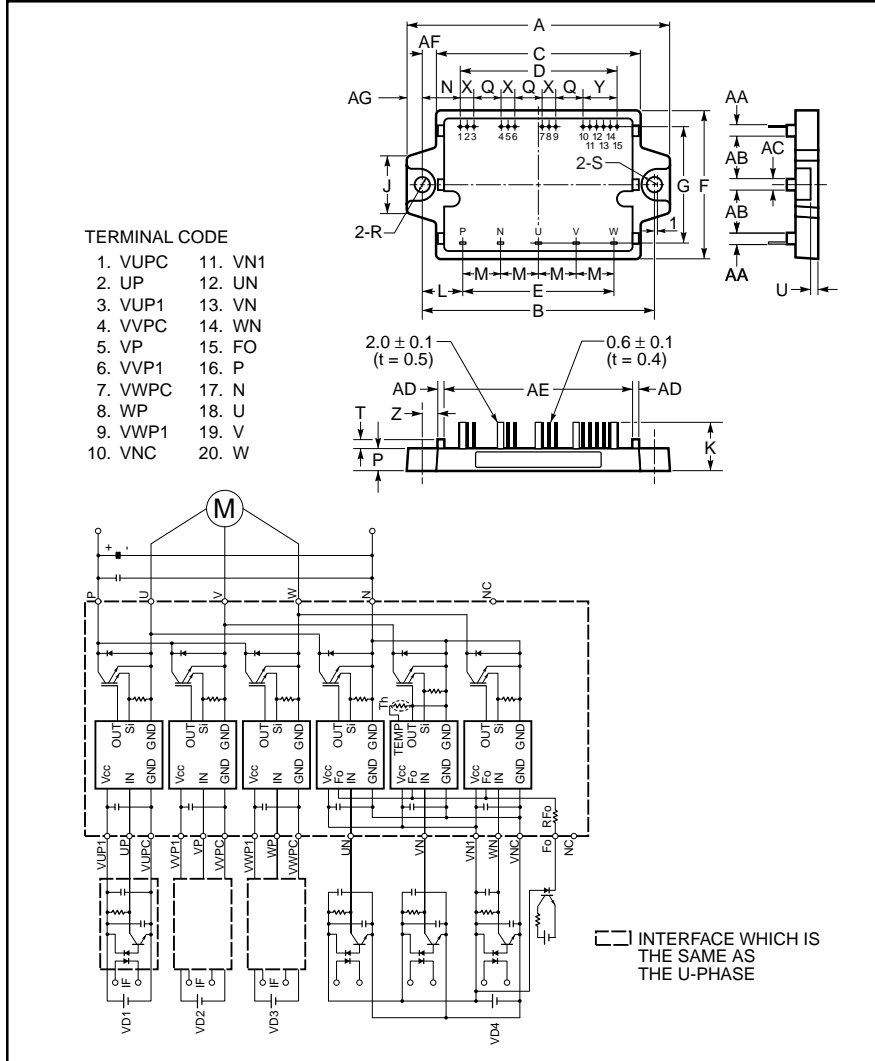


### Intellimod™ Modules

Three Phase Converter  
IGBT Inverter Output  
15 Amperes/1200 Volt



#### 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. PM15CZF120 is a 1200V, 15 Ampere Intellimod™ Intelligent Power Module.

Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	3.86±0.04	98.0±1.0
B	3.43±0.02	87.0±0.5
C	2.99	76.0
D	2.30	58.42
E	2.20±0.03	56.0±0.8
F	2.21±0.04	56.0±1.0
G	1.73±0.03	44.0±0.8
J	0.83	21.0
K	0.71±0.04	18.0±1.0
L	0.61	15.5
M	0.55±0.01	14.0±0.3
N	0.56	14.29
P	0.32±0.02	8.0±0.5
Q	0.40	10.16

Dimensions	Inches	Millimeters
R	0.22 Dia.	5.5 Dia.
S	0.24 Rad.	6.0 Rad.
T	0.14	3.5
U	0.12±0.02	3.0±0.5
X	0.1±0.01	2.54±0.3
Y	0.1±0.01	2.54±0.3
Z	0.24	6.0
AA	0.12	3.0
AB	0.69	17.5
AC	0.16	4.0
AD	0.10	2.5
AE	2.76	70.0
AF	0.22	5.5
AG	0.22	5.5

Type	Current Rating Amperes	V <sub>CES</sub> Volts (x 10)
PM	15	120



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

**PM15CZF120**  
**Intellimod™ Modules**  
**Three Phase Converter IGBT Inverter Output**  
**15 Amperes/1200 Volts**

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

Characteristics	Symbol	PM15CZF120	Units
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	-	17	in-lb
Module Weight (Typical)	-	80	Grams
Supply Voltage Protected by OC and SC ( $V_D = 13.5 \sim 16.5\text{V}$ , Inverter Part)	$V_{CC(prot)}$	800	Volts
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	$V_{RMS}$	2500	Volts

**Control Sector**

Supply Voltage Applied between ( $V_{UP1}-V_{UPC}$ , $V_{VP1}-V_{VPC}$ , $V_{WP1}-V_{WPC}$ , $V_{N1}-V_{NC}$ )	$V_D$	20	Volts
Input Voltage Applied between ( $U_P$ , $V_P$ , $W_P$ , $U_N$ , $V_N$ , $W_N$ )	$V_{CIN}$	20	Volts
Fault Output Supply Voltage (Applied between $F_O$ and $V_{NC}$ )	$V_{FO}$	20	Volts
Fault Output Current	$I_{FO}$	20	mA

**IGBT Inverter Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{CIN} = 15\text{V}$ )	$V_{CES}$	1200	Volts
Collector Current, $\pm$	$I_C$	15	Amperes
Peak Collector Current, $\pm$	$I_{CP}$	30	Amperes
Supply Voltage (Applied between P-N)	$V_{CC}$	900	Volts
Supply Voltage, Surge (Applied between P-N, Surge Value)	$V_{CC(surge)}$	1000	Volts
Collector Dissipation	$P_C$	83	Watts

**PM15CZF120**  
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**Electrical and Mechanical Characteristics,  $T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>Control Sector</b>						
Over Current Trip Level	OC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	22	37	–	Amperes
Short Circuit Trip Level	SC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	–	56	–	Amperes
Over Current Delay Time	$t_{\text{off(OC)}}$	$V_D = 15\text{V}$	–	10	–	$\mu\text{S}$
Over Temperature Protection	OT	Trip Level	100	110	120	$^\circ\text{C}$
	$OT_R$	Reset Level	–	90	–	$^\circ\text{C}$
Supply Circuit Under Voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
	$UV_R$	Reset Level	–	12.5	–	Volts
Supply Voltage	$V_D$	Applied between $V_{UP1}-V_{UPC}$ , $V_{VP1}-V_{VPC}$ , $V_{WP1}-V_{WPC}$ , $V_{N1}-V_{NC}$	13.5	15.0	16.5	Volts
Circuit Current	$I_D$	$V_D = 15\text{V}$ , $V_{CIN} = 15\text{V}$ , $V_{N1}-V_{NC}$	–	18	25	mA
		$V_D = 15\text{V}$ , $V_{CIN} = 15\text{V}$ , $V_{XP1}-V_{XPC}$	–	7	10	mA
Input ON Threshold Voltage	$V_{CIN(\text{on})}$	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{CIN(\text{off})}$	$U_P, V_P, W_P, U_N, V_N, W_N$	1.7	2.0	2.3	Volts
PWM Input Frequency	$f_{\text{PWM}}$	3- $\emptyset$ Sinusoidal	–	15	20	kHz
Fault Output Current	$I_{\text{FO(H)}}$	$V_D = 15\text{V}$ , $V_{\text{FO}} = 15\text{V}$	–	–	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

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**15 Amperes/1200 Volts**

**Electrical and Mechanical Characteristics, T<sub>j</sub> = 25°C unless otherwise specified**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>IGBT Inverter Sector</b>						
Collector-Emitter Cutoff Current	I <sub>CES</sub>	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>D</sub> = 15V, T <sub>j</sub> = 25°C	-	-	1	mA
		V <sub>CE</sub> = V <sub>CES</sub> , V <sub>D</sub> = 15V, T <sub>j</sub> = 125°C	-	-	10	mA
FwDi Forward Voltage	V <sub>EC</sub>	-I <sub>C</sub> = 15A, V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V	-	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0V, I <sub>C</sub> = 15A, T <sub>j</sub> = 25°C	-	2.7	3.7	Volts
		V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0V, I <sub>C</sub> = 15A, T <sub>j</sub> = 125°C	-	2.5	3.4	Volts
Inductive Load Switching Times	t <sub>on</sub>		0.3	0.6	1.3	μS
	t <sub>rr</sub>	V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0 ~ 15V,	-	0.15	-	μS
	t <sub>C(on)</sub>	V <sub>CC</sub> = 600V, I <sub>C</sub> = 15A,	-	0.3	1.0	μS
	t <sub>off</sub>	T <sub>j</sub> = 125°C, Inductive Load	-	1.8	3.3	μS
	t <sub>C(off)</sub>		-	0.8	1.5	μS

**Thermal Characteristics**

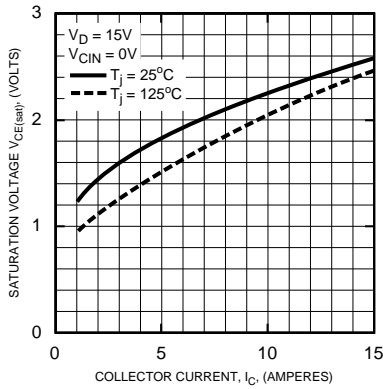
Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	R <sub>th(j-c)Q</sub>	Each IGBT	-	-	1.5	°C/Watt
	R <sub>th(j-c)D</sub>	Each FwDi	-	-	4.5	°C/Watt
Contact Thermal Resistance	R <sub>th(c-f)</sub>	Case to Fin Per Module, Thermal Grease Applied	-	-	0.067	°C/Watt

**Recommended Conditions for Use**

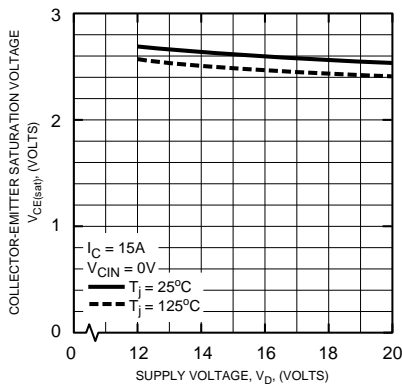
Characteristic	Symbol	Condition	Value	Units
Supply Voltage	V <sub>CC</sub>	Applied across P-N Terminals	0 ~ 800	Volts
	V <sub>D</sub>	Applied between V <sub>UP1</sub> -V <sub>UPC</sub> , V <sub>N1</sub> -V <sub>NC</sub> , V <sub>VP1</sub> -V <sub>VPC</sub> , V <sub>WP1</sub> -V <sub>WPC</sub>	15 ± 1.5	Volts
Input ON Voltage	V <sub>CIN(on)</sub>	Applied between	0 ~ 0.8	Volts
Input OFF Voltage	V <sub>CIN(off)</sub>	U <sub>P</sub> , V <sub>P</sub> , W <sub>P</sub> , U <sub>N</sub> , V <sub>N</sub> , W <sub>N</sub>	4.0 ~ V <sub>D</sub>	Volts
PWM Input Frequency	f <sub>PWM</sub>	Using Application Circuit	5 ~ 20	kHz
Minimum Dead Time	t <sub>DEAD</sub>	Input Signal	≥3.0	μS

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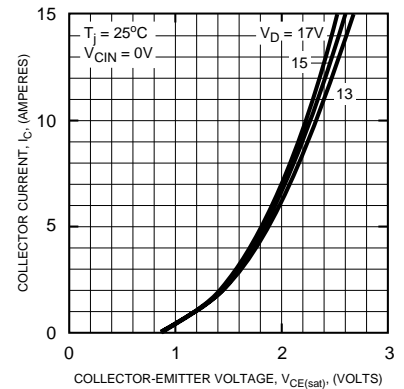
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



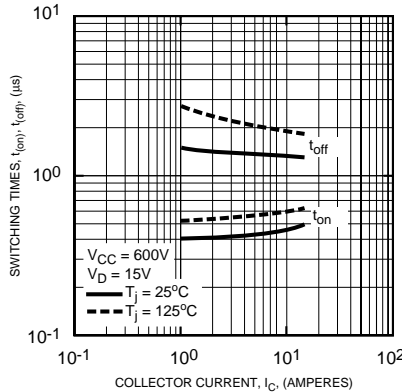
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



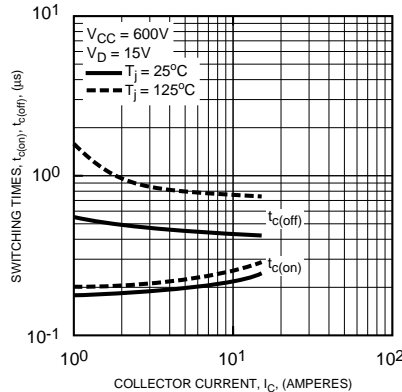
**OUTPUT CHARACTERISTICS (TYPICAL)**



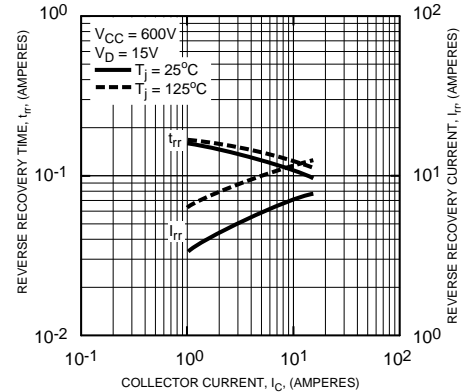
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



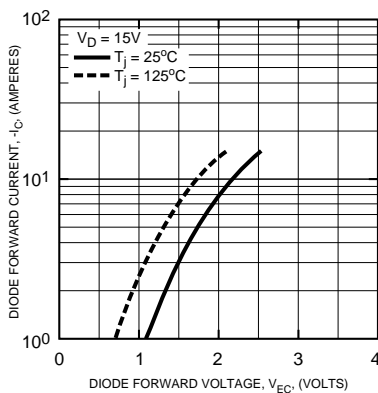
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



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



**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**





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