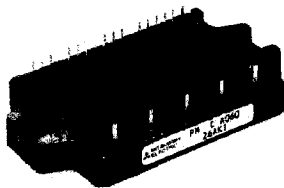


PM10CMA060

FLAT-BASE TYPE
INSULATED PACKAGE

PM10CMA060



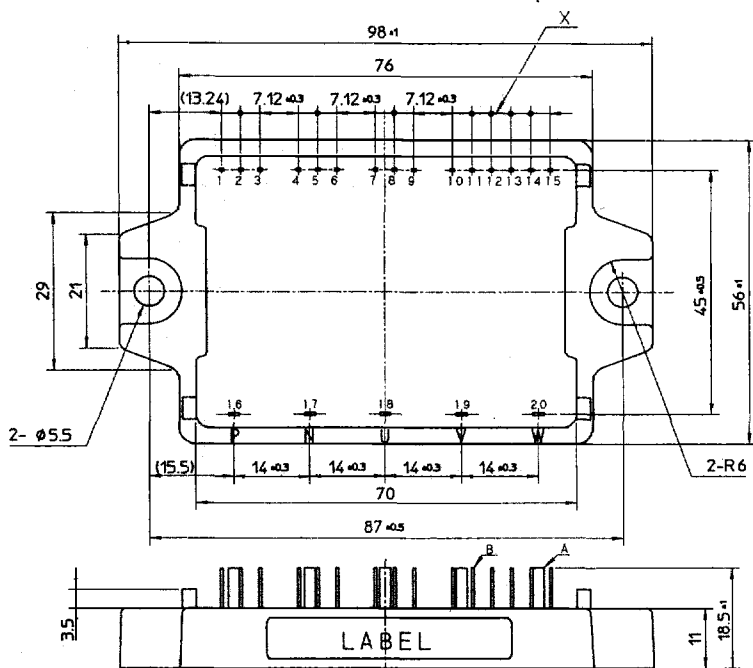
- 3 φ 10A, 600V Current-sense IGBT type inverter
- Monolithic gate drive & protection logic
- Detection, protection & status indication circuits for over-current, short-circuit, over-temperature & under-voltage
- Acoustic noise-less 400W class inverter application

APPLICATION

General purpose inverter, servo drives and other motor controls

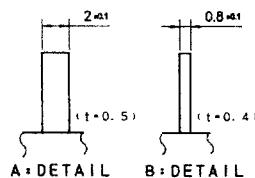
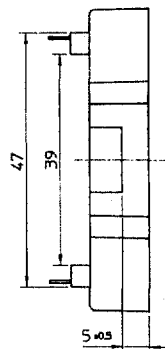
OUTLINE DRAWING

Dimensions in mm



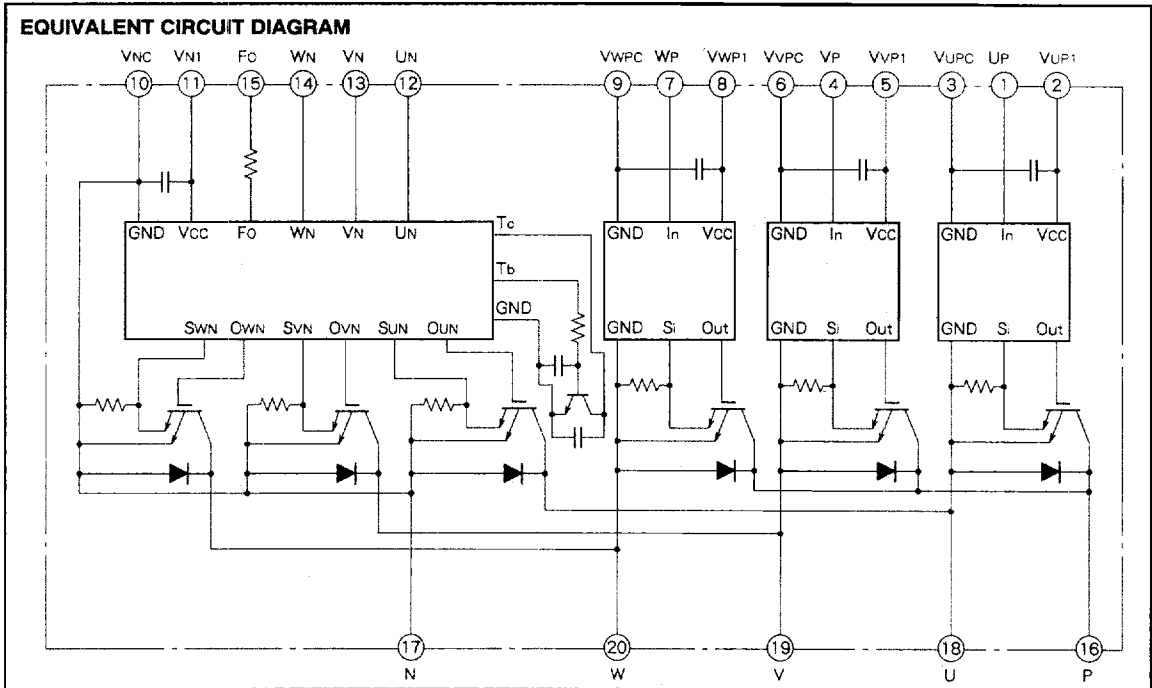
1. U _P	11. V _{N1}
2. V _{UP1}	12. U _N
3. V _{UPC}	13. V _N
4. V _P	14. W _N
5. V _{VP1}	15. F _o
6. V _{YPC}	16. P
7. W _P	17. N
8. V _{WP1}	18. U
9. V _{WPC}	19. V
10. V _{NC}	20. W

X IS 3.56 ± 0.3



PM10CMA060

FLAT-BASE TYPE
INSULATED PACKAGE



MAXIMUM RATINGS ($T_j = 25^\circ\text{C}$, 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	$T_c = 25^\circ\text{C}$	10	A
$\pm I_{cp}$	Collector current (peak)	$T_c = 25^\circ\text{C}$	20	A
P_c	Collector dissipation	$T_c = 25^\circ\text{C}$	39	W
T_j	Junction temperature		$-20 \sim +150$	$^\circ\text{C}$

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
V_{cin}	Input voltage	Applied between : $U_P-U_{PC}, V_P-V_{PC}, W_P-W_{PC}, U_N, V_N, W_N-V_{NC}$	20	V
V_{Fo}	Fault output supply voltage	Applied between : $Fo-GND$	20	V
I_{Fo}	Fault output current	Sink current of Fo terminal	20	mA

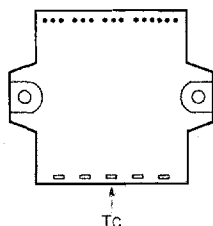
PM10CMA060

FLAT-BASE TYPE
INSULATED PACKAGE

TOTAL SYSTEM

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC(PROT)}	Supply voltage protected by OC & SC	V _D = 13.5~16.5V Inverter part T _j = 125°C start	400	V
T _c	Module case operating temperature	(Note 1)	- 20~ + 100	°C
T _{stg}	Storage temperature		- 40~ + 125	°C
V _{iso}	Isolation voltage	60Hz, Sinusoidal, AC, 1min	2000	V _{rms}

Note 1. T_c measuring point is as shown below



ELECTRICAL CHARACTERISTICS (T_j = 25°C, unless otherwise noted)

INVERTER PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V _{CE(sat)}	Collector-emitter saturation voltage	V _D = 15V, V _{CIN} = 0V Pulsed				V
		I _c = 10A, T _j = 25°C I _c = 10A, T _j = 125°C	-	2.6 2.5	3.5 3.4	
V _{EC}	FWDi forward voltage	- I _c = 10A, V _D = 15V, V _{CIN} = 15V	-	1.5	2.5	V
t _{on}	Switching time	V _D = 15V, V _{CIN} = 15V ↔ 0V V _{CC} = 300V, I _c = 10A T _j = 125°C, (Per 1 arm) Inductive Load	0.3	0.6	1.5	μs
t _{rr}			-	0.15	0.4	μs
t _{c(on)}			-	0.3	1.0	μs
t _{off}			-	1.5	2.3	μs
t _{c(off)}			-	0.5	1.5	μs
I _{CES}	Collector-emitter cutoff current	V _{CE} = V _{CES}				mA
		T _j = 25°C T _j = 125°C	-	-	1 10	

CONTROL PART

Symbol	Parameter	Test conditions	Limits			Unit	
			Min	Typ	Max		
V _D	Supply voltage	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 _D	Circuit current	V _D = 15V, V _{CIN} = 15V				mA	
		V _{N1} -V _{Nc} V _{XPI} -V _{XPC}	-	18 7	25 10		
V _{CIN(ON)}	Input on threshold current	Applied between : U _P -U _{PC} , V _P -V _{PC} , W _P -W _{PC}	1.2	1.5	1.8	mA	
V _{CIN(OFF)}	Input off threshold current	U _N , V _N , W _N -V _{Nc}	1.7	2.0	2.3		
f _{PWM}	PWM input frequency	3 φ sinusoidal	-	15	20	kHz	
t _{dead}	Arm shoot-through blocking time	For each pulse input U _P -U _N , V _P -V _N , W _P -W _N Using application circuit opto-coupler's input signal I _F = 12mA	2	-	-		
OC	Over current trip level	- 20°C ≤ T _j ≤ 125°C, V _D = 15V	12	18	-	A	
SC	Short circuit trip level	- 20°C ≤ T _j ≤ 125°C, V _D = 15V	-	27	-		
t _{off(oc)}	Over current delay time	V _D = 15V	-	10	-	μs	
OT	Over temperature protection	Base-plate temperature detection	Trip level	100	110	120	°C
OT _r			Reset level	-	90	-	
UV	Supply circuit under voltage protection		Trip level	11.5	12.0	12.5	V
UV _r			Reset level	-	12.5	-	
I _{FO(H)}	Fault output current (Note 2)	V _D = 15V, V _{FO} = 15V		-	-	0.01	mA
I _{FO(L)}				-	10	15	
t _{FO}	Fault output pulse width (Note 2)	V _D = 15V	1.0	1.8	-	ms	

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.

PM10CMA060

FLAT-BASE TYPE
INSULATED PACKAGE

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
—	Weight	—	—	90	—	g

RECOMMENDED CONDITIONS FOR USE

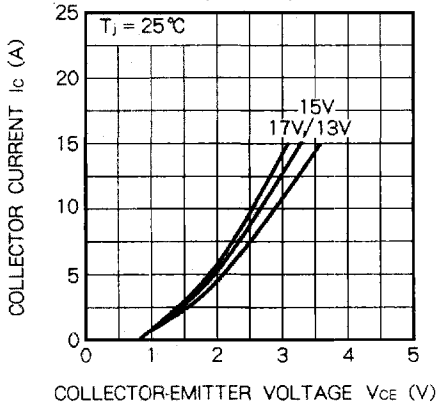
Symbol	Parameter	Test conditions	Value			Unit
			Min	Typ	Max	
V_{cc}	Supply voltage	Applied across P-N terminals	0	300	400	V
V_D		Applied between : $V_{UP1-V_{UPC}}$, $V_{VP1-V_{VPC}}$, $V_{WP1-V_{WPC}}$, $V_{N1-V_{NC}}$	13.5	15	16.5	V
$V_{CIN(ON)}$	Input on current	Applied between :	0	—	0.8	V
$V_{CIN(OFF)}$	Input off current	U_P-V_{UPC} , V_P-V_{VPC} , W_P-V_{WPC} , U_N , V_N , W_N-V_{NC}	4	—	V_D	V
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	4	—	—	μs

PM10CMA060

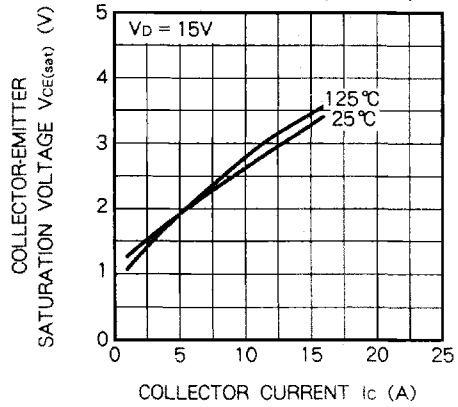
FLAT-BASE TYPE
INSULATED PACKAGE

PERFORMANCE CURVES

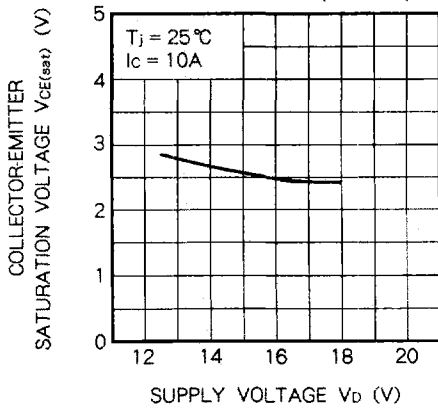
OUTPUT CHARACTERISTICS (TYPICAL)



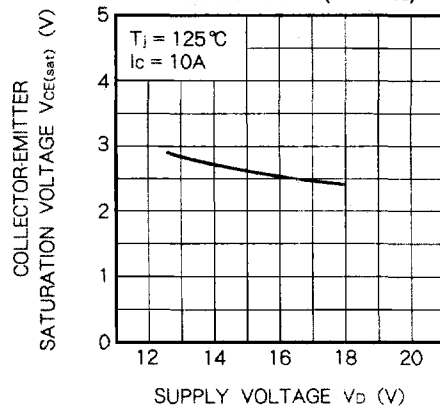
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



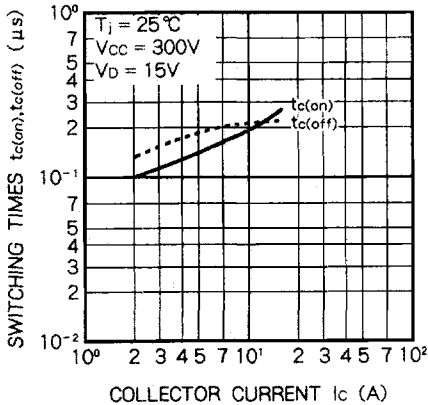
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



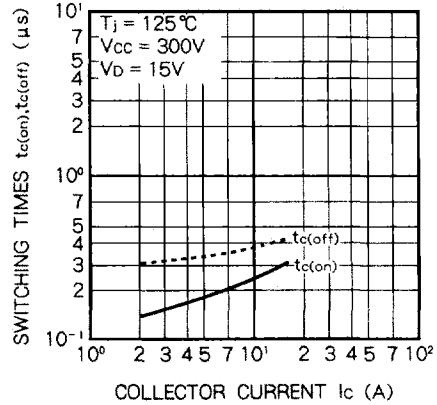
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)

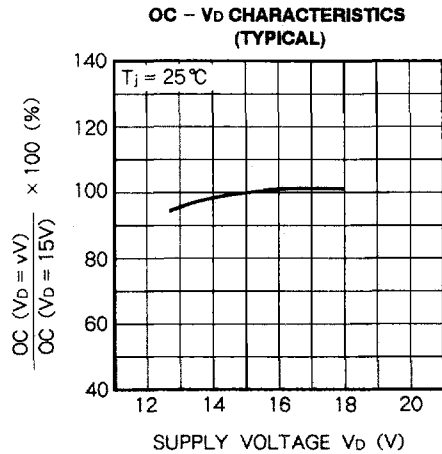
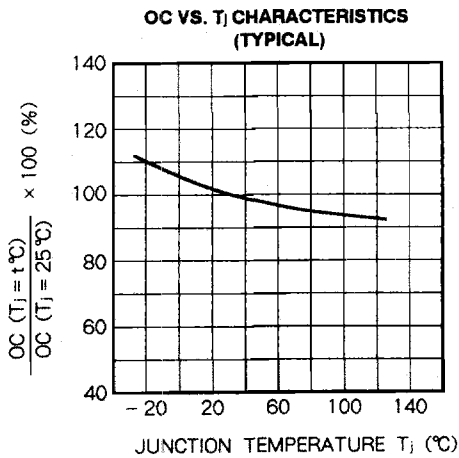
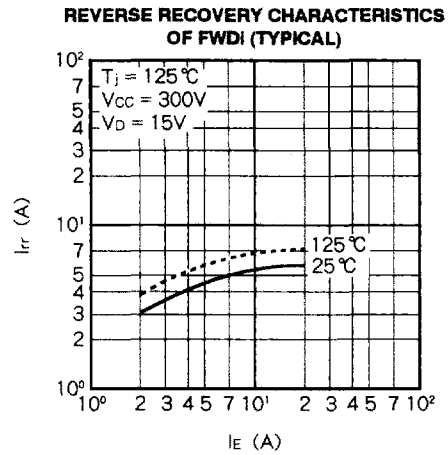
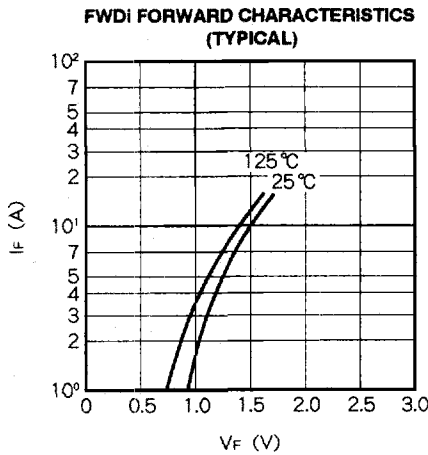
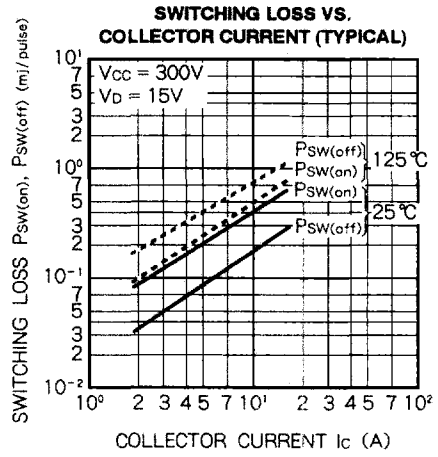
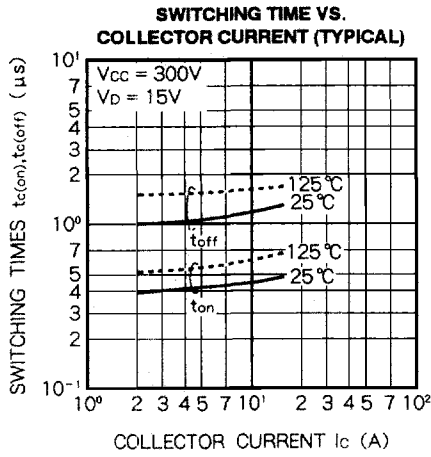


SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



PM10CMA060

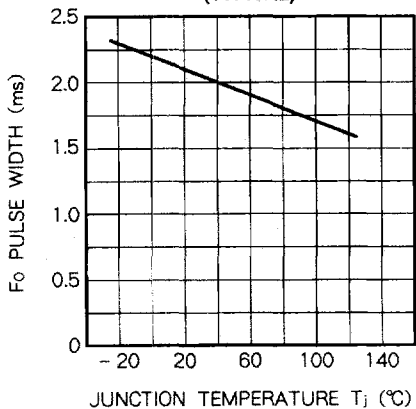
FLAT-BASE TYPE
INSULATED PACKAGE



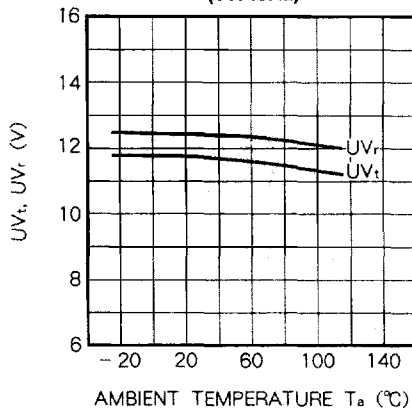
PM10CMA060

FLAT-BASE TYPE
INSULATED PACKAGE

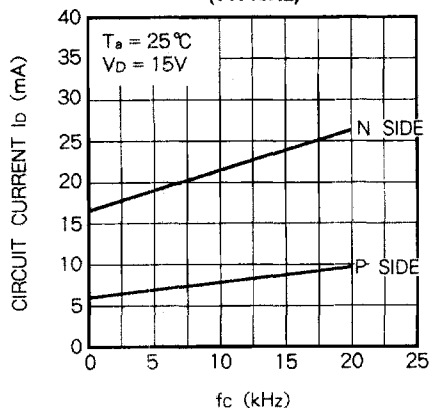
F₀ PULSE WIDTH VS. T_J CHARACTERISTICS
(TYPICAL)



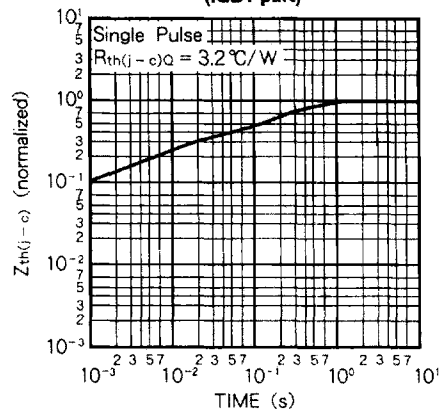
UV_i, UV_r VS. T_a CHARACTERISTICS
(TYPICAL)



I_b VS. f_c CHARACTERISTICS
(TYPICAL)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT part)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDi part)

