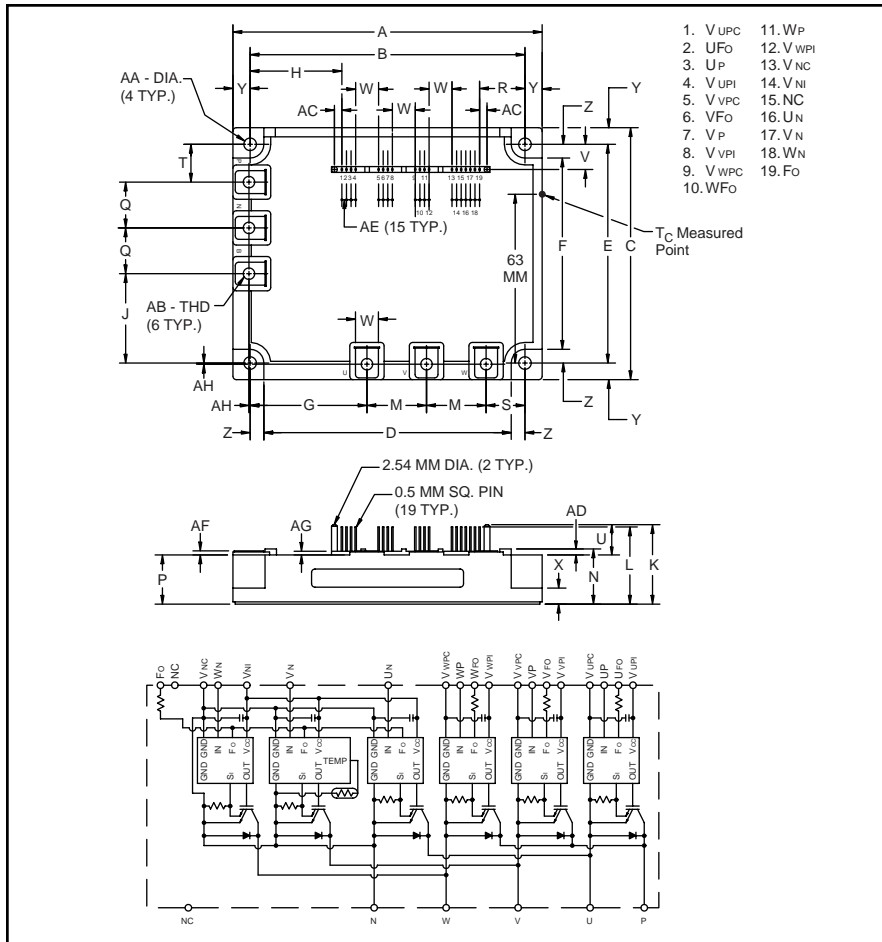


Intellimod™ Module

Three Phase
IGBT Inverter Output
200 Amperes/600 Volts



- V_{UPC}
- V_{FO}
- U_P
- V_{UPI}
- V_{VPC}
- V_{FO}
- V_P
- V_{VPI}
- V_{VPC}
- W_P
- W_P
- V_{WPI}
- V_{NC}
- V_{NI}
- U_N
- V_N
- W_N
- F_O



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

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

Ordering Information:
Example: Select the complete part number from the table below -i.e. PM200CSD060 is a 600V, 200 Ampere Intellimod™ Intelligent Power Module.

Type	Current Rating Amperes	V _{CEs} Volts (x 10)
PM	200	60



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

PM200CSD060
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Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	PM200CSD060	Units
Power Device Junction Temperature	T_j	-20 to 150	$^\circ\text{C}$
Storage Temperature	T_{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_{ISO}	2500	Volts

IGBT Inverter Sector

Collector-Emitter Voltage ($V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$)	V_{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_{CP}	400	Amperes
Supply Voltage (Applied between P - N)	V_{CC}	450	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

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

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 Cutoff Current	I_{CES}	$V_{\text{CE}} = V_{\text{CES}}$, $T_j = 25^\circ\text{C}$, $V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$	—	—	1.0	mA
		$V_{\text{CE}} = V_{\text{CES}}$, $T_j = 125^\circ\text{C}$, $V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$	—	—	10	mA
Diode Forward Voltage	V_{EC}	$-I_C = 200\text{A}$, $V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$	—	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{\text{CE(sat)}}$	$V_D = 15\text{V}$, $V_{\text{CIN}} = 0\text{V}$, $I_C = 200\text{A}$, $T_j = 25^\circ\text{C}$	—	1.70	2.3	Volts
		$V_D = 15\text{V}$, $V_{\text{CIN}} = 0\text{V}$, $I_C = 200\text{A}$, $T_j = 125^\circ\text{C}$	—	1.70	2.3	Volts
Inductive Load Switching Times	t_{on}		0.4	0.8	2.0	μS
	t_{rr}	$V_D = 15\text{V}$, $V_{\text{CIN}} = 0 \sim 15\text{V}$	—	0.15	0.3	μS
	$t_{\text{C(on)}}$	$V_{\text{CC}} = 300\text{V}$, $I_C = 200\text{A}$	—	0.4	1.0	μS
	t_{off}	$T_j = 125^\circ\text{C}$	—	2.0	2.9	μS
	$t_{\text{C(off)}}$		—	0.6	1.2	μS



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PM200CSD060
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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
Control Sector						
Over Current Trip Level Inverter Part ($V_D = 15\text{V}$)	OC	$T_j = -20^\circ\text{C}$	—	—	1010	Amperes
		$T_j = 25^\circ\text{C}$	518	609	850	Amperes
		$T_j = 125^\circ\text{C}$	310	—	—	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
Over Current Delay Time	$t_{\text{off}}(\text{OC})$	$V_D = 15\text{V}$	—	10	—	μs
Over Temperature Protection ($V_D = 15\text{V}$)	OT	Trip Level	111	118	125	$^\circ\text{C}$
	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
	UV_R	Reset Level	—	12.5	—	Volts
Circuit Current	I_D	$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{\text{N1}}-V_{\text{NC}}$	—	45	62	mA
		$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{\text{XP1}}-V_{\text{XPC}}$	—	15	20	mA
Input ON Threshold Voltage	$V_{\text{CIN}}(\text{on})$	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{\text{CIN}}(\text{off})$	$U_P, V_P, W_P, U_N, V_N, W_N$	1.7	2.0	2.3	Volts
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_{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.

Thermal Characteristics

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{\text{th}}(\text{j-c})\text{Q}$	Each IGBT	—	—	0.21	$^\circ\text{C}/\text{Watt}$
	$R_{\text{th}}(\text{j-c})\text{F}$	Each FWDi	—	—	0.35	$^\circ\text{C}/\text{Watt}$
	$R_{\text{th}}(\text{j-c})\text{Q}$	Each IGBT**	—	—	0.13 [†]	$^\circ\text{C}/\text{Watt}$
	$R_{\text{th}}(\text{j-c})\text{F}$	Each FWDi**	—	—	0.21 [†]	$^\circ\text{C}/\text{Watt}$
Contact Thermal Resistance	$R_{\text{th}}(\text{c-f})$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.018	$^\circ\text{C}/\text{Watt}$

** T_C measured point is just under chip.

† If you use this value, $R_{\text{th}}(\text{f-a})$ 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 $V_{\text{UP1}}-V_{\text{UPC}}$, $V_{\text{N1}}-V_{\text{NC}}$, $V_{\text{VP1}}-V_{\text{VPC}}$, $V_{\text{WP1}}-V_{\text{WPC}}$	15 ± 1.5	Volts
Input ON Voltage	$V_{\text{CIN}}(\text{on})$	Applied between	0 ~ 0.8	Volts
Input OFF Voltage	$V_{\text{CIN}}(\text{off})$	$U_P, V_P, W_P, U_N, V_N, W_N$	$4.0 \sim V_D$	Volts
PWM Input Frequency	f_{PWM}	Using Application Circuit	0 ~ 20	kHz
Minimum Dead Time	t_{DEAD}	Input Signal	≥ 2.5	μs

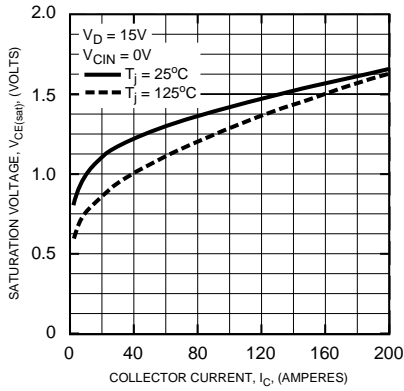
*** With ripple satisfying the following conditions: dv/dt swing $\leq \pm 5\text{V}/\mu\text{s}$, Variation $\leq 2\text{V}$ peak to peak.



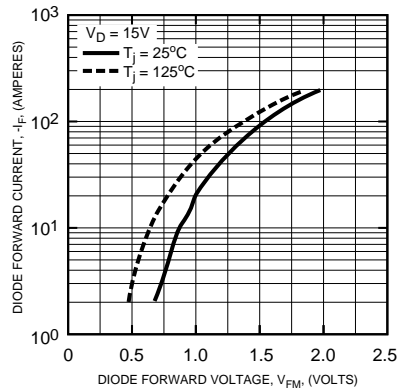
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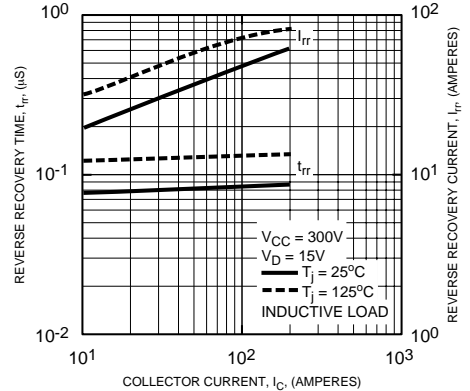
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL) (INVERTER PART)



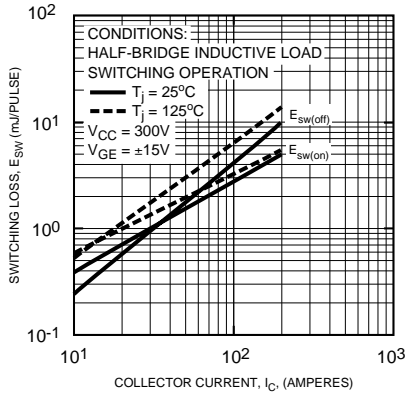
DIODE FORWARD CHARACTERISTICS (INVERTER PART)



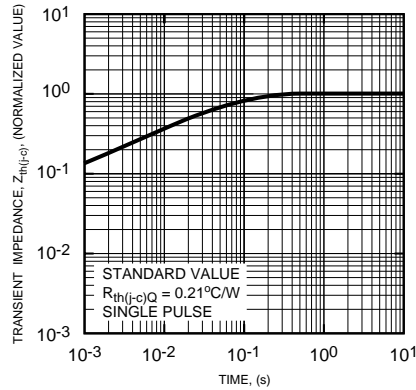
REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)



SWITCHING LOSS CHARACTERISTICS



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWD)

