

PM300DHA060

FLAT-BASE TYPE
INSULATED PACKAGE

PM300DHA060



- 1 ϕ 300A, 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 30kW class inverter application
- UL Recognized

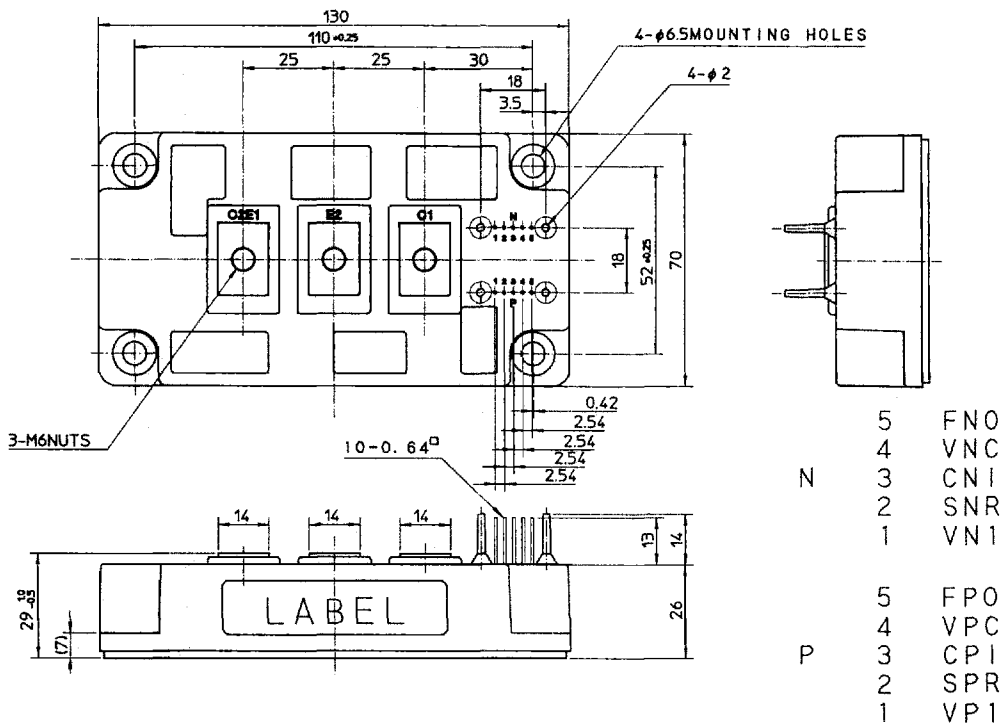
Yellow Card No. E80276 (N)
File No. E80271

APPLICATION

General purpose inverter, servo drives and other motor controls

OUTLINE DRAWING

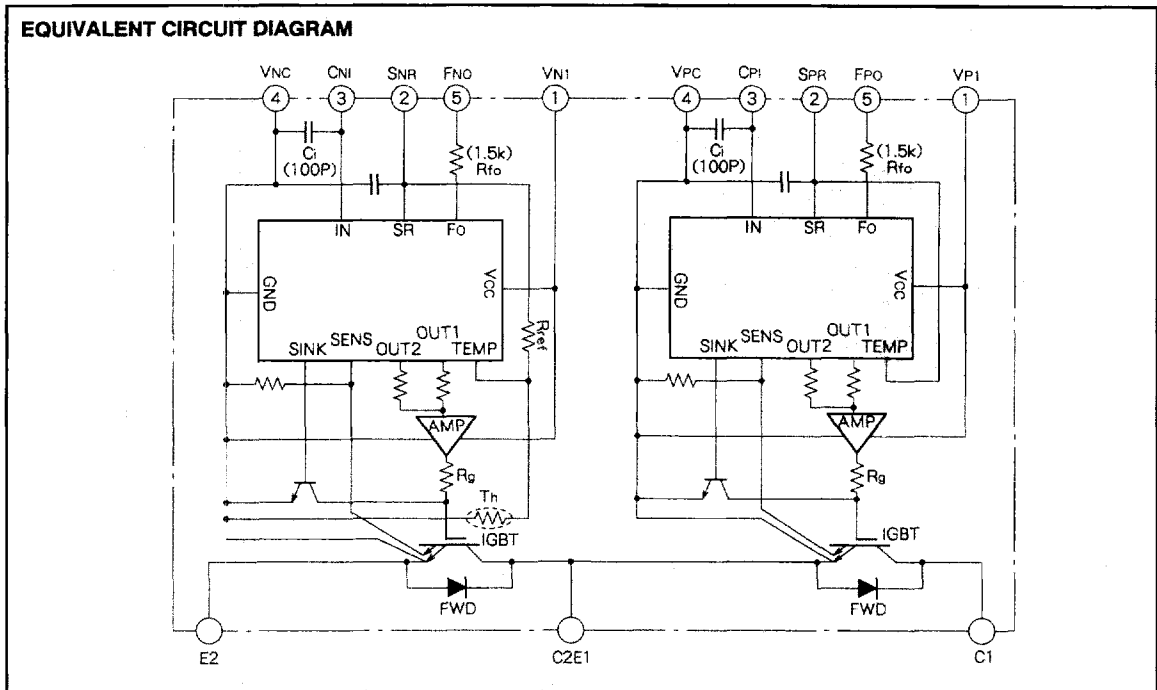
Dimensions in mm



PM300DHA060

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INSULATED PACKAGE

EQUIVALENT CIRCUIT DIAGRAM



MAXIMUM RATINGS ($T_j = 25^\circ\text{C}$, 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
$\pm I_C$	Collector current	$T_c = 25^\circ\text{C}$	300	A
$\pm I_{CP}$	Collector current (peak)	$T_c = 25^\circ\text{C}$	600	A
P_C	Collector dissipation	$T_c = 25^\circ\text{C}$	1140	W
T_j	Junction temperature		$-20 \sim +150$	$^\circ\text{C}$

CONTROL PART

Symbol	Parameter	Conditions	Ratings	Unit
V_D	Supply voltage	Applied between : $V_{P1}-V_{PC}$, $V_{N1}-V_{NC}$	20	V
V_{CIN}	Input voltage	Applied between : $C_{P1}-V_{PC}$, $C_{N1}-V_{NC}$	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

PM300DHA060

FLAT-BASE TYPE
INSULATED PACKAGE

TOTAL SYSTEM

Symbol	Parameter	Conditions	Ratings	Unit
$V_{CC(Prot)}$	Supply voltage protected by OC & SC	$V_D = 13.5 \sim 16.5V$ Inverter part, $T_j = 125^\circ C$ start	400	V
T_c	Module case operating temperature		$-20 \sim +100$	$^\circ C$
T_{stg}	Storage temperature		$-40 \sim +125$	$^\circ C$
V_{iso}	Isolation voltage	60Hz, sinusoidal, AC, 1min	2500	Vrms

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

CONTROL PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_D	Supply voltage	Applied between : $V_{P1}-V_{PC}, V_{N1}-V_{NC}$	13.5	15	16.5	V
I_o	Circuit current	$V_D = 15V, V_{CIN} = 5V$ $V_{N1}-V_{NC}$ $V_{P1}-V_{PC}$	—	19	26	mA
$V_{CIN(ON)}$	Input on threshold voltage	Applied between : $C_{P1}-V_{PC}, C_{N1}-V_{NC}$	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	3 ϕ sinusoidal	—	15	20	kHz
t_{dead}	Arm shoot-through blocking time	For IPM's each input signals	4.0	—	—	μs
		Using application circuit $I_F = 12mA$	6.0	—	—	μs
OC	Over current trip level	$T_j \leq 125^\circ C, V_D = 15V$	390	540	—	A
SC	Short circuit trip level	$T_j \leq 125^\circ C, V_D = 15V$	540	760	—	A
$t_{off(oc)}$	Over current delay time	$V_D = 15V$	—	5	—	μs
OT	Over temperature	Base-plate Temperature detection, $V_D = 15V$	100	110	120	$^\circ C$
OT _r	protection		85	95	105	$^\circ C$
UV	Supply circuit under voltage protection	$T_j \leq 125^\circ C$	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	$T_j \leq 125^\circ C, R_{in} = 6.8k\Omega, (SPR, SNR)$	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.

PM300DHA060

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INSULATED PACKAGE

THERMAL RESISTANCES

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$R_{th(j-c)}$	Junction to case thermal resistances	Inverter IGBT part, per 1/2 module	—	—	0.11	°C/W
$R_{th(j-c)F}$		Inverter FWDi part, per 1/2 module	—	—	0.24	°C/W
$R_{th(c-f)}$	Contact thermal resistance	Thermal grease applied, per 1/2 module	—	—	0.075	°C/W

MECHANICAL RATINGS AND CHARACTERISTICS

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
—	Mounting torque	Mounting part screw : M6	1.96	2.45	2.94	N · m
			20	25	30	kg · cm
—	Mounting torque	Main terminals part screw : M6	1.96	2.45	2.94	N · m
			20	25	30	kg · cm
—	Weight		—	630	—	g

RECOMMENDED CONDITIONS FOR USE

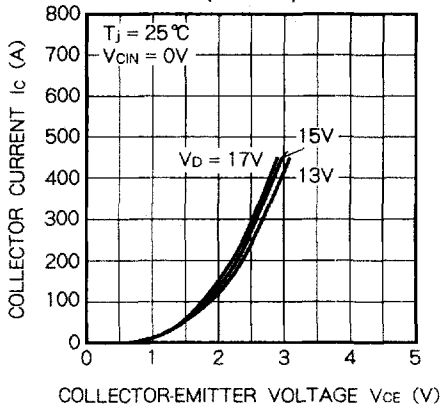
Symbol	Parameter	Test conditions	Value			Unit
			Min	Typ	Max	
V_{CC}	Supply voltage	Applied across C1-E2 terminals	0	300	400	V
V_D		Applied between : $V_{P1}-V_{PC}$, $V_{N1}-V_{NC}$	13.5	15	16.5	V
$V_{CIN(ON)}$	Input on voltage	Applied between : $C_{PI}-V_{PC}$, $C_{NI}-V_{NC}$	0	—	0.8	V
$V_{CIN(OFF)}$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

PM300DHA060

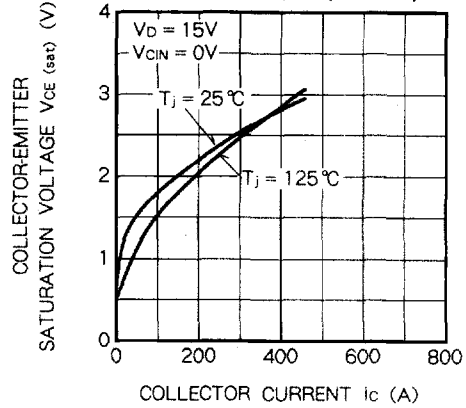
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INSULATED PACKAGE

PERFORMANCE CURVES

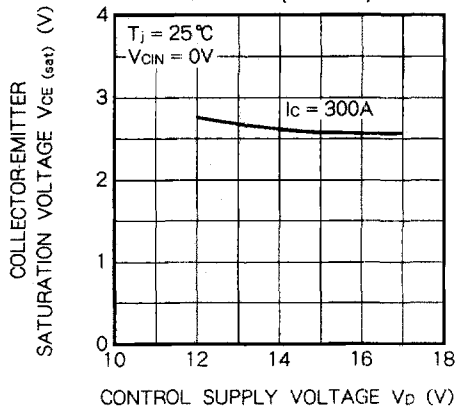
OUTPUT CHARACTERISTICS
(TYPICAL)



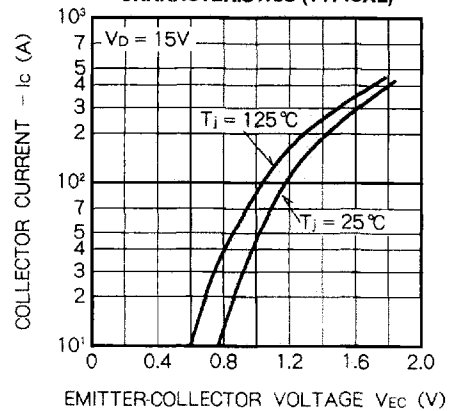
SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)



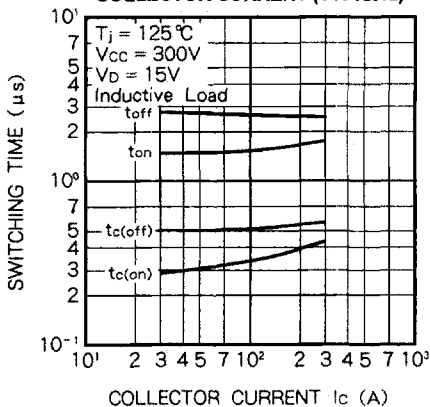
COLLECTOR-EMITTER SATURATION
VOLTAGE (TYPICAL)



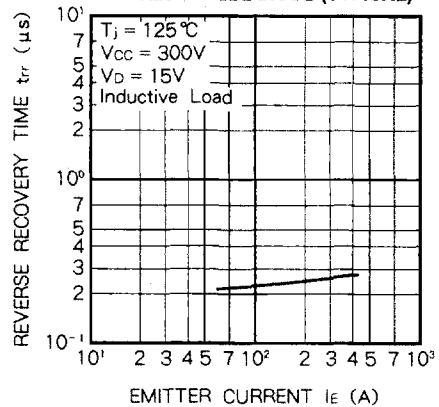
FREE-WHEEL DIODE FORWARD
CHARACTERISTICS (TYPICAL)



SWITCHING TIME VS.
COLLECTOR CURRENT (TYPICAL)



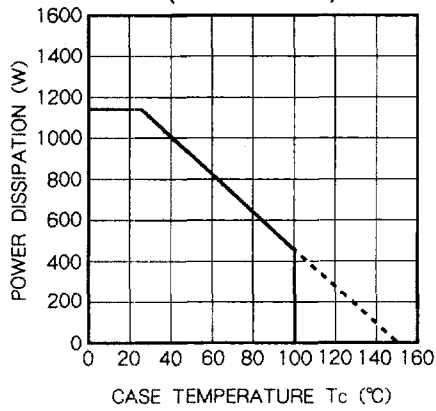
REVERSE RECOVERY CHARACTERISTICS
OF FREE-WHEEL DIODE (TYPICAL)



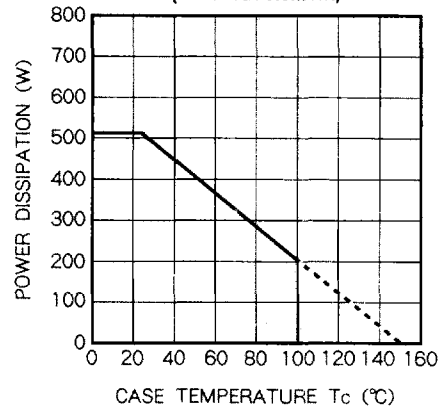
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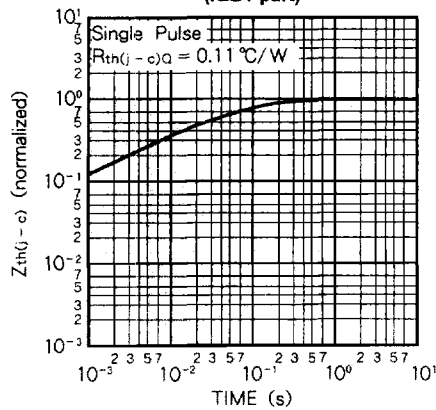
POWER DISSIPATION DERATING CURVE
(Per IGBT element)



POWER DISSIPATION DERATING CURVE
(Per FWDi element)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS
(IGBT part)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS
(FWDi part)

