

# PM150CVA060

FLAT-BASE TYPE  
INSULATED PACKAGE

## PM150CVA060



### FEATURE

- 3φ 150A, 600V Current-sense IGBT for 20kHz switching
- Monolithic gate drive & protection logic
- Detection, protection & status indication circuits for over-current, short-circuit, over-temperature & under-voltage (P-Fo available from upper leg devices)
- Acoustic noise-less 15kW class inverter application
- UL Recognized  
Yellow Card No. E80276(N)  
File No. E80271

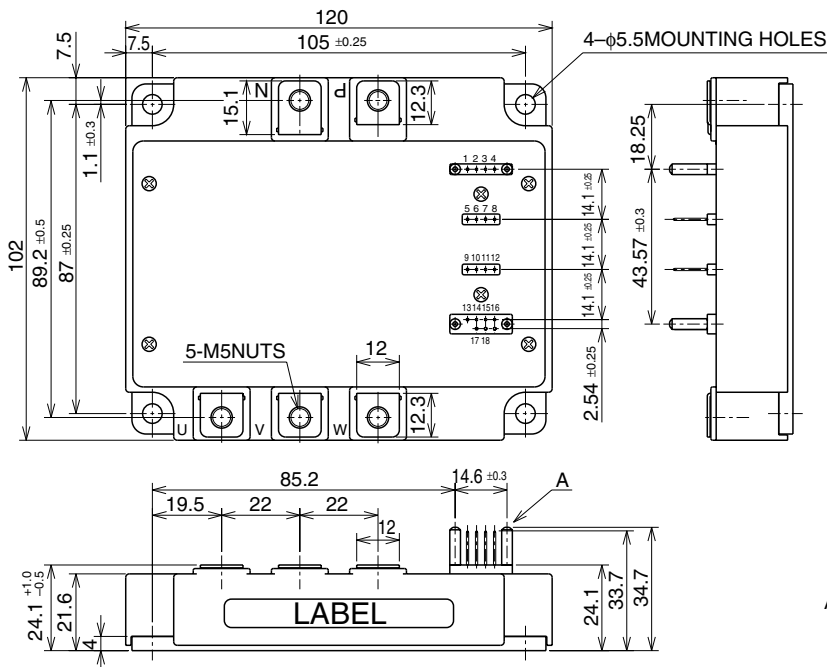
### APPLICATION

General purpose inverter, servo drives and other motor controls

### PACKAGE OUTLINES

Dimensions in mm

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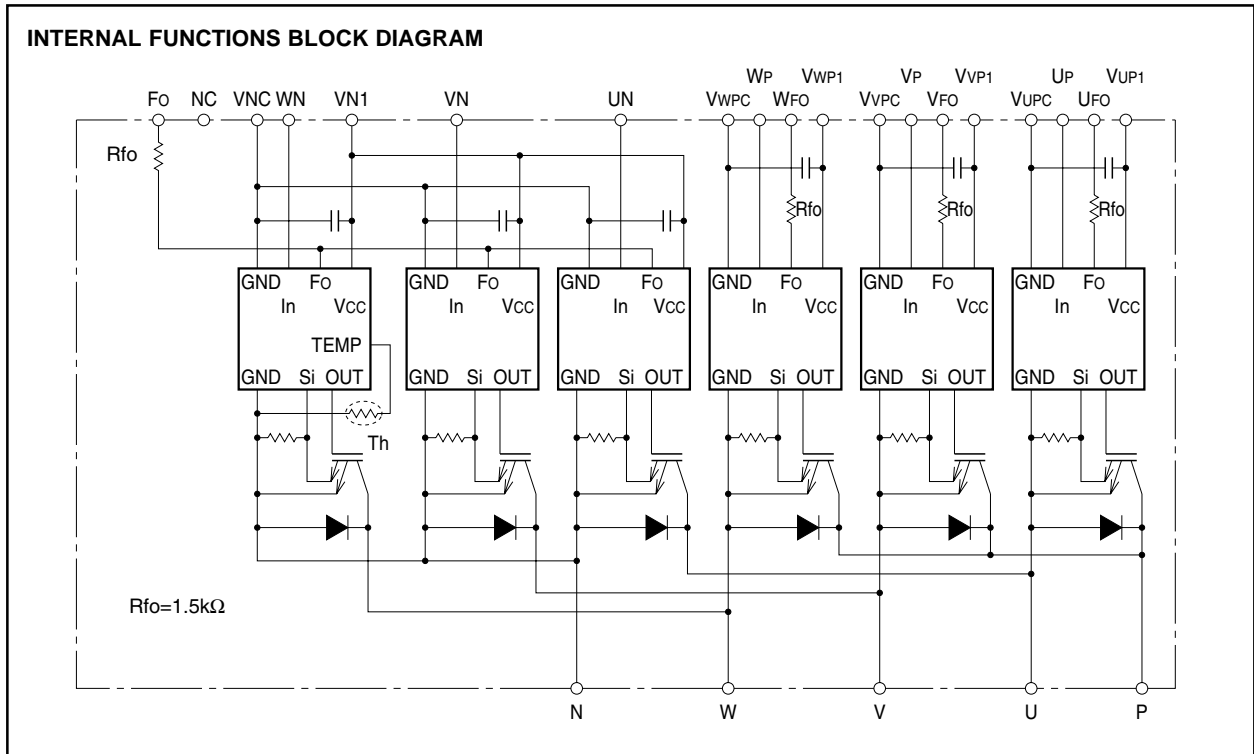
### TERMINAL CODE

- |         |          |         |
|---------|----------|---------|
| 1. WFO  | 8. VVP1  | 15. VNC |
| 2. VWPC | 9. UFO   | 16. VN1 |
| 3. WP   | 10. VUPC | 17. UN  |
| 4. VWP1 | 11. UP   | 18. VN  |
| 5. VFO  | 12. VUP1 | 19. WN  |
| 6. VVPC | 13. NC   |         |
| 7. VP   | 14. FO   |         |

A : DETAIL

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MAXIMUM RATING (Tj = 25°C unless otherwise noted)  
INVERTER PART

Symbol	Parameter	Condition	Ratings	Unit
V <sub>CES</sub>	Collector-Emitter Voltage	V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V	600	V
±I <sub>C</sub>	Collector Current	T <sub>C</sub> = 25°C	150	A
±I <sub>CP</sub>	Collector Current (Peak)	T <sub>C</sub> = 25°C	300	A
P <sub>C</sub>	Collector Dissipation	T <sub>C</sub> = 25°C	406	W
T <sub>j</sub>	Junction Temperature		-20 ~ +150	°C

**CONTROL PART**

Symbol	Parameter	Condition	Ratings	Unit
V <sub>D</sub>	Supply Voltage	Applied between : V <sub>UP1</sub> -V <sub>UPC</sub> V <sub>VVP1</sub> -V <sub>VVPC</sub> , V <sub>WVP1</sub> -V <sub>VWPC</sub> , V <sub>VN1</sub> -V <sub>VNC</sub>	20	V
V <sub>CIN</sub>	Input Voltage	Applied between : U <sub>P</sub> -V <sub>UPC</sub> , V <sub>P</sub> -V <sub>VVPC</sub> , W <sub>P</sub> -V <sub>VWPC</sub> U <sub>N</sub> • V <sub>N</sub> • W <sub>N</sub> -V <sub>VNC</sub>	20	V
V <sub>F0</sub>	Fault Output Supply Voltage	Applied between : U <sub>F0</sub> -V <sub>UPC</sub> , V <sub>F0</sub> -V <sub>VVPC</sub> , W <sub>F0</sub> -V <sub>VWPC</sub> F <sub>0</sub> -V <sub>VNC</sub>	20	V
I <sub>F0</sub>	Fault Output Current	Sink current at U <sub>F0</sub> , V <sub>F0</sub> , W <sub>F0</sub> and F <sub>0</sub> terminal	20	mA

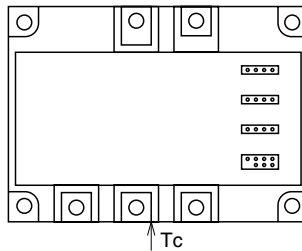
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## TOTAL SYSTEM

Symbol	Parameter	Condition	Ratings	Unit
V <sub>CC(Prot)</sub>	Supply Voltage Protected by SC	V <sub>D</sub> = 13.5 ~ 16.5V, Inverter Part, T <sub>j</sub> = 125°C Start	400	V
V <sub>CC(surge)</sub>	Supply Voltage (Surge)	Applied between : P-N, Surge value or without switching	500	V
T <sub>c</sub>	Module Case Operating Temperature	(Note-1)	-20 ~ +100	°C
T <sub>stg</sub>	Storage Temperature		-40 ~ +125	°C
V <sub>iso</sub>	Isolation Voltage	60Hz, Sinusoidal, Charged part to Base, AC 1 min.	2500	V <sub>rms</sub>

(Note-1) T<sub>c</sub> measurement point is below. (3mm depth at the center of the side of base plate)



## ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = 25°C, unless otherwise noted)

### INVERTER PART

Symbol	Parameter	Test Condition	Limits			Unit
			Min.	Typ.	Max.	
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	V <sub>D</sub> = 15V, I <sub>C</sub> = 150A V <sub>CIN</sub> = 0V	—	2.35	2.80	V
V <sub>CE</sub>	Collector-Emitter Forward Voltage	-I <sub>C</sub> = 150A, V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V	—	2.20	2.30	V
t <sub>on</sub>	Switching Time	V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0V ↔ 15V V <sub>CC</sub> = 300V, I <sub>C</sub> = 150A T <sub>j</sub> = 125°C Inductive Load (upper and lower arm)	0.4	0.8	2.1	μs
t <sub>tr</sub>			—	0.2	0.3	
t <sub>c(on)</sub>			—	0.3	1.1	
t <sub>off</sub>			—	1.8	2.9	
t <sub>c(off)</sub>			—	0.6	1.2	
I <sub>CES</sub>	Collector-Emitter Cutoff Current	V <sub>CE</sub> = V <sub>CE(sat)</sub> , V <sub>CIN</sub> = 15V	—	—	1	mA
		T <sub>j</sub> = 125°C	—	—	10	

### CONTROL PART

Symbol	Parameter	Test Condition	Limits			Unit	
			Min.	Typ.	Max.		
I <sub>D</sub>	Circuit Current	V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V	V <sub>N1</sub> -V <sub>N2</sub>	—	40	55	mA
			V*P1-V*PC	—	13	18	
V <sub>th(ON)</sub>	Input ON Threshold Voltage	Applied between : UP-V <sub>UPC</sub> , VP-V <sub>VPC</sub> , WP-V <sub>WPC</sub>	1.2	1.5	1.8	V	
V <sub>th(OFF)</sub>	Input OFF Threshold Voltage	UN • VN • WN-V <sub>N2</sub>	1.7	2.0	2.3		
SC	Short Circuit Trip Level	-20 ≤ T <sub>j</sub> ≤ 125°C, V <sub>D</sub> = 15V	210	—	—	A	
t <sub>off(SC)</sub>	Short Circuit Current Delay Time	V <sub>D</sub> = 15V	—	10	—	μs	
OT	Over Temperature Protection	Base-plate Temperature detection, V <sub>D</sub> = 15V	Trip level	111	118	125	°C
			Reset level	—	100	—	
UV	Supply Circuit Under-Voltage Protection	-20 ≤ T <sub>j</sub> ≤ 125°C	Trip level	11.5	12.0	12.5	V
			Reset level	—	12.5	—	
I <sub>FO(H)</sub>	Fault Output Current	V <sub>D</sub> = 15V, V <sub>FO</sub> = 15V	(Note-2)	—	—	0.01	mA
I <sub>FO(L)</sub>			(Note-2)	—	10	15	
t <sub>FO</sub>	Minimum Fault Output Pulse Width	V <sub>D</sub> = 15V	(Note-2)	1.0	1.8	—	ms

(Note-2) Fault output is given only when the internal SC, OT & UV protection.  
 Fault output of OT protection operate by lower arm  
 Fault output of OT, UV protection given pulse while over level.

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**THERMAL RESISTANCES**

Symbol	Parameter	Test Condition	Limits			Unit
			Min.	Typ.	Max.	
Rth(j-c)Q	Junction to case Thermal Resistances	Inverter IGBT part (per 1/6 module)	—	—	0.308	°C/W
Rth(j-c)F		Inverter FWDi part (per 1/6 module)	—	—	0.47	
Rth(c-f)	Contact Thermal Resistance	Case to fin, Thermal grease applied (per 1 module)	—	—	0.022	

**MECHANICAL RATINGS AND CHARACTERISTICS**

Symbol	Parameter	Test Condition	Limits			Unit
			Min.	Typ.	Max.	
—	Mounting torque	Mounting part screw : M5	2.5	3.0	3.5	N • m
—	Mounting torque	Main terminal screw : M5	2.5	3.0	3.5	N • m
—	Weight		—	730	—	g

**RECOMMENDED CONDITIONS FOR USE**

Symbol	Parameter	Test Condition	Recommended value	Unit
VCC	Supply Voltage	Applied across P-N terminals	≤ 400	V
VD	Control Supply Voltage	Applied between : VUP1-VUPC, VVP1-VVPC VWP1-VWPC, VN1-VNC (Note-3)	15 ± 1.5	V
VCIN(ON)	Input ON Voltage	Applied between : UP-VUPC, VP-VVPC, WP-VWPC UN • VN • WN-VNC	≤ 0.8	V
VCIN(OFF)	Input OFF Voltage		≥ 4.0	
tdead	Arm Shoot-through Blocking Time	For IPM's each input signals	≥ 2.5	µs
fPWM	PWM Input Frequency	Using Application Circuit input signal of IPM, 3φ Sinosoidal PWM, VVP1 inverter	≤ 30	kHz

Note 3: With ripple satisfying the following conditions: dv/dt swing ≤ ±5V/µs, Variation ≤ 2V peak to peak

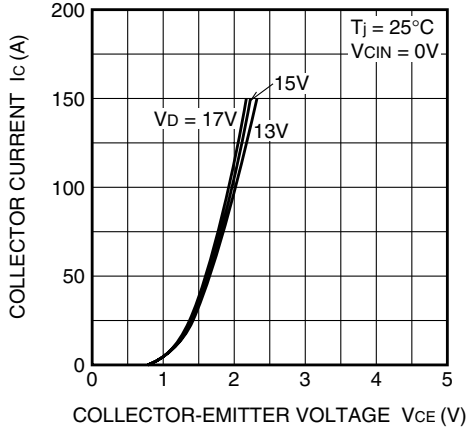
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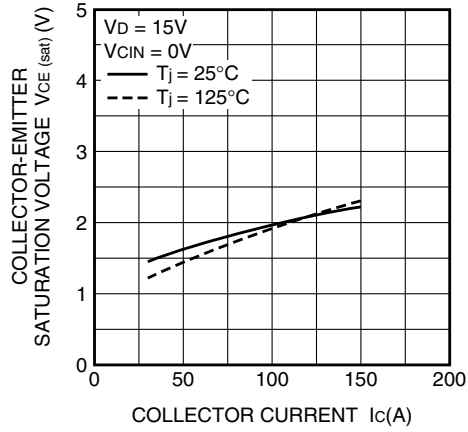
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**PERFORMANCE CURVES**

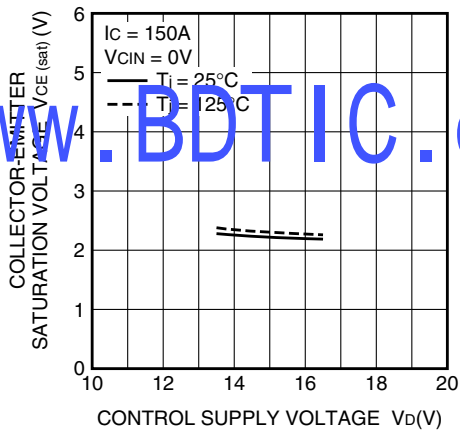
**OUTPUT CHARACTERISTICS (TYPICAL)**



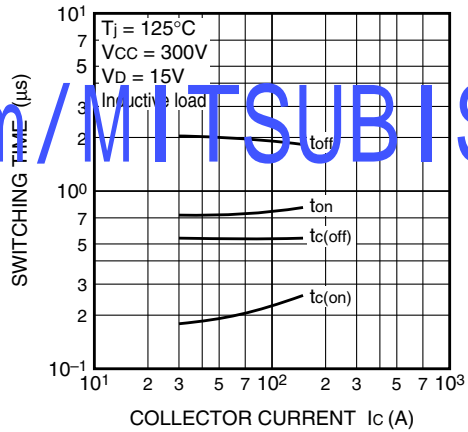
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



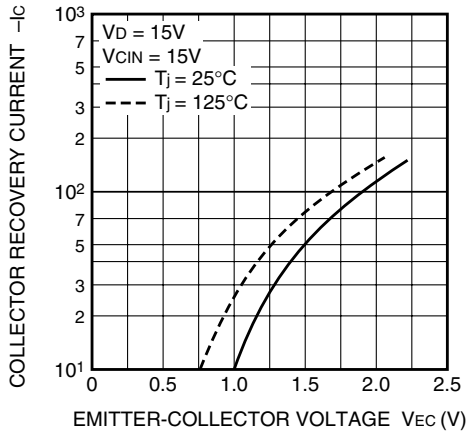
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



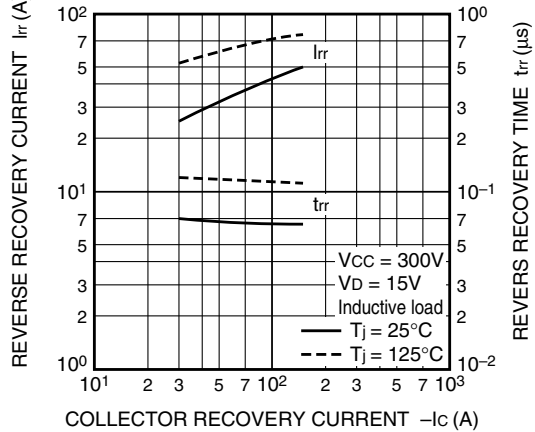
**SWITCHING CHARACTERISTICS (TYPICAL)**



**DIODE FORWARD CHARACTERISTICS (TYPICAL)**



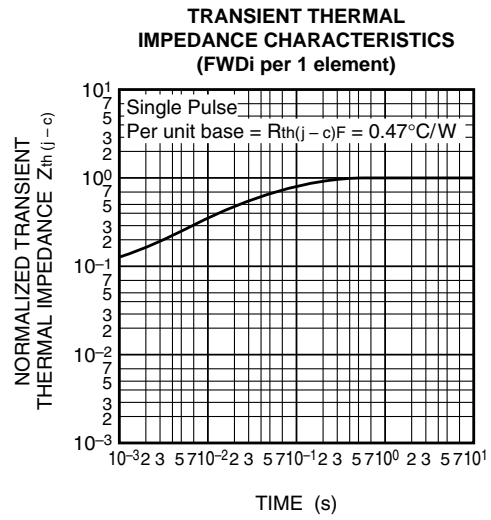
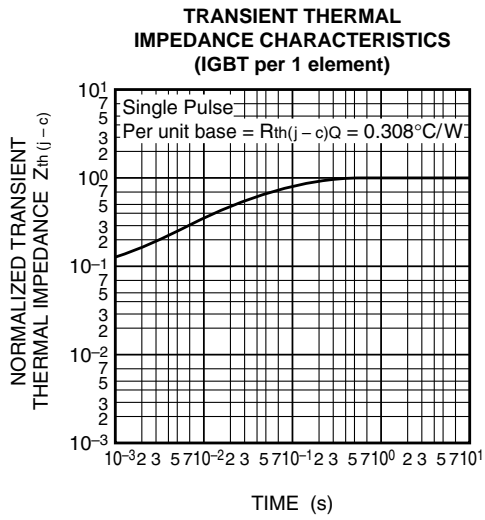
**DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**



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