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MITSUBISHI INTELLIGENT POWER MODULES

PM15CHA060

FLAT-BASE TYPE
 INSULATED PACKAGE

PM15CHA060



- 3 ϕ 15A, 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 750W class inverter application
- UL Recognized

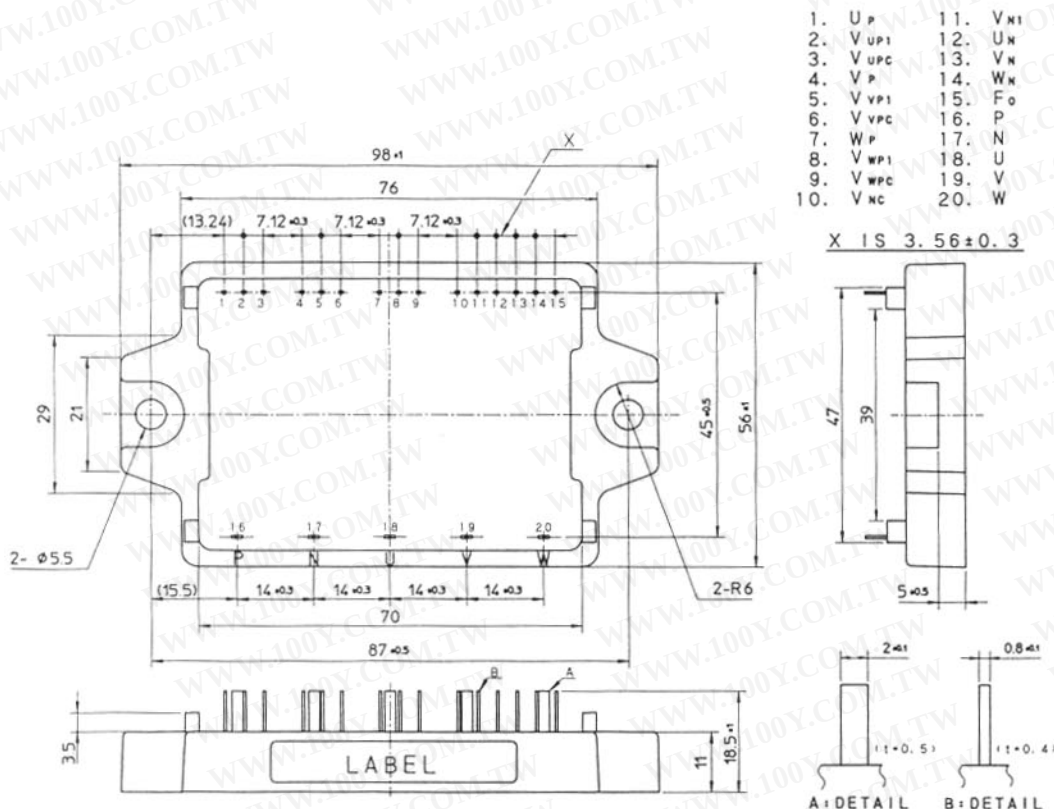
Yellow Card No. E80276 (N)
 File No. E80271

APPLICATION

General purpose inverter, servo drives and other motor controls

OUTLINE DRAWING

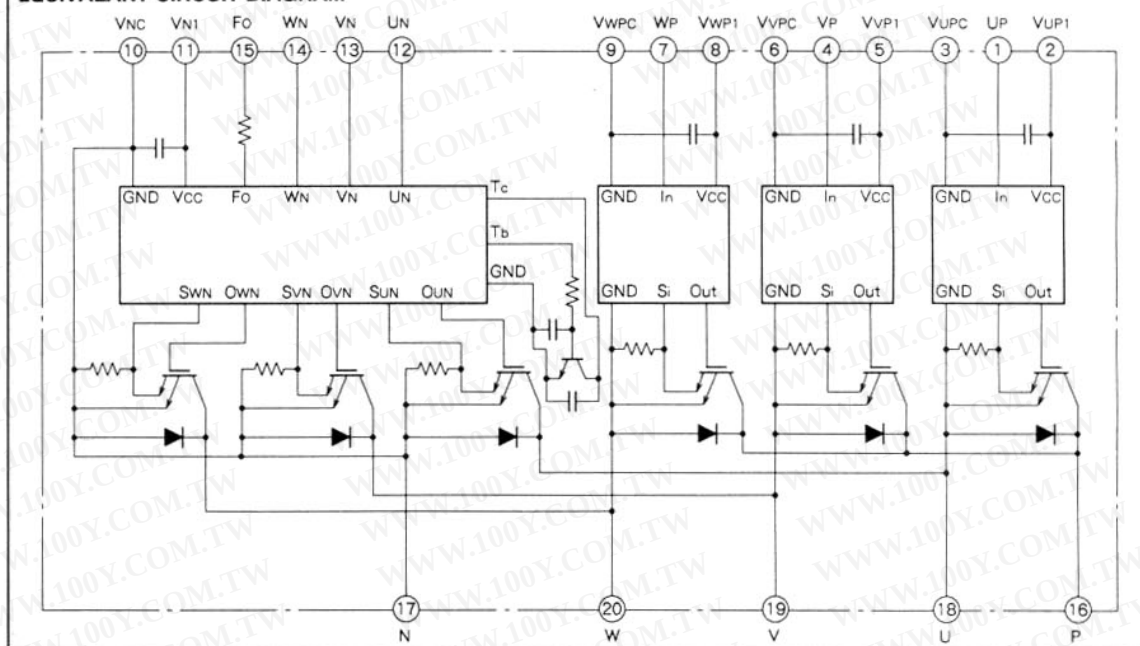
Dimensions in mm



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EQUIVALANT CIRCUIT DIAGRAM



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

INVERTER PART

Symbol	Parameter	Conditions	Rated Values	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 _{CE}	Collector-emitter voltage		600	V
± I _C	Collector current	T _C = 25 °C	15	A
± I _{CP}	Collector current (peak)	T _C = 25 °C	30	A
P _C	Collector dissipation	T _C = 25 °C	43	W
T _J	Junction temperature		- 20 ~ + 150	°C

CONTROL PART

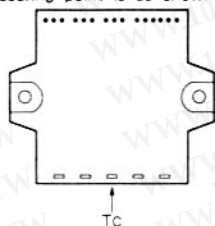
Symbol	Parameter	Conditions	Ratings	Unit
V_D	Supply voltage	Applied between : $V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}, V_{N1}-V_{NC}$	20	V
I_{CIN}	Input current	Applied between :	20	mA
V_{CIN}	Input voltage	$U_P, V_P, W_P, U_N, V_N, W_N$	20	V
V_{FO}	Fault output supply voltage	Applied between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

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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	(Note 1)	$-20 \sim +100$	$^\circ C$
T_{stg}	Storage temperature		$-40 \sim +125$	$^\circ C$
V_{iso}	Isolation voltage	60Hz, Sinusoidal, AC, 1min	2500	V_{rms}

Note 1. T_c measuring point is as shown belowELECTRICAL 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	$V_D = 15V, I_{CIN} = 0mA$ Pulsed				V
		$I_C = 15A, T_J = 25^\circ C$	—	2.6	3.5	
		$I_C = 15A, T_J = 125^\circ C$	—	2.5	3.4	
V_{EC}	FWDi forward voltage	$-I_C = 15A, V_D = 15V, I_{CIN} = 1mA$	—	1.7	2.5	V
t_{on}	Switching time	$V_D = 15V, I_{CIN} = 0mA \leftrightarrow 1mA$	0.5	0.9	1.5	μs
t_{rr}		$V_{CC} = 300V, I_C = 15A$	—	0.15	0.4	μs
$t_{c(on)}$		$T_J = 125^\circ C$	—	0.3	1.0	μs
t_{off}		(Per 1 arm)	—	1.5	2.5	μs
$t_{c(off)}$		Inductive Load	—	0.5	1.5	μs
I_{CES}	Collector-emitter cutoff current	$V_{CE} = V_{CES}$				mA
		$T_J = 25^\circ C$	—	—	1	
		$T_J = 125^\circ C$	—	—	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	$V_D = 15V, I_{CIN} = 1mA$				mA
		$V_{N1}-V_{NC}$	—	25	40	
		$V_{XP1}-V_{XPC}$	—	7	12	
$I_{CIN(ON)}$	Input on threshold current	Applied between : $U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}, U_N, V_N, W_N-V_{NC}$	0.1	0.22	0.5	mA
$I_{CIN(OFF)}$	Input off threshold current		0.1	0.22	0.5	mA
f_{PWM}	PWM input frequency	3 ϕ sinusoidal	—	15	20	kHz
t_{dead}	Arm shoot-through blocking time	For each pulse input $U_P-U_N, V_P-V_N, W_P-W_N$	2.0	—	—	μs
		Using application circuit opto-coupler's input signal $I_F = 12mA$	5.0	—	—	
OC	Over current trip level	$-20^\circ C \leq T_J \leq 125^\circ C, V_D = 15V$	18	26	—	A
SC	Short circuit trip level	$-20^\circ C \leq T_J \leq 125^\circ C, V_D = 15V$	—	39	—	A
$t_{off(OC)}$	Over current delay time	$V_D = 15V$	—	10	—	μs
OT	Over temperature	Trip level	100	110	120	$^\circ C$
OTr	protection	Reset level	—	90	—	$^\circ C$
UV	Supply circuit under	Trip level	11.5	12.0	12.5	V
UVr	voltage protection	Reset level	—	12.5	—	V
$I_{FO(H)}$	Fault output current	$V_D = 15V, V_{FO} = 15V$	—	—	0.01	mA
$I_{FO(L)}$	(Note 2)		—	10	15	mA
t_{FO}	Minimum fault output pulse width	$V_D = 15V$	20	40	60	μs
	(Note 2)	Using application circuit opto-coupler's input signal $V_D = 15V$	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	
$R_{th(j-c)O}$	Junction-to-case thermal resistances	Inverter IGBT part, per 1/6 module	–	–	2.9	°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

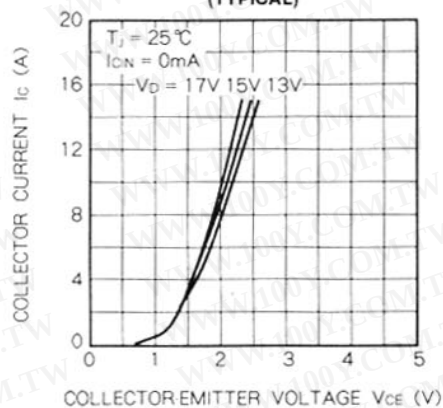
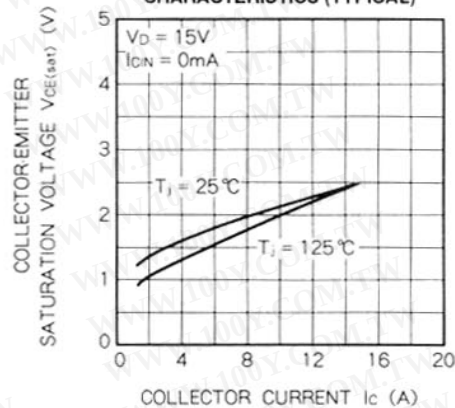
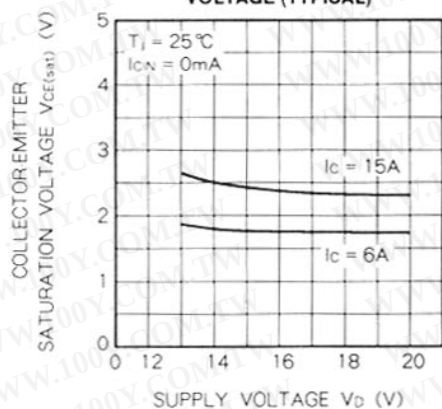
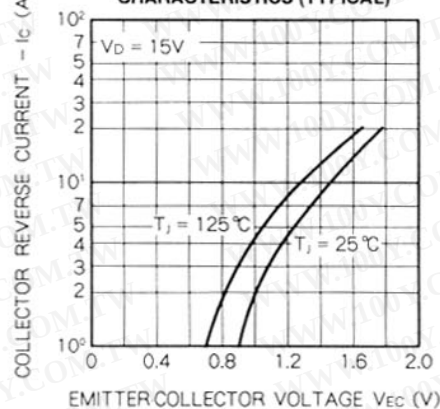
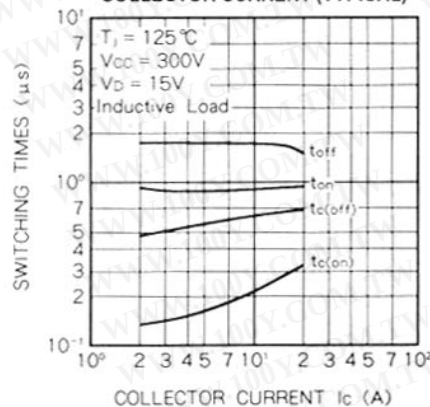
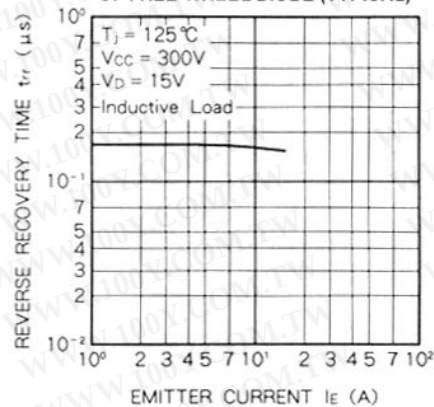
RECOMMENDED CONDITIONS FOR USE

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 : $V_{UP1-VUPC}$, $V_{VP1-VVPC}$, $V_{WP1-VWPC}$, V_{N1-VNC}	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

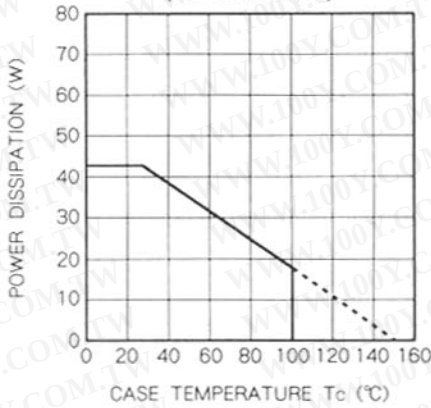
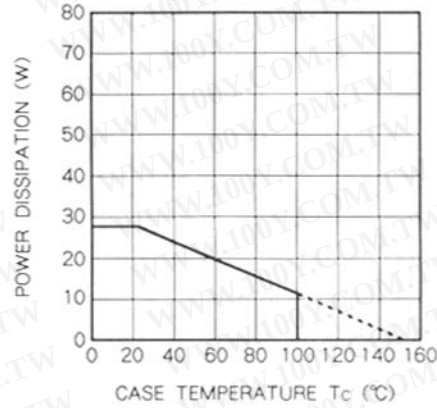
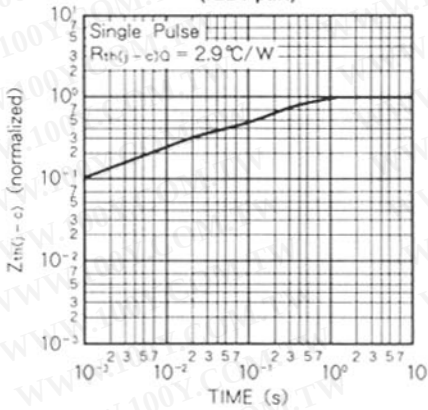
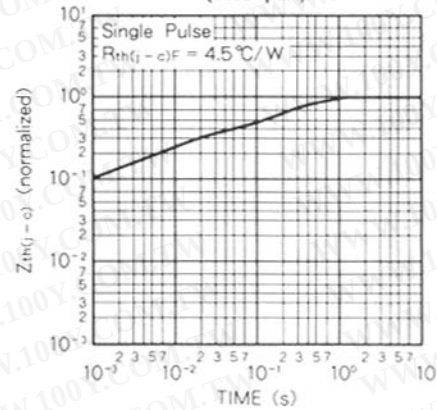
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PERFORMANCE CURVES

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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FLAT-BASE TYPE
INSULATED PACKAGEPOWER 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)

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