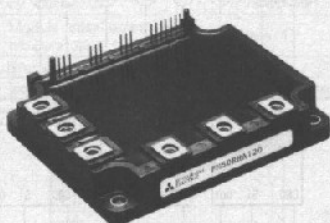


PM50RHA120

FLAT-BASE TYPE
INSULATED PACKAGE

PM50RHA120



- 3 ϕ 50A, 1200V 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 7.5kW class inverter application
- UL Recognized

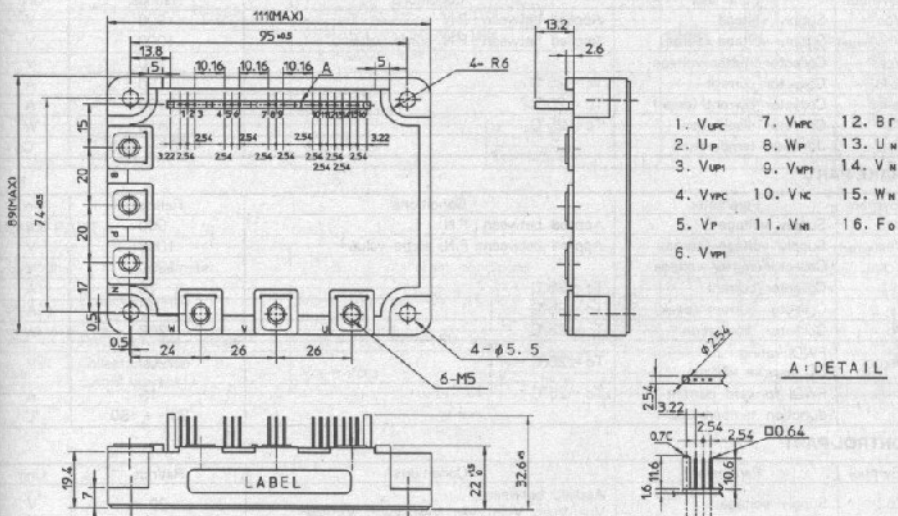
Yellow Card No. E80276 (N)
File No. E80271

APPLICATION www.DataSheet4U.com

General purpose inverter, servo drives and other motor controls

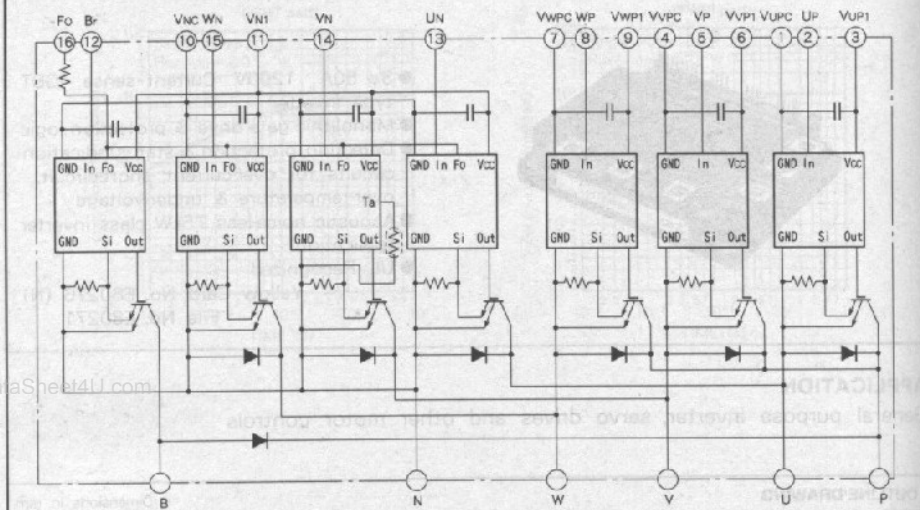
OUTLINE DRAWING

Dimensions in mm



www.DataSheet4U.com

EQUIVALENT CIRCUIT DIAGRAM



MAXIMUM RATINGS (T_j = 25 °C, unless otherwise noted)

INVERTER PART

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage	Applied between : P-N	900	V
V _{CC(surge)}	Supply voltage (surge)	Applied between : P-N, surge value	1000	V
V _{CEs}	Collector-emitter voltage		1200	V
±I _c	Collector current	T _c = 25 °C	50	A
±I _{CP}	Collector current (peak)	T _c = 25 °C	100	A
P _c	Collector dissipation	T _c = 25 °C	416	W
T _j	Junction temperature		-20~+150	°C

BRAKE PART

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage	Applied between : P-N	900	V
V _{CC(surge)}	Supply voltage (surge)	Applied between : P-N, surge value	1000	V
V _{CEs}	Collector-emitter voltage		1200	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	208	W
V _{R(DC)}	FWDi rating DC reverse voltage	T _c = 25 °C	1200	V
I _F	FWDi forward current	T _c = 25 °C	15	A
T _j	Junction temperature		-20~+150	°C

CONTROL PART

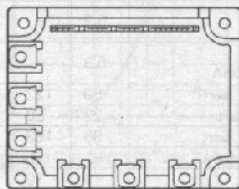
Symbol	Parameter	Conditions	Ratings	Unit
V ₀	Supply voltage	Applied between : V _{UP1} -V _{UPC} , V _{VP1} -V _{VPc} , V _{WP1} -V _{WPc} , V _{N1} -V _{NC}	20	V
V _{0IN}	input voltage	Applied between : U _P -U _{PC} , V _F -V _{FC} , W _F -W _{FC} , U _N · V _N · W _N · B _F -V _{NC}	20	V
V _{F0}	Fault output supply voltage	Applied between : F ₀ -V _{NC}	20	V
I _{F0}	Fault output current	Sink current of F ₀ terminal	20	mA

PM50RHA120

FLAT-BASE TYPE
INSULATED PACKAGE

TOTAL SYSTEM

Symbol	Parameter	Conditions	Ratings	Unit
$V_{OC(Prot)}$	Supply voltage protected by OC & SC	$V_D = 13.5 \sim 16.5V$ Inverter part, $T_j = 125^\circ C$ start	800	V
T_c	Module case operating temperature	(Note 1)	$-20 \sim +100$	$^\circ C$
T_{sto}	Storage temperature	-	$-40 \sim +125$	$^\circ C$
V_{iso}	Isolation voltage	60Hz, sinusoidal, AC, 1min	2500	Vrms

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	$V_D = 15V, V_{CIN} = 0V$ Pulsed	$I_c = 50A, T_j = 25^\circ C$	-	2.8	3.8	V
V_{FC}	FWDI forward voltage	$I_c = 50A, V_D = 15V, V_{CIN} = 15V$	$T_j = 125^\circ C$	-	2.5	3.5	V
t_{on}	Switching time	$V_D = 15V, V_{CIN} = 0V \leftrightarrow 15V$ $V_{CC} = 600V, I_c = 50A$ $T_j = 125^\circ C$ (Per 1 arm) Inductive load	$T_j = 25^\circ C$	0.5	1.0	2.5	μs
t_{tr}			$T_j = 125^\circ C$	-	0.3	0.6	μs
$t_{e(on)}$			$T_j = 25^\circ C$	-	0.4	1.5	μs
t_{off}			$T_j = 125^\circ C$	-	2.5	3.8	μs
$t_{e(off)}$			$T_j = 25^\circ C$	-	0.8	1.4	μs
I_{CES}	Collector-emitter cutoff current	$V_{CE} = V_{CES}$	$T_j = 25^\circ C$	-	-	1	mA
			$T_j = 125^\circ C$	-	-	10	mA

BRAKE PART

Symbol	Parameter	Test conditions	Limits			Unit	
			Min	Typ	Max		
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_D = 15V, V_{CIN} = 0V$ Pulsed	$I_c = 15A, T_j = 25^\circ C$	-	2.8	3.8	V
V_{FC}	FWDI forward voltage	$I_c = 15A, V_D = 15V, V_{CIN} = 15V$	$T_j = 125^\circ C$	-	2.5	3.5	V
I_{CES}	Collector-emitter cutoff current	$V_{CE} = V_{CES}$	$T_j = 25^\circ C$	-	-	1	mA
			$T_j = 125^\circ C$	-	-	10	mA

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 _C	Circuit current	V _D = 15V, V _{CIN} = 15V V _{N1} -V _{NC} V _{XP1} -V _{XPC}	-	80	120	mA
			-	25	35	
V _{CIN(ON)}	Input on threshold voltage	Applied between: U _P -V _{UPC} , V _P -V _{VPC} , W _P -V _{WPC} , U _N · V _N · W _N · B ₋ 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 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	3.3	-	-	μs
			5.3	-	-	
OC	Over current trip level	- 20°C ≤ T _J ≤ 125°C V _D = 15V	Inverter part 59	122	-	A
			Brake part 22	50	-	
SC	Short circuit trip level	- 20°C ≤ T _J ≤ 125°C V _D = 15V	Inverter part 88	183	-	A
			Brake part -	95	-	
t _{off(oc)}	Over current delay time	V _D = 15V	-	10	-	μs
OT	Over temperature protection	Trip level Base-plate	111	118	125	°C
OTr	Reset level	Temperature detection	-	100	-	°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	V _D = 15V, V _{FO} = 15V (Note 2)	-	-	0.01	mA
I _{FO(L)}			-	10	15	
t _{FO}	Minimum fault output pulse width (Note 2)	V _D = 15V	1.0	2.0	-	ms

Note 2. Fault output is given only when the internal OC, SC, OT & UV protection 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)}	Junction-to-case thermal resistances	Inverter IGBT part, per 1/6 module	-	-	0.3	°C/W
R _{th(j-f)}		Inverter FWDi part, per 1/6 module	-	-	1.0	°C/W
R _{th(c-c)}		Brake IGBT	-	-	0.6	°C/W
R _{th(c-f)}		Brake FWDi	-	-	2.0	°C/W
R _{th(c-s)}	Contact thermal resistance	Thermal grease applied, per 1/6 module	-	-	0.19	°C/W

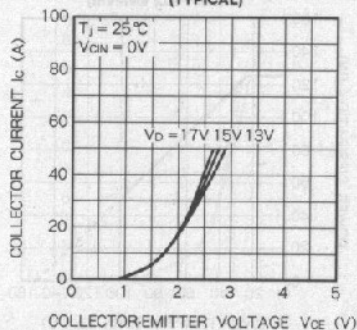
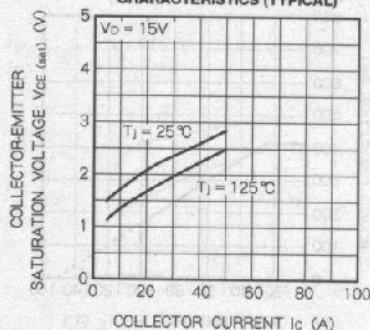
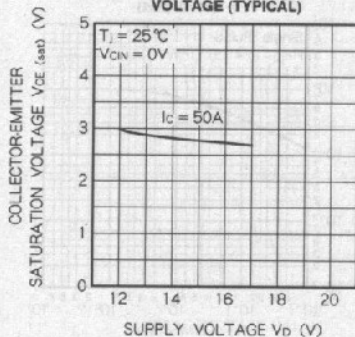
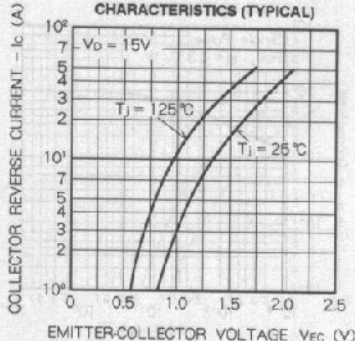
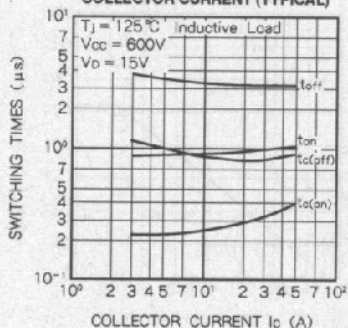
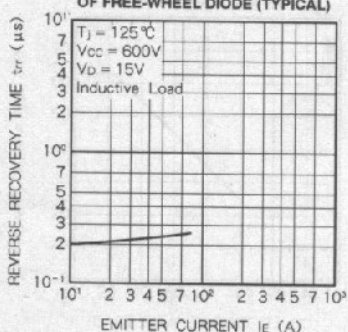
MECHANICAL RATINGS AND CHARACTERISTICS

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	
-	Mounting torque	Main terminals part screw : M5	1.47	1.67	1.96	N · m
			15	17	20	
-	Weight	-	-	550	-	g

RECOMMENDED CONDITIONS FOR USE

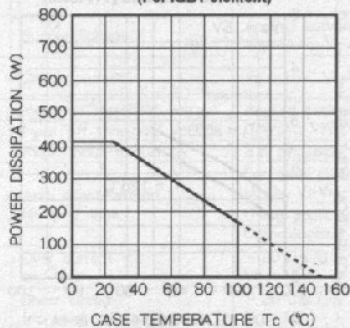
Symbol	Parameter	Test conditions	Value			Unit
			Min	Typ	Max	
V _{CC}	Supply voltage	Applied across P-N terminals	0	800	800	V
V _D		Applied between: V _{UP1} -V _{UPC} , V _{VP1} -V _{VPC} , V _{WP1} -V _{WPC} , V _{N1} -V _{NC}	13.5	15	16.5	
V _{CIN(ON)}	Input on voltage	Applied between: U _P -V _{UPC} , V _P -V _{VPC} , W _P -V _{WPC} , U _N , V _N , W _N , B ₋ V _{NC}	0	-	0.8	V
V _{CIN(OFF)}	Input off voltage		12	-	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	5.3	-	-	μs

PERFORMANCE CURVES (INVERTER PART)

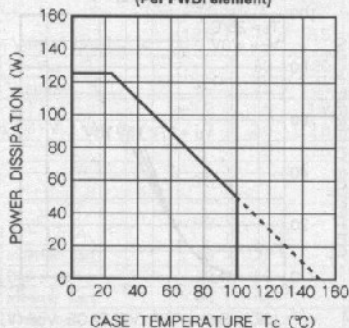
OUTPUT CHARACTERISTICS
(TYPICAL)SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)COLLECTOR-EMITTER SATURATION
VOLTAGE (TYPICAL)FREE-WHEEL DIODE FORWARD
CHARACTERISTICS (TYPICAL)SWITCHING TIME VS.
COLLECTOR CURRENT (TYPICAL)REVERSE RECOVERY CHARACTERISTICS
OF FREE-WHEEL DIODE (TYPICAL)

(INVERTER PART)

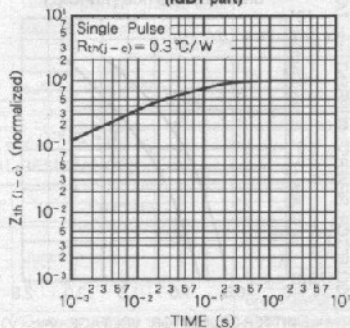
POWER DISSIPATION DERATING CURVE
(Per IGBT element)



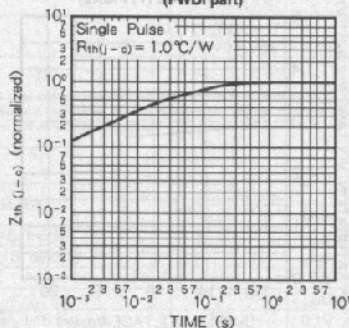
POWER DISSIPATION DERATING CURVE
(Per FWDI element)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT part)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDI part)

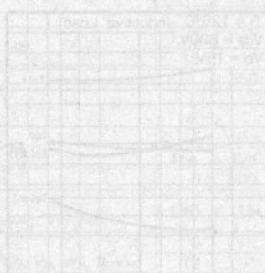


MECHANICAL RATINGS AND CHARACTERISTICS

REVERSE RECOVERY CHARACTERISTICS
OF FREE WHEEL DIODE (TYPICAL)

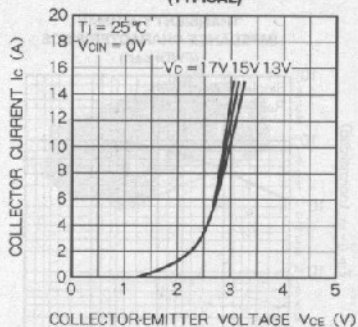


SWITCHING CHARACTERISTICS
OF FREE WHEEL DIODE (TYPICAL)

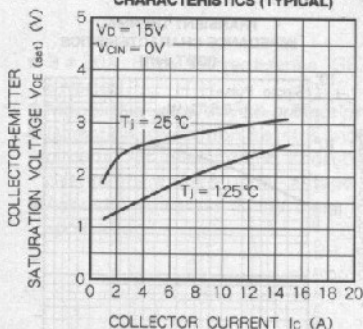


PERFORMANCE CURVES (BRAKE PART)

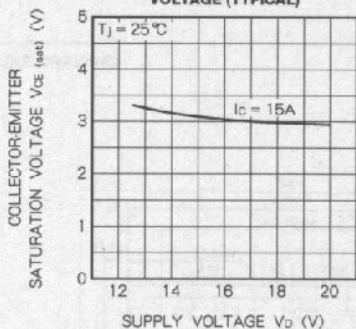
OUTPUT CHARACTERISTICS (TYPICAL)



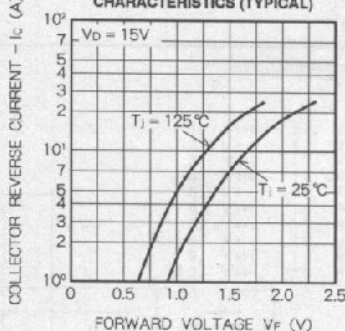
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



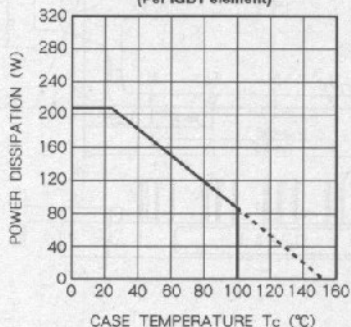
COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



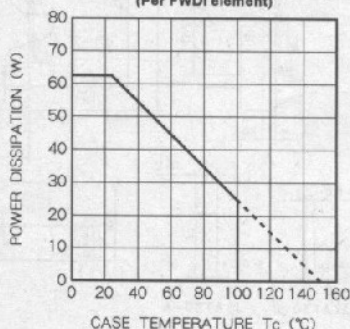
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



POWER DISSIPATION DERATING CURVE (Per IGBT element)



POWER DISSIPATION DERATING CURVE (Per FWDI element)



(BRAKE PART)

