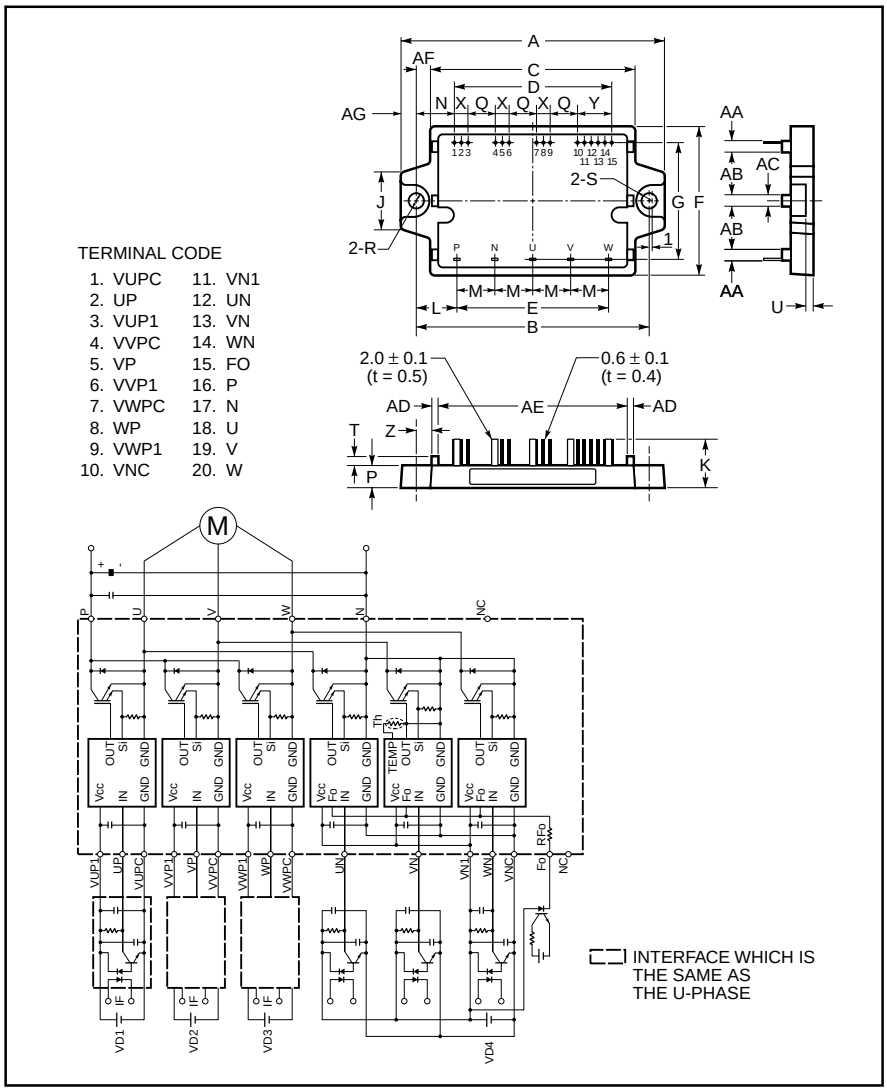
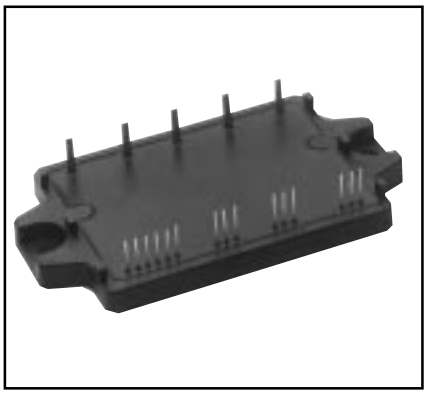
MITSUBISHI INTELLIGENT POWER MODULES

PM15CZF120

FLAT-BASE TYPE
INSULATED PACKAGE





Description:
Mitsubishi 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 Intelligent Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 10)
PM	15	120

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

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Absolute Maximum Ratings, T_j = 25 °C unless otherwise specified

Ratings	Symbol	PM15CZF120	Units
Junction Temperature	T_j	–20 to 150	°C
Storage Temperature	T_{stg}	–40 to 125	°C
Case Operating Temperature	T_C	-20 to 100	°C
Mounting Torque M5 Mounting Screws	–	1.47 ~ 1.96	N · m
Module Weight (Typical)	–	80	Grams
Supply Voltage Protected by OC and SC (V_D = 13.5 ~ 16.5V, Inverter Part)	$V_{CC(prot)}$	800	Volts
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	V_{iso}	2500	Vrms

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_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}, U_N · V_N · W_N-V_{NC})	V_{CIN}	20	Volts
Fault Output Supply Voltage (Applied between F_O and V_{NC})	V_{FO}	20	Volts
Fault Output Current (Sink Current of F_O Terminal)	I_{FO}	20	mA

IGBT Inverter Sector

Collector-Emitter Voltage (V_D = 15V, V_{CIN} = 15V)	V_{CES}	1200	Volts
Collector Current, (T_C = 25°C)	I_C	15	Amperes
Peak Collecotr Current, (T_C = 25°C)	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

Electrical and Mechanical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Control Sector						
Over Current Trip Level	OC	-20°C ≤ T_j ≤ 125°C, V_D= 15V	22	37	–	Amperes
Short Circuit Trip Level	SC	-20°C ≤ T_j ≤ 125°C, V_D= 15V	–	56	–	Amperes
Over Current Delay Time	$t_{off(OC)}$	V_D = 15V	–	10	–	µs
Over Temperature Protection	OT	Trip Level	100	110	120	°C
	OT_r	Reset Level	–	90	–	°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 = 15V, V_{CIN} = 15V, V_{N1}-V_{NC}	–	18	25	mA
		V_D = 15V, V_{CIN} = 15V, V_{XP1}-V_{XPC}	–	7	10	mA
Input ON Threshold Voltage	$V_{th(on)}$	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{th(off)}$	U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}, U_N · V_N · W_N-V_{NC}	1.7	2.0	2.3	Volts
PWM Input Frequency	f_{PWM}	3-ϕ Sinusoidal	–	–	15	kHz
Fault Output Current	$I_{FO(H)}$	V_D = 15V, V_{FO} = 15V	–	–	0.01	mA
	$I_{FO(L)}$	V_D = 15V, V_{FO} = 15V	–	10	15	mA
Minimum Fault Output Pulse Width	t_{FO}	V_D = 15V	1.0	1.8	–	ms

Electrical and Mechanical Characteristics, Tj = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
IGBT Inverter Sector						
Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_D = 15V, T_j = 25°C	–	–	1	mA
		$V_{CE} = V_{CES}$, V_D = 15V, T_j = 125°C	–	–	10	mA
FwDi Forward Voltage	V_{EC}	$-I_C$ = 15A, V_D = 15V, V_{CIN} = 15V	–	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_D= 15V, V_{CIN}= 0V, I_C = 15A, T_j = 25°C	–	2.7	3.7	Volts
		V_D = 15V, V_{CIN} = 0V, I_C = 15A, T_j = 125°C	–	2.5	3.4	Volts
Inductive Load Switching Times	t_{on}	V_D = 15V, V_{CIN} = 0 ↔ 15V, V_{CC} = 600V, I_C = 15A, T_j = 125°C, Inductive Load	0.3	0.6	1.3	µs
	t_{rr}		–	0.15	–	µs
	$t_{C(on)}$		–	0.3	1.0	µs
	t_{off}		–	1.8	3.3	µs
	$t_{C(off)}$		–	0.8	1.5	µs

Thermal Characteristics

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	–	–	1.5	°C/Watt
	$R_{th(j-c)F}$	Each FWDi	–	–	4.5	°C/Watt
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	–	–	0.067	°C/Watt

Recommended Conditions for Use

Characteristic	Symbol	Condition	Value	Units
Supply Voltage	V_{CC}	Applied across P-N Terminals	0 ~ 800	Volts
	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 U_P, V_P, W_P, U_N, V_N, W_N	0 ~ 0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$		4.0 ~ V_D	Volts
PWM Input Frequency	f_{PWM}	Using Application Circuit	5 ~ 15	kHz
Minimum Dead Time	t_{dead}	Input Signal	≥3.0	µs

PM15CZF120

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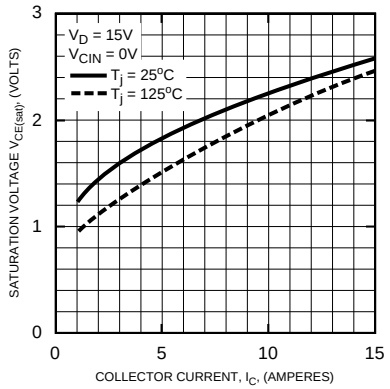
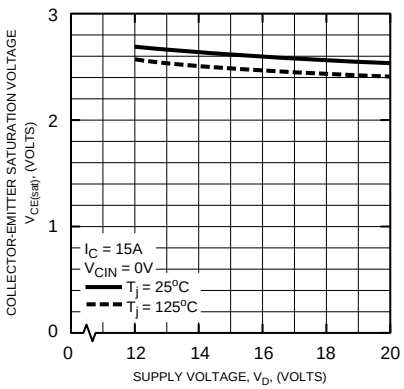
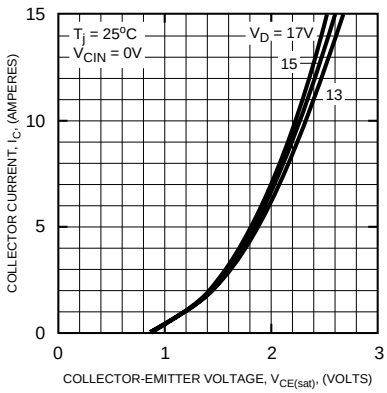
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



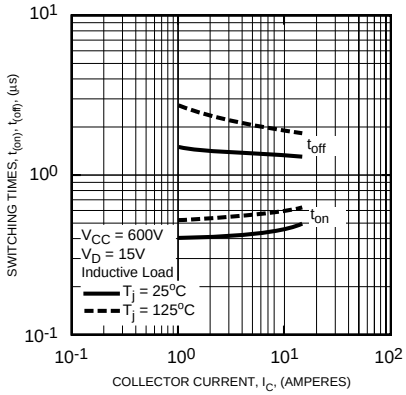
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



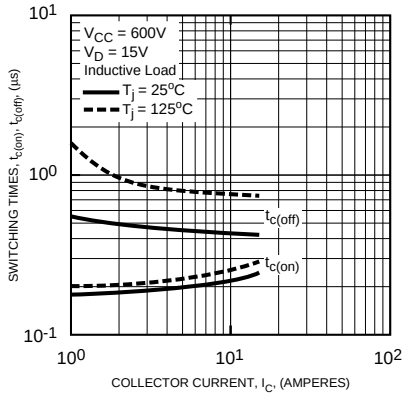
OUTPUT CHARACTERISTICS (TYPICAL)



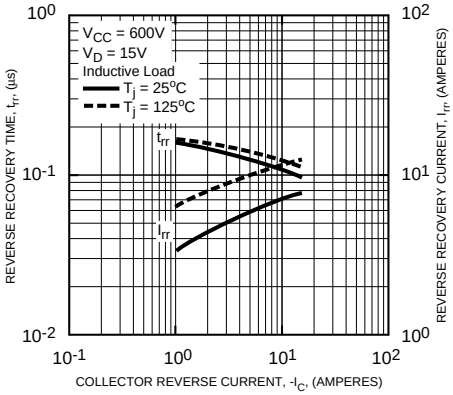
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



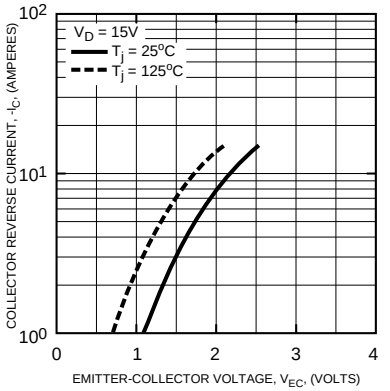
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



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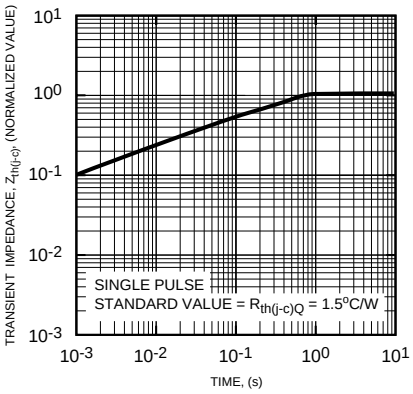
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each FWDi)