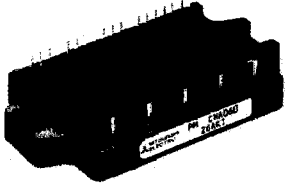


# PM10CHA060

FLAT-BASE TYPE  
INSULATED PACKAGE

PM10CHA060



- 3 φ 10A, 600V Current-sense IGBT type inverter
- Monolithic gate drive & protection logic
- Detection, protection & status indication circuits for over-current, short-circuit, over-temperature & under-voltage
- Acoustic noise-less 400W class inverter application
- UL Recognized

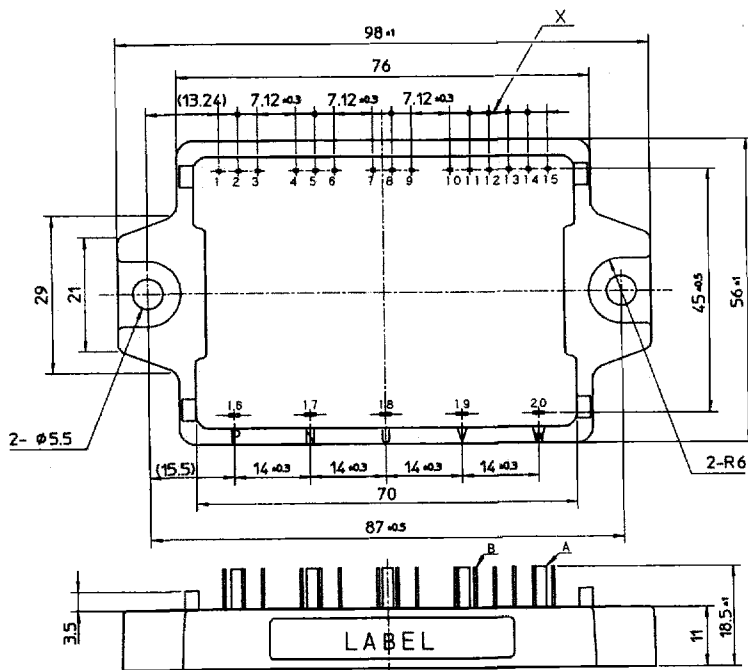
Yellow Card No. E80276 (N)  
File No. E80271

## APPLICATION

General purpose inverter, servo drives and other motor controls

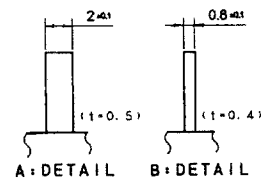
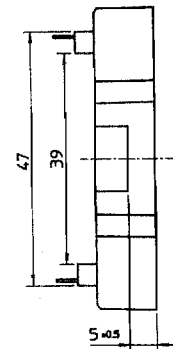
## OUTLINE DRAWING

Dimensions in mm



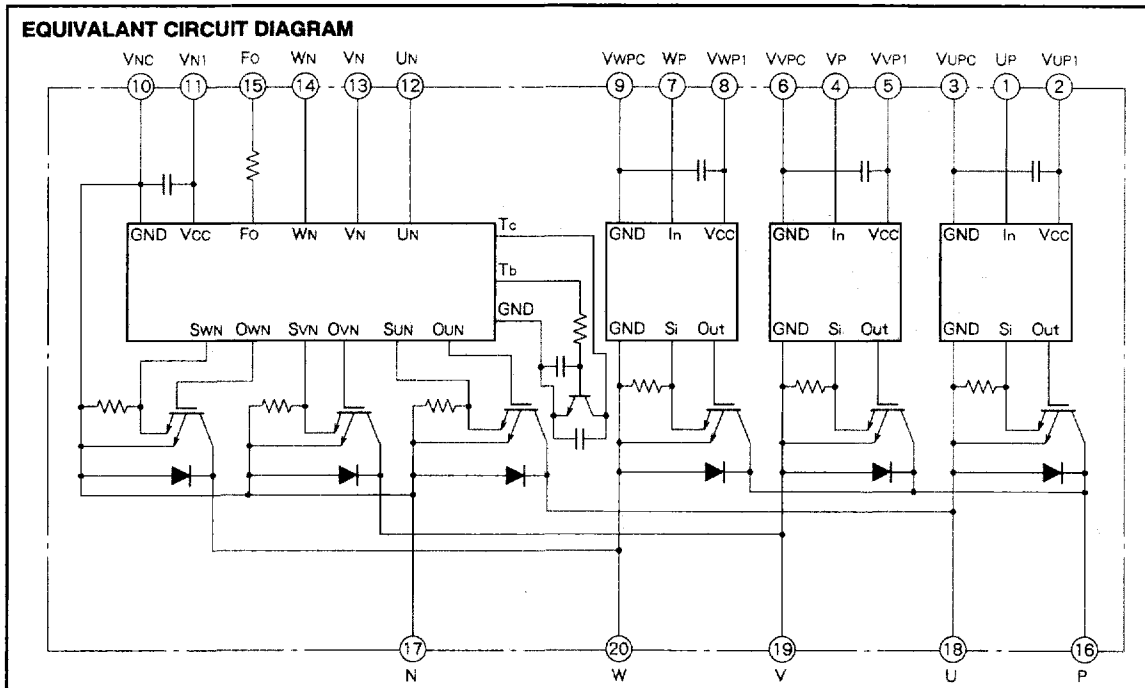
- |                     |                     |
|---------------------|---------------------|
| 1. U <sub>P</sub>   | 11. V <sub>N1</sub> |
| 2. V <sub>UP1</sub> | 12. U <sub>H</sub>  |
| 3. V <sub>UPC</sub> | 13. V <sub>W</sub>  |
| 4. V <sub>P</sub>   | 14. W <sub>N</sub>  |
| 5. V <sub>VP1</sub> | 15. F <sub>o</sub>  |
| 6. V <sub>VPC</sub> | 16. P               |
| 7. W <sub>P</sub>   | 17. N               |
| 8. V <sub>WP1</sub> | 18. U               |
| 9. V <sub>WPC</sub> | 19. V               |
| 10. V <sub>NC</sub> | 20. W               |

X IS 3.56 ± 0.3



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**MAXIMUM RATINGS** ( $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise noted)

**INVERTER PART**

Symbol	Parameter	Conditions	Ratings	Unit
$V_{cc}$	Supply voltage	Applied between : P-N	450	V
$V_{cc(surge)}$	Supply voltage (surge)	Applied between : P-N, surge value	500	V
$V_{CES}$	Collector-emitter voltage		600	V
$\pm I_C$	Collector current	$T_c = 25\text{ }^\circ\text{C}$	10	A
$\pm I_{CP}$	Collector current (peak)	$T_c = 25\text{ }^\circ\text{C}$	20	A
$P_c$	Collector dissipation	$T_c = 25\text{ }^\circ\text{C}$	39	W
$T_j$	Junction temperature		- 20 ~ + 150	$^\circ\text{C}$

**CONTROL PART**

Symbol	Parameter	Conditions	Ratings	Unit
$V_D$	Supply voltage	Applied between : $V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}, V_{N1}-V_{NC}$	20	V
$I_{CIN}$	Input current	Applied between :	20	mA
$V_{CIN}$	Input voltage	$U_P, V_P, W_P, U_N, V_N, W_N$	20	V
$V_{Fo}$	Fault output supply voltage	Applied between : $Fo-V_{NC}$	20	V
$I_{Fo}$	Fault output current	Sink current of $Fo$ terminal	20	mA

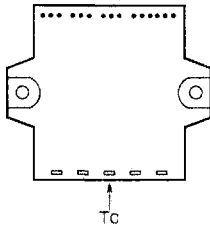
**PM10CHA060**

**FLAT-BASE TYPE  
INSULATED PACKAGE**

**TOTAL SYSTEM**

Symbol	Parameter	Conditions	Ratings	Unit
V <sub>CC(PROT)</sub>	Supply voltage protected by OC & SC	V <sub>D</sub> = 13.5~16.5V Inverter part T <sub>j</sub> = 125°C start	400	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, AC, 1min	2500	V <sub>rms</sub>

Note 1. T<sub>c</sub> measuring point is as shown below



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

**INVERTER PART**

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V <sub>CE(sat)</sub>	Collector-emitter saturation voltage	V <sub>D</sub> = 15V, I <sub>CIN</sub> = 0mA Pulsed		2.6	3.5	V
		I <sub>c</sub> = 10A, T <sub>j</sub> = 25°C	-	2.5	3.4	
V <sub>EC</sub>	FWDi forward voltage	- I <sub>c</sub> = 10A, V <sub>D</sub> = 15V, I <sub>CIN</sub> = 1mA	-	1.5	2.5	V
t <sub>on</sub>	Switching time	V <sub>D</sub> = 15V, I <sub>CIN</sub> = 0mA ↔ 1mA V <sub>CC</sub> = 300V, I <sub>c</sub> = 10A T <sub>j</sub> = 125°C, (Per 1 arm) Inductive Load	0.5	0.8	1.5	μs
t <sub>rr</sub>			-	0.15	0.4	μs
t <sub>c(on)</sub>			-	0.3	1.0	μs
t <sub>off</sub>			-	1.1	2.5	μs
t <sub>c(off)</sub>			-	0.5	1.5	μs
I <sub>CES</sub>	Collector-emitter cutoff current	V <sub>CE</sub> = V <sub>CEs</sub>			1	mA
		T <sub>j</sub> = 25°C	-	-	10	
		T <sub>j</sub> = 125°C	-	-	-	

**CONTROL PART**

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V <sub>D</sub>	Supply voltage	Applied between : V <sub>UP1</sub> -V <sub>UPC</sub> , V <sub>VP1</sub> -V <sub>VPc</sub> , V <sub>WP1</sub> -V <sub>WPC</sub> , V <sub>N1</sub> -V <sub>Nc</sub>	13.5	15	16.5	V
I <sub>D</sub>	Circuit current	V <sub>D</sub> = 15V, I <sub>CIN</sub> = 1mA		25	40	mA
		V <sub>N1</sub> -V <sub>Nc</sub> V <sub>XP1</sub> -V <sub>XPc</sub>	-	7	12	
I <sub>CIN(ON)</sub>	Input on threshold current	Applied between :	0.1	0.22	0.5	mA
I <sub>CIN(OFF)</sub>	Input off threshold current	U <sub>P</sub> -V <sub>UPC</sub> , V <sub>P</sub> -V <sub>VPc</sub> , W <sub>P</sub> -V <sub>WPC</sub> , U <sub>N</sub> , V <sub>N</sub> , W <sub>N</sub> -V <sub>Nc</sub>	0.1	0.22	0.5	
f <sub>PWM</sub>	PWM input frequency	3 φ sinusoidal	-	15	20	kHz
t <sub>dead</sub>	Arm shoot-through blocking time	For each pulse input U <sub>P</sub> -U <sub>N</sub> , V <sub>P</sub> -V <sub>N</sub> , W <sub>P</sub> -W <sub>N</sub> Using application circuit opto-coupler's input signal I <sub>F</sub> = 12mA	2.0	-	-	
OC	Over current trip level	-20°C ≤ T <sub>j</sub> ≤ 125°C, V <sub>D</sub> = 15V	12	18	-	A
SC	Short circuit trip level	-20°C ≤ T <sub>j</sub> ≤ 125°C, V <sub>D</sub> = 15V	-	27	-	
t <sub>off(oc)</sub>	Over current delay time	V <sub>D</sub> = 15V	-	10	-	μs
OT	Over temperature protection	Base-plate temperature detection, V <sub>D</sub> = 15V	100	110	120	
OT <sub>r</sub>	Reset level		-	90	-	°C
UV	Supply circuit under voltage protection	T <sub>j</sub> ≤ 125°C	11.5	12.0	12.5	V
UV <sub>r</sub>	Reset level		-	12.5	-	
I <sub>FO(H)</sub>	Fault output current (Note 2)	V <sub>D</sub> = 15V, V <sub>FO</sub> = 15V			0.01	mA
I <sub>FO(L)</sub>					10	
t <sub>FO</sub>	Minimum fault output pulse width (Note 2)	V <sub>D</sub> = 15V Using application circuit opto-coupler's input signal, V <sub>D</sub> = 15V	20	40	60	μs
			25	100	-	

Note 2. Fault output is given only when the internal OC, SC, OT & UV protections schemes of any lower arm device operate to protect the device. For each upper arm device, the internal OC, SC & UV protection schemes are provided to protect the device but, no fault output is given.

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## THERMAL RESISTANCES

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$R_{th(j-c)Q}$	Junction-to-case thermal resistances	Inverter IGBT part, per 1/6 module	-	-	3.2	°C/W
$R_{th(j-c)F}$		Inverter FWDi part, per 1/6 module	-	-	4.5	°C/W
$R_{th(c-f)}$	Contact thermal resistance	Thermal grease applied, per 1/6 module	-	-	0.4	°C/W

## MECHANICAL RATINGS AND CHARACTERISTICS

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
-	Mounting torque	Mounting part screw : M5	1.47	1.67	1.96	N · m
-	Weight	-	15	17	20	kg · cm
			-	90	-	g

## RECOMMENDED CONDITIONS FOR USE

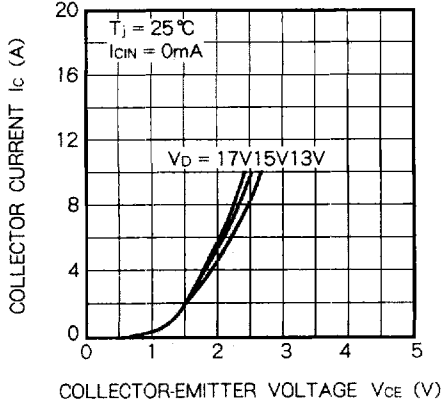
Symbol	Parameter	Test conditions	Value			Unit
			Min	Typ	Max	
$V_{CC}$	Supply voltage	Applied across P-N terminals	0	300	400	V
$V_D$		Applied between : $V_{UP1-V_{UPC}}, V_{VP1-V_{VPC}}, V_{WP1-V_{WPC}}, V_{N1-V_{NC}}$	13.5	15	16.5	V
$I_{CIN(ON)}$	Input on current	Applied between :	0	-	0.05	mA
$I_{CIN(OFF)}$	Input off current	$U_P, V_P, W_P, U_N, V_N, W_N$	0.5	-	2	mA
$f_{PWM}$	PWM input frequency	Using application circuit	5	15	20	kHz
$t_{dead}$	Arm shoot-through blocking time	Using application circuit opto-coupler's input signal	5.0	-	-	μs

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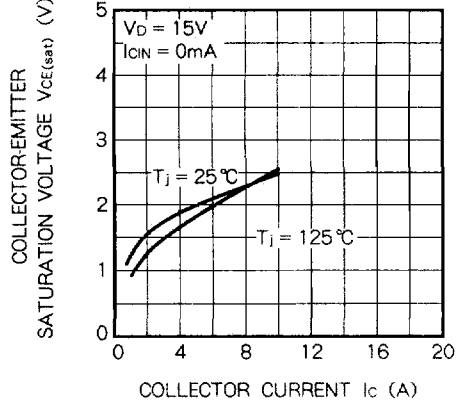
FLAT-BASE TYPE  
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PERFORMANCE CURVES

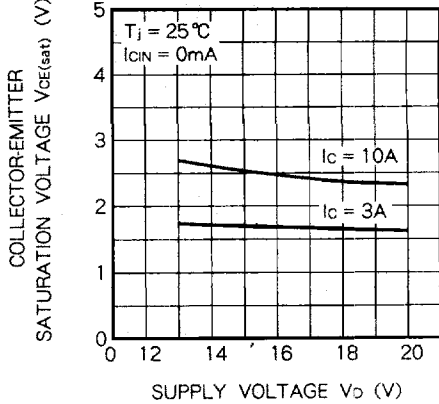
OUTPUT CHARACTERISTICS (TYPICAL)



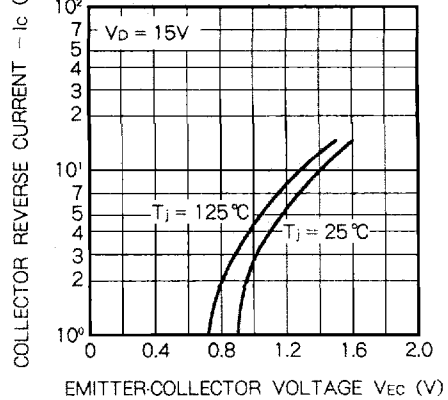
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



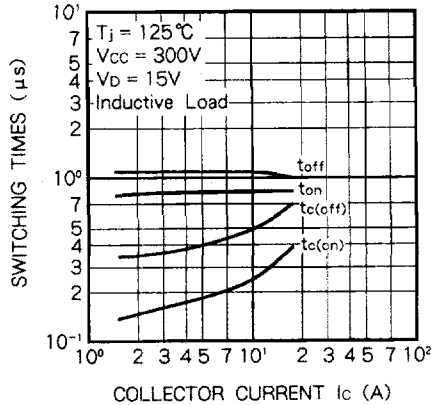
COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



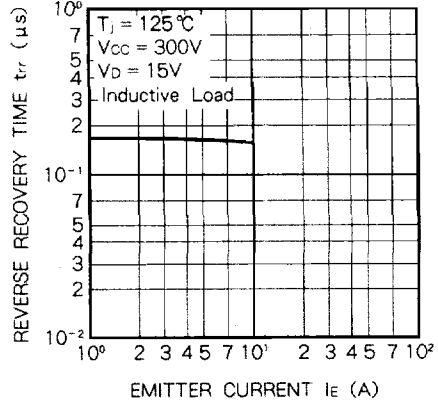
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



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