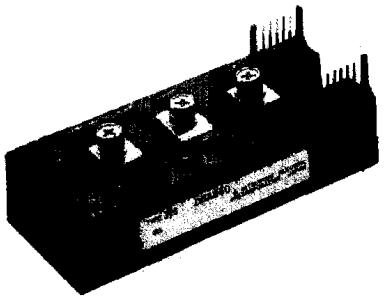
PM150DHA060

FLAT-BASE TYPE
INSULATED PACKAGE

PM150DHA060



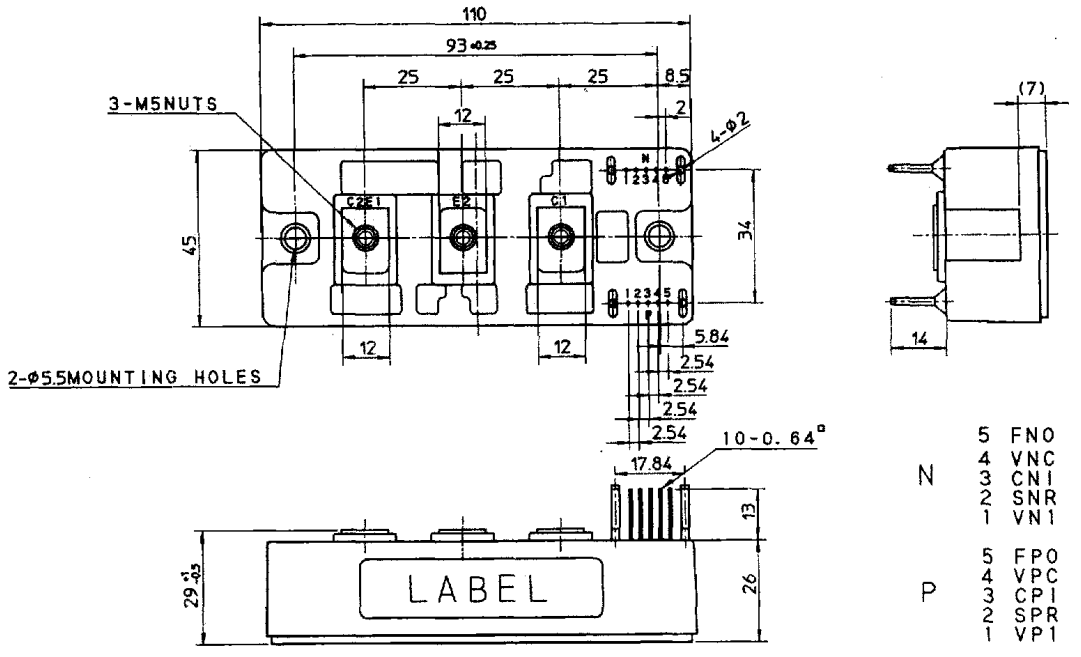
- 1φ 150A, 600V Current-sense IGBT type inverter
- Monolithic gate drive & protection logic
- Detection, protection & status indication circuits for over-current, short-circuit, over-temperature & under-voltage
- Acoustic noise-less 15kW class inverter application
- UL Recognized

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

APPLICATION

General purpose inverter, servo drives and other motor controls

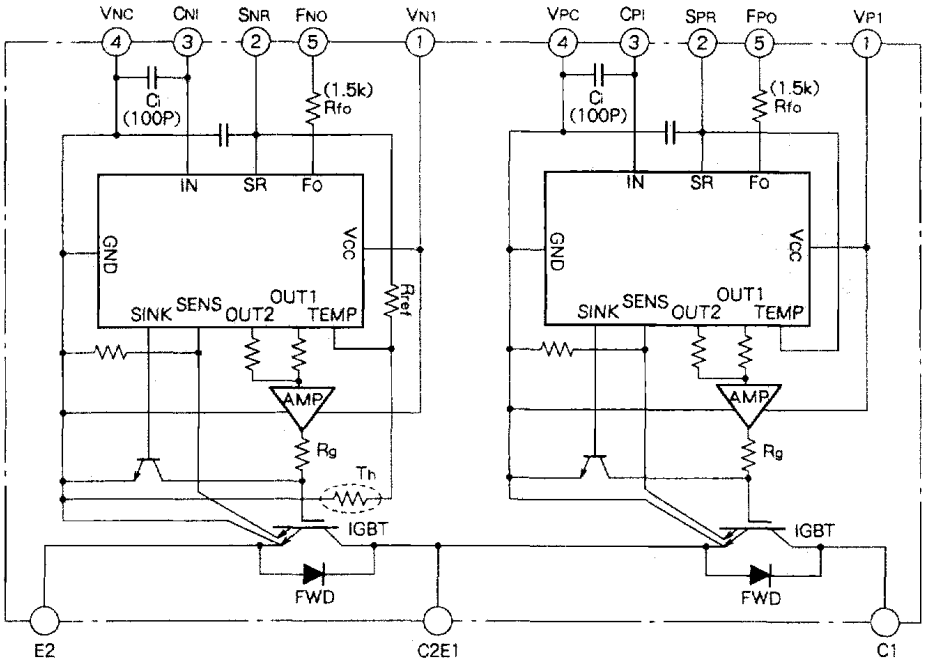
OUTLINE DRAWING Dimensions in mm



PM150DHA060

FLAT-BASE TYPE
INSULATED PACKAGE

EQUIVALENT CIRCUIT DIAGRAM



MAXIMUM RATINGS (T_j = 25℃, unless otherwise noted)

INVERTER PART

Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage	Applied between : C1-E2	450	V
$V_{CC(surge)}$	Supply voltage (surge)	Applied between : C1-E2, surge value	500	V
V_{CES}	Collector-emitter voltage		600	V
± I_C	Collector current	T_c = 25℃	150	A
± I_{CP}	Collector current (peak)	T_c = 25℃	300	A
P_C	Collector dissipation	T_c = 25℃	595	W
T_j	Junction temperature		− 20 ~ + 150	℃

CONTROL PART

Symbol	Parameter	Conditions	Ratings	Unit
V_D	Supply voltage	Applied between : V_{P1}-V_{PC}, V_{N1}-V_{NC}	20	V
V_{CIN}	Input voltage	Applied between : C_{PI}-V_{PC}, C_{NI}-V_{NC}	10	V
V_{FO}	Fault output supply voltage	Applied between : F_{PO}-V_{PC}, F_{NO}-V_{NC}	20	V
I_{FO}	Fault output current	Sink current of F_{PO}, F_{NO} terminals	20	mA

MITSUBISHI ELECTRIC

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℃ start	400	V
T_C	Module case operating temperature		−20~+100	℃
T_{stg}	Storage temperature		−40~+125	℃
V_{iso}	Isolation voltage	60Hz, sinusoidal, AC, 1min	2500	Vrms

ELECTRICAL CHARACTERISTICS (T_j = 25℃, 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 = 150A, T_j = 25℃	–	2.6	3.5	V
			I_C = 150A, T_j = 125℃	–	2.4	3.4	
V_{EC}	FWDi forward voltage	− I_C = 150A, V_{CIN} = 5V		–	1.6	2.5	V
t_{on}	Switching time	V_D = 15V, V_{CIN} = 0V↔5V V_{CC} = 300V, I_C = 150A T_j = 125℃ (Per 1arm) Inductive load		0.5	1.4	2.5	μs
t_{rr}				–	0.2	0.4	μs
$t_{c(on)}$				–	0.4	1.0	μs
t_{off}				–	2.0	3.0	μs
$t_{c(off)}$				–	0.5	1.0	μs
I_{CES}	Collector-emitter cutoff current	V_{CE} = V_{CES}	T_j = 25℃	–	–	1	mA
			T_j = 125℃	–	–	10	

CONTROL PART

Symbol	Parameter		Test conditions		Limits Min	Limits Typ	Limits Max	Unit
V_D	Supply voltage		Applied between : V_{P1}-V_{PC}, V_{N1}-V_{NC}		13.5	15	16.5	V
I_D	Circuit current		V_D = 15V, V_{CIN} = 5V	V_{N1}-V_{NC}	–	13	20	mA
				V_{P1}-V_{PC}	–	13	20	
$V_{CIN(ON)}$	Input on threshold voltage		Applied between : C_{PI}-V_{PC}, C_{NI}-V_{NC}		1.2	1.5	1.8	V
$V_{CIN(OFF)}$	Input off threshold voltage				1.7	2.0	2.3	V
f_{PWM}	PWM input frequency		3φ sinusoidal		–	15	20	kHz
t_{dead}	Arm shoot-through blocking time		For IPM's each input signals		4	–	–	μs
			Using application circuit I_F = 12mA		6	–	–	
OC	Over current trip level		$T_j \leqq$ 125℃, V_D = 15V		210	300	–	A
SC	Short circuit trip level		$T_j \leqq$ 125℃, V_D = 15V		300	420	–	A
$t_{off(oc)}$	Over current delay time		V_D = 15V		–	5	–	μs
OT	Over temperature protection	Trip level	Base-plate Temperature detection, V_D = 15V		100	110	120	℃
OT_r		Reset level			85	95	105	℃
UV	Supply circuit under voltage protection	Trip level	$T_j \leqq$ 125℃		11.5	12.0	12.5	V
UV_r		Reset level			–	12.5	–	V
$I_{FO(H)}$	Fault output current (Note 1)		V_D = 15V, V_{FO} = 15V		–	–	0.01	mA
$I_{FO(L)}$					–	10	15	mA
t_{FO}	Minimum fault output pulse width (Note 1)		V_D = 15V		1.0	1.8	–	ms
V_{SXR}	SXR terminal output voltage		$T_j \leqq$ 125℃, R_{in} = 6.8k Ω, (S_{PR}, S_{NR})		4.5	5.1	5.6	V

Note 1. Fault output is given only when the internal OC, SC, OT & UV protections schemes of either upper or lower arm device operate to protect it.

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 1/2 module	–	–	0.21	°C/W
$R_{th(j-c)F}$		Inverter FWDi part per 1/2 module	–	–	0.47	°C/W
$R_{th(c-f)}$	Contact thermal resistance	Thermal grease applied, per 1/2 module	–	–	0.12	°C/W

MECHANICAL RATINGS AND CHARACTERISTICS

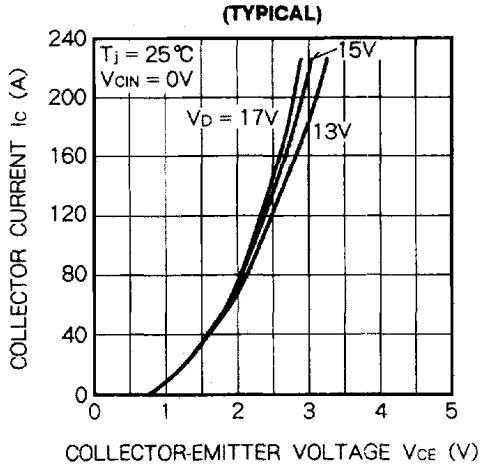
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
–	Mounting torque	Mounting part screw : M5	1.47	1.67	1.96	N・m
			15	17	20	kg・cm
–	Mounting torque	Main terminals part screw : M5	1.47	1.67	1.96	N・m
			15	17	20	kg・cm
–	Weight		–	340	–	g

RECOMMENDED CONDITIONS FOR USE

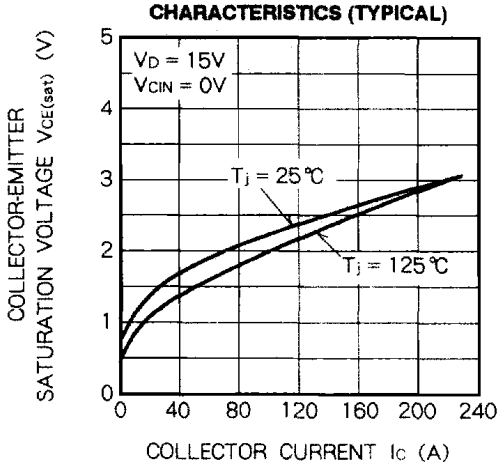
Symbol	Parameter	Test conditions	Value			Unit
			Min	Typ	Max	
V_{CC}	Supply voltage	Applied across C1-E2 terminals	0	300	400	V
V_D		Applied between : V_{P1}-V_{PC}, V_{N1}-V_{NC}	13.5	15	16.5	V
$V_{CIN(ON)}$	Input on voltage	Applied between : C_{PI}-V_{PC}, C_{NI}-V_{NC}	0	–	0.8	V
$V_{CIN(OFF)}$	Input off voltage		4	–	V_{SXR}	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	6	–	–	μs

PERFORMANCE CURVES

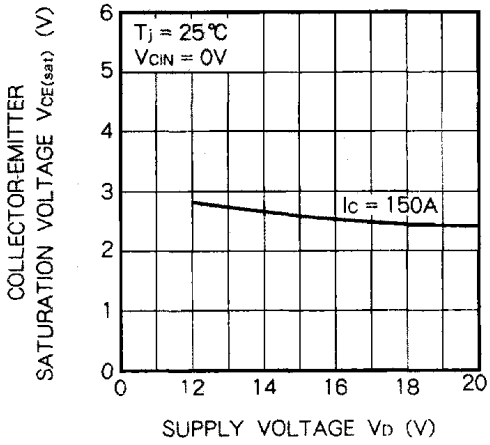
OUTPUT CHARACTERISTICS (TYPICAL)



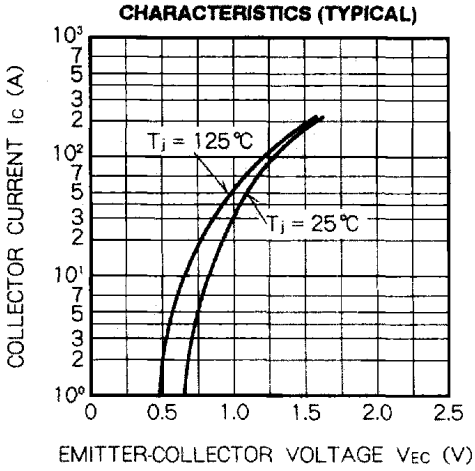
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



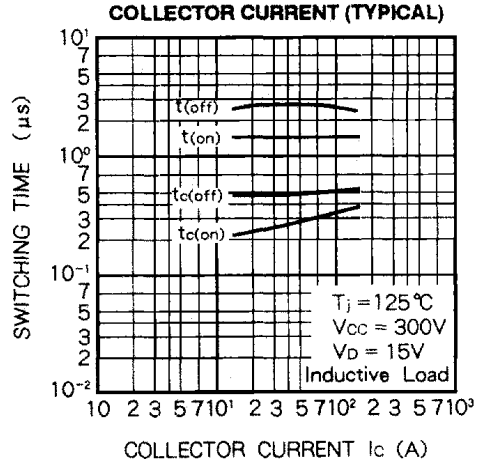
COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



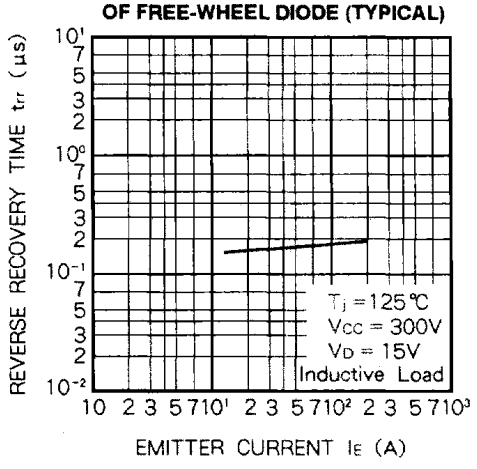
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



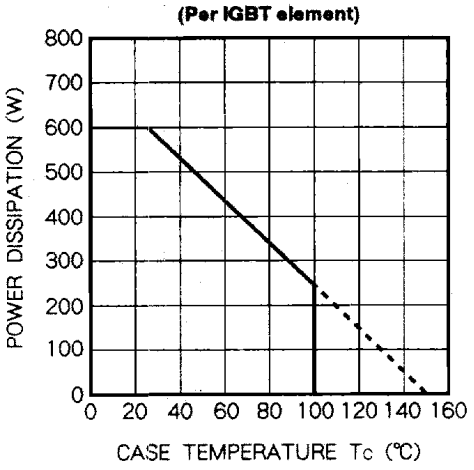
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



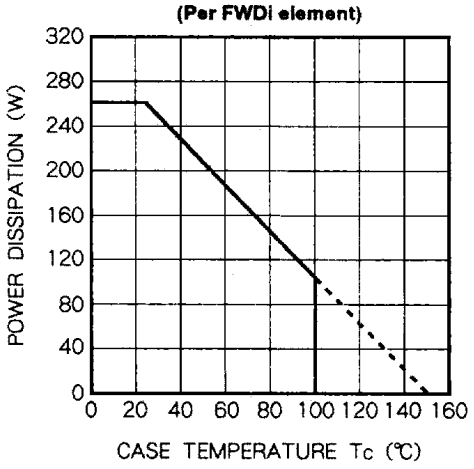
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



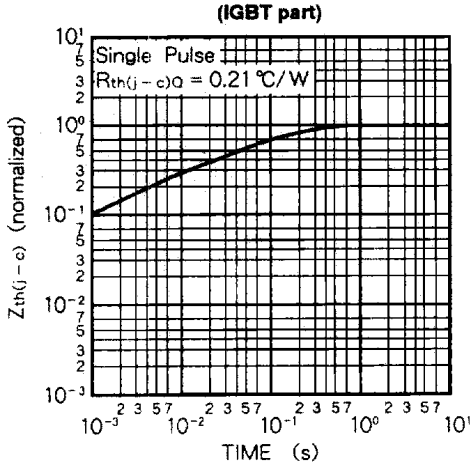
POWER DISSIPATION DERATING CURVE
(Per IGBT element)



POWER DISSIPATION DERATING CURVE
(Per FWDi element)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT part)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDi part)