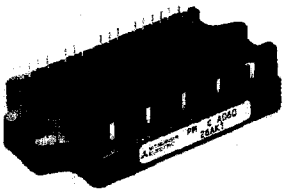
PM30CMA060

FLAT-BASE TYPE
INSULATED PACKAGE

PM30CMA060



- 3 ϕ 30A, 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 2.2kW class inverter application

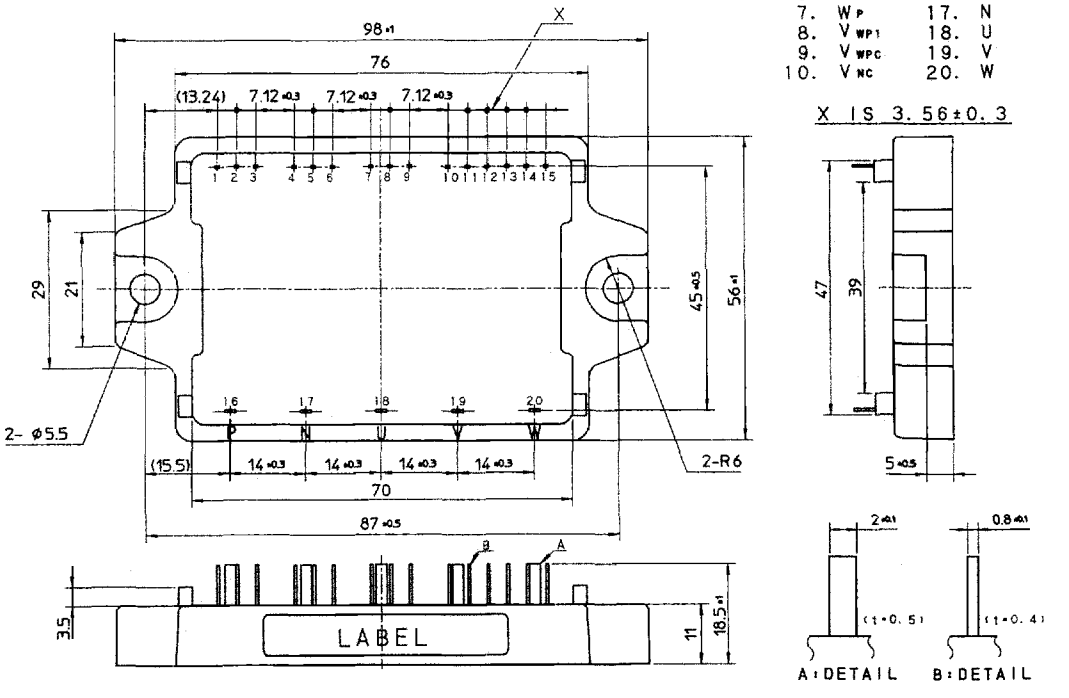
APPLICATION

General purpose inverter, servo drives and other motor controls

OUTLINE DRAWING

Dimensions in mm

1.	U_P	11.	V_{NI}
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_{VPC}	16.	P
7.	W_P	17.	N
8.	V_{WP1}	18.	U
9.	V_{WPC}	19.	V
10.	V_{NC}	20.	W

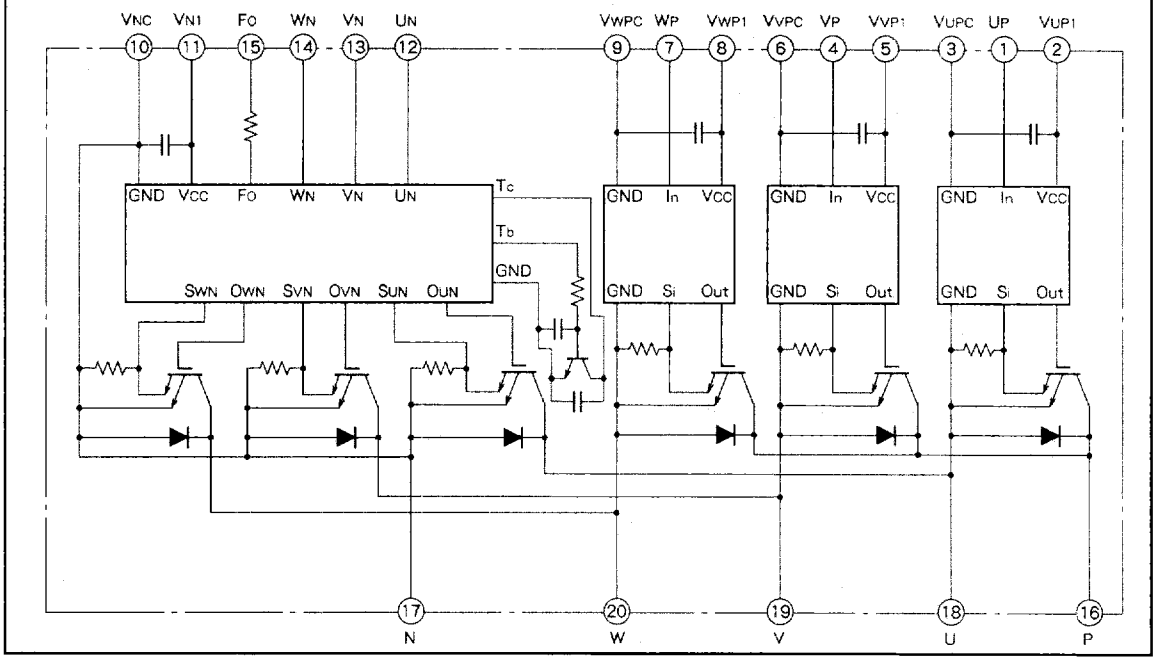


MITSUBISHI ELECTRIC

PM30CMA060

FLAT-BASE TYPE
INSULATED PACKAGE

EQUIVALANT CIRCUIT DIAGRAM



MAXIMUM RATINGS (T_j = 25℃, 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
± I_C	Collector current	T_C = 25℃	30	A
± I_{CP}	Collector current (peak)	T_C = 25℃	60	A
P_C	Collector dissipation	T_C = 25℃	96	W
T_j	Junction temperature		− 20~ + 150	℃

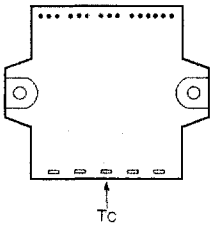
CONTROL PART

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

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. Tc measuring point is as shown below



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

INVERTER PART

Symbol	Parameter	Test conditions		Limits Min	Limits Typ	Limits Max	Unit
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_D = 15V, V_{CIN} = 0V Pulsed	I_C = 30A, T_j = 25°C	–	2.7	3.5	V
			I_C = 30A, T_j = 125°C	–	2.5	3.4	
V_{EC}	FWDi forward voltage	− I_C = 30A, V_D = 15V, V_{CIN} = 15V		–	1.7	2.5	V
t_{on}	Switching time	V_D = 15V, V_{CIN} = 15V↔0V V_{CC} = 300V, I_C = 30A T_j = 125°C, (Per 1 arm) Inductive Load		0.3	0.8	1.5	μs
t_{rr}				–	0.15	0.4	μs
$t_{c(on)}$				–	0.4	1.2	μs
t_{off}				–	2.5	3.3	μs
$t_{c(off)}$				–	0.6	1.2	μs
I_{CES}	Collector-emitter cutoff current	V_{CE} = V_{CES}	T_j = 25°C	–	–	1	mA
			T_j = 125°C	–	–	10	

CONTROL PART

Symbol	Parameter	Test conditions		Limits Min	Limits Typ	Limits Max	Unit
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	V_{N1}-V_{NC}	–	18	25	mA
			V_{XP1}-V_{XPC}	–	7	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	mA
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		3	–	–	μs
		Using application circuit opto-coupler's input signal I_F = 12mA		5	–	–	
OC	Over current trip level	− 20°C≦ T_j ≦125°C, V_D = 15V		39	53	–	A
SC	Short circuit trip level	− 20°C≦ T_j ≦125°C, V_D = 15V		–	80	–	A
$t_{off(oc)}$	Over current delay time	V_D = 15V		–	10	–	μs
OT	Over temperature protection	Trip level	Base-plate temperature detection	100	110	120	°C
OTr		Reset level		–	90	–	°C
UV	Supply circuit under voltage protection	Trip level		11.5	12.0	12.5	V
UVr		Reset level		–	12.5	–	V
$I_{FO(H)}$	Fault output current (Note 2)	V_D = 15V, V_{FO} = 15V		–	–	0.01	mA
$I_{FO(L)}$				–	10	15	mA
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.

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	–	–	1.3	℃/W
$R_{th(j-c)F}$		Inverter FWDi part, per 1/6 module	–	–	3.0	℃/W
$R_{th(c-f)}$	Contact thermal resistance	Thermal grease applied, per 1/6 module	–	–	0.4	℃/W

MECHANICAL RATINGS AND CHARACTERISTICS

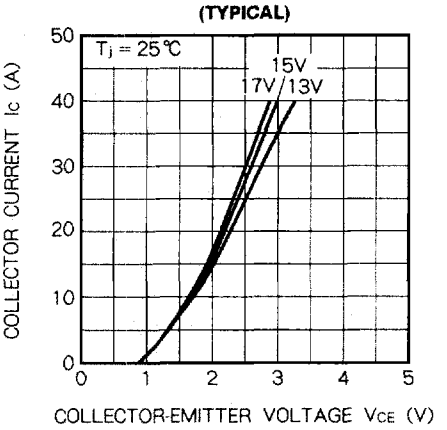
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
–	Mounting torque	Mounting part screw : M5	1.47	1.67	1.96	N・m
			15	17	20	kg・cm
–	Weight	–	–	90	–	g

RECOMMENDED CONDITIONS FOR USE

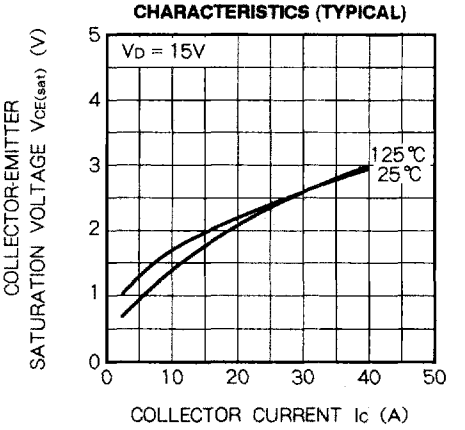
Symbol	Parameter	Test conditions	Value			Unit
			Min	Typ	Max	
V_{CC}	Supply voltage	Applied across P-N terminals	0	300	400	V
V_D		Applied between : V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}, V_{N1}-V_{NC}	13.5	15	16.5	V
$V_{CIN(ON)}$	Input on current	Applied between : U_P-V_{UPC}, V_P-V_{UPC}, W_P-V_{UPC}, U_N, V_N, W_N-V_{NC}	0	–	0.8	V
$V_{CIN(OFF)}$	Input off current		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	5	–	–	μs

PERFORMANCE CURVES

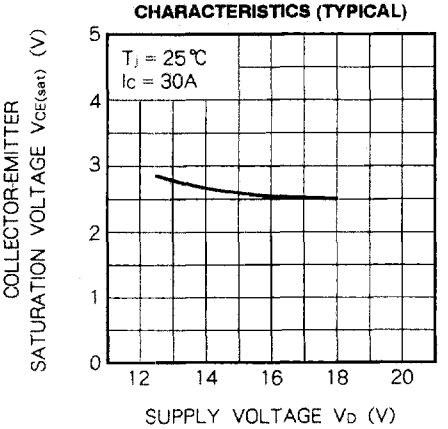
OUTPUT CHARACTERISTICS (TYPICAL)



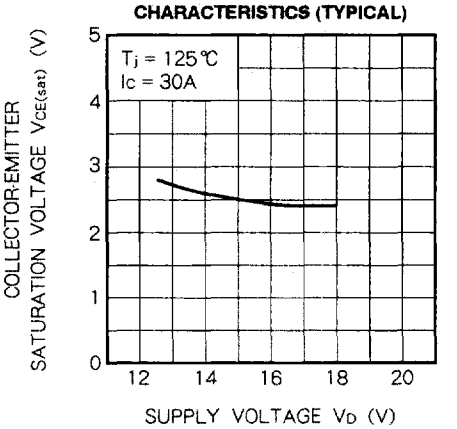
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



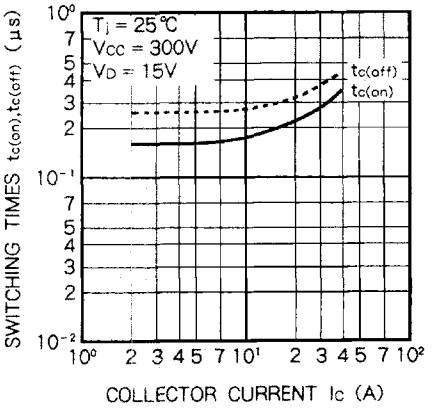
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



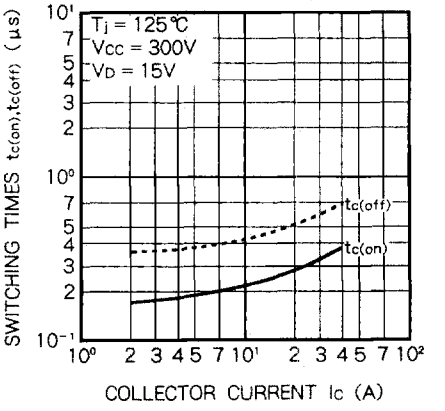
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



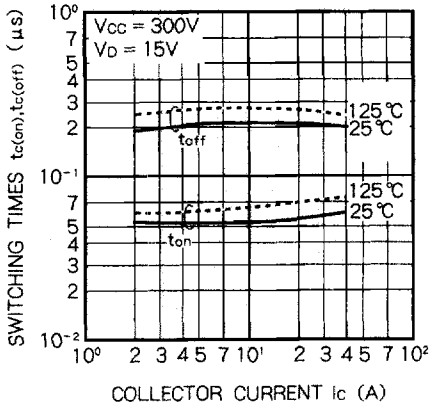
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



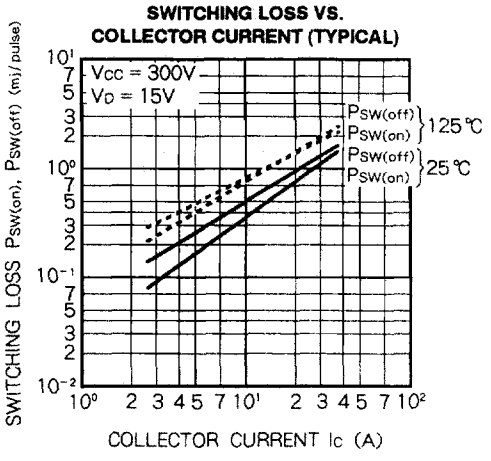
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



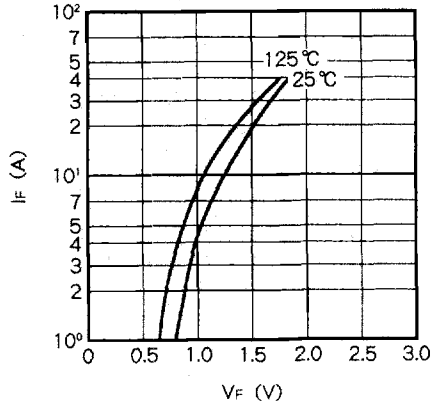
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



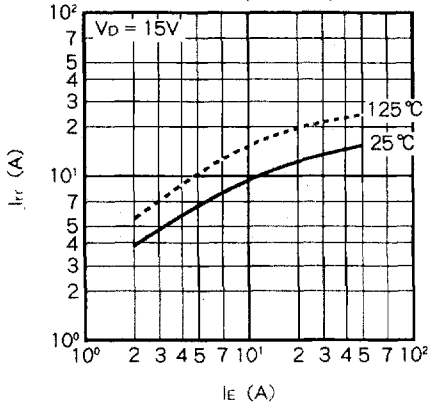
SWITCHING LOSS VS. COLLECTOR CURRENT (TYPICAL)



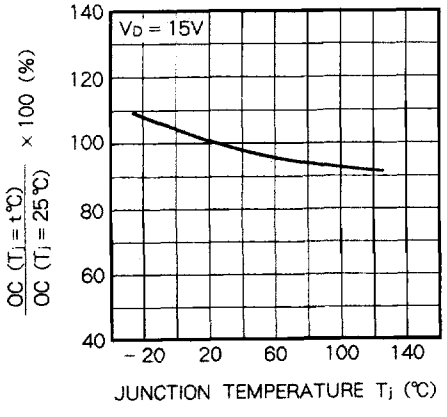
FWDi FORWARD CHARACTERISTICS (TYPICAL)



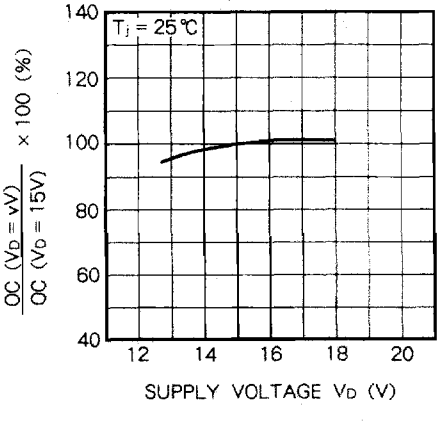
REVERSE RECOVERY CHARACTERISTICS OF FWDi (TYPICAL)



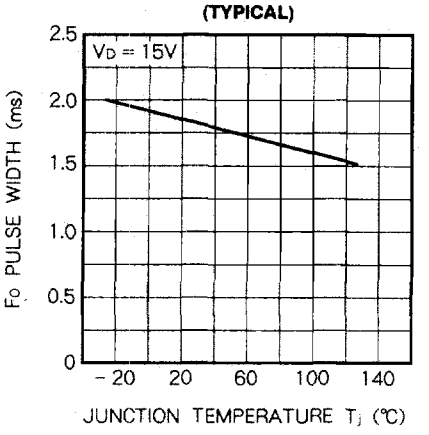
OC VS. Tj CHARACTERISTICS (TYPICAL)



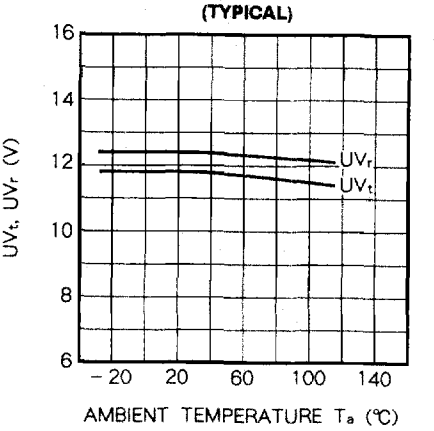
OC – VD CHARACTERISTICS (TYPICAL)



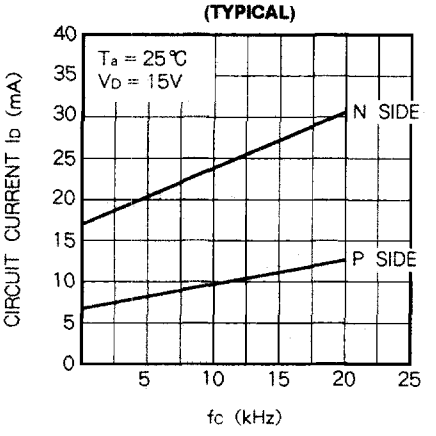
FO PULSE WIDTH VS. Tj CHARACTERISTICS (TYPICAL)



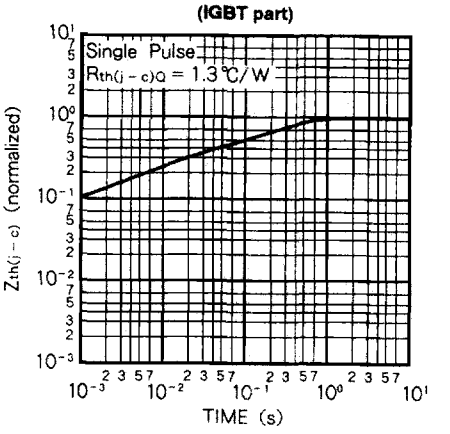
UVt, UVr VS. Ta CHARACTERISTICS (TYPICAL)



ID VS. fc CHARACTERISTICS (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi part)