PM150CVA120

FLAT-BASE TYPE
INSULATED PACKAGE

PM150CVA120

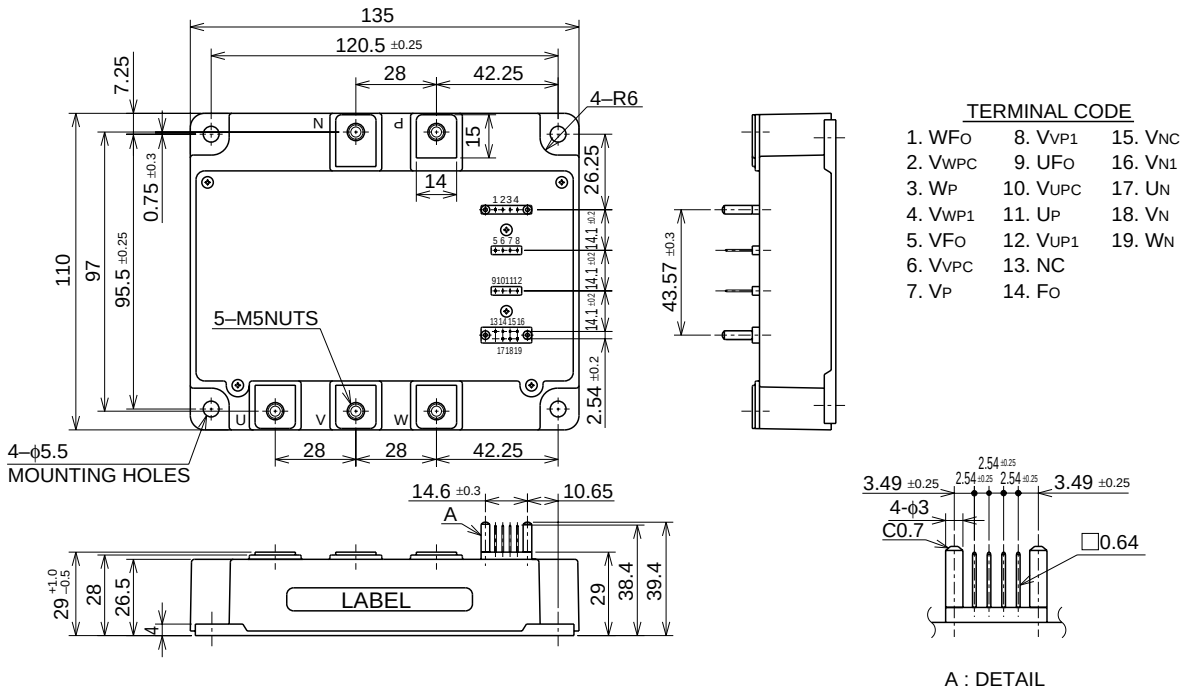
FEATURE

- 3ϕ 150A, 1200V Current-sense IGBT for 20kHz switching
- Monolithic gate drive & protection logic
- Detection, protection & status indication circuits for over-current, short-circuit, over-temperature & under-voltage (P-FO available from upper leg devices)
- Acoustic noise-less 30kW class inverter application
- UL Recognized
  Yellow Cord No. E80276(N)
  File No. E80271

APPLICATION

General purpose inverter, servo drives and other motor controls

PACKAGE OUTLINES **Dimensions in mm**

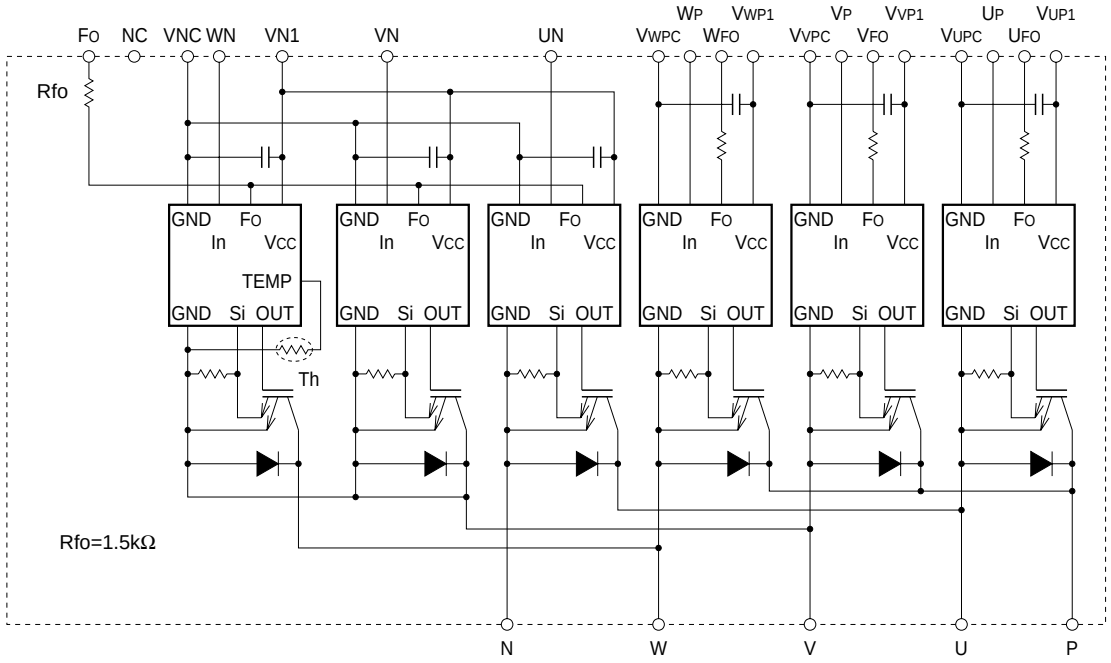


MITSUBISHI ELECTRIC

PM150CVA120

FLAT-BASE TYPE
INSULATED PACKAGE

INTERNAL FUNCTIONS BLOCK DIAGRAM



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

INVERTER PART

Symbol	Parameter	Condition	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	V_D = 15V, V_{CIN} = 5V	1200	V
±I_C	Collector Current	T_C = 25°C	150	A
±I_{CP}	Collector Current (Peak)	T_C = 25°C	300	A
P_C	Collector Dissipation	T_C = 25°C	710	W
T_j	Junction Temperature		–20 ~ +150	°C

CONTROL PART

Symbol	Parameter	Condition	Ratings	Unit
V_D	Supply Voltage	Applied between : U_{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-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC} U_N • V_N • W_N-V_{NC}	20	V
V_{FO}	Fault Output Supply Voltage	Applied between : U_{FO}-V_{UPC}, V_{FO}-V_{VPC}, W_{FO}-V_{WPC} F_O-V_{NC}	20	V
I_{FO}	Fault Output Current	Sink current at U_{FO}, V_{FO}, W_{FO} and F_O terminal	20	mA

MITSUBISHI ELECTRIC

TOTAL SYSTEM

Symbol	Parameter	Condition	Ratings	Unit
$V_{CC(PROT)}$	Supply Voltage Protected by SC	V_D = 13.5 ~ 16.5V, Inverter Part, T_j = 125°C Start	800	V
$V_{CC(surge)}$	Supply Voltage (Surge)	Applied between : P-N, Surge value or without switching	1000	V
T_C	Module Case Operating Temperature		–20 ~ +100	°C
T_{stg}	Storage Temperature		–40 ~ +125	°C
V_{iso}	Isolation Voltage	60Hz, Sinusoidal, Charged part to Base, AC 1 min.	2500	V_{rms}

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

INVERTER PART

Symbol	Parameter	Test Condition		Limits			Unit
				Min.	Typ.	Max.	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_D = 15V, I_C = 150A, V_{CIN} = 0V	T_j = 25°C	—	2.65	3.30	V
			T_j = 125°C	—	2.75	3.35	
V_{EC}	FWDi Forward Voltage	–I_C = 150A, V_D = 15V, V_{CIN} = 5V		—	2.50	3.50	V
t_{on}	Switching Time	V_D = 15V, I_{CIN} = 0V↔5V, V_{CC} = 600V, I_C = 150A, T_j = 125°C, Inductive Load (upper and lower arm)		0.4	0.9	2.3	µs
t_{rr}				—	0.2	0.3	
$t_{c(on)}$				—	0.4	1.0	
t_{off}				—	2.4	3.4	
$t_{c(off)}$				—	0.7	1.2	
I_{CES}	Collector-Emitter Cutoff Current	V_{CE} = V_{CES}, V_D = 15V	T_j = 25°C	—	—	1	mA
			T_j = 125°C	—	—	10	

CONTROL PART

Symbol	Parameter	Test Condition		Limits			Unit
				Min.	Typ.	Max.	
I_D	Circuit Current	V_D = 15V, V_{CIN} = 5V	V_{N1}-V_{NC}	—	72	100	mA
			V_{XP1}-V_{XPC}	—	24	34	
$V_{th(ON)}$	Input ON Threshold Voltage	Applied between : U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC} U_N • V_N • W_N-V_{NC}		1.2	1.5	1.8	V
$V_{th(OFF)}$	Input OFF Threshold Voltage			1.7	2.0	2.3	
SC	Short Circuit Trip Level	–20≤ T_j ≤ 125°C, V_D = 15V		200	—	—	A
$t_{off(SC)}$	Short Circuit Current Delay Time	V_D = 15V		—	10	—	µs
OT	Over Temperature Protection	Base-plate Temperature detection, VD = 15V	Trip level	111	118	125	°C
OT_r			Reset level	—	100	—	
UV	Supply Circuit Under-Voltage Protection	–20 ≤ T_j ≤ 125°C	Trip level	11.5	12.0	12.5	V
UV_r			Reset level	—	12.5	—	
$I_{FO(H)}$	Fault Output Current (Note-1)	V_D = 15V, V_{FO} = 15V		—	—	0.01	mA
$I_{FO(L)}$				—	10	15	
t_{FO}	Minimum Fault Output Pulse Width (Note-1)	V_D = 15V		1.0	1.8	—	ms

(Note-1) Fault output is given only when the internal SC, OT & UV protection.
Fault output of OT protection operate by lower arm
Fault output of OT, UV protection given pulse while over level.

THERMAL RESISTANCES

Symbol	Parameter	Test Condition	Limits			Unit
			Min.	Typ.	Max.	
$R_{th(j-c)Q}$	Junction to case Thermal Resistances	Inverter IGBT part (per 1/6 module)	—	—	0.176	°C/W
$R_{th(j-c)F}$		Inverter FWDi part (per 1/6 module)	—	—	0.26	
$R_{th(c-f)}$	Contact Thermal Resistance	Case to fin, Thermal grease applied (per 1 module)	—	—	0.018	

MECHANICAL RATINGS AND CHARACTERISTICS

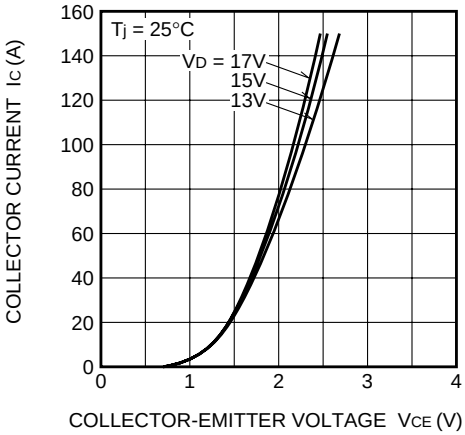
Symbol	Parameter	Test Condition	Limits			Unit
			Min.	Typ.	Max.	
—	Mounting torque	Mounting part screw : M5	2.5	3.0	3.5	N • m
—	Mounting torque	Main terminal screw : M5	2.5	3.0	3.5	N • m
—	Weight		—	1000	—	g

RECOMMENDED CONDITIONS FOR USE

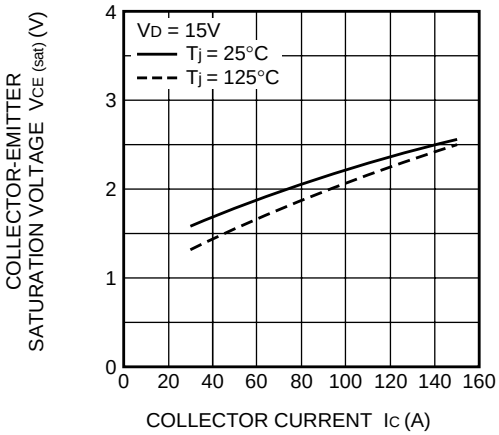
Symbol	Parameter	Test Condition	Recommended value	Unit
V_{CC}	Supply Voltage	Applied across P-N terminals	≤ 800	V
V_D	Control Supply Voltage	Applied between : V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC} V_{WP1}-V_{WPC}, V_{N1}-V_{NC}	15 ± 1.5	V
$V_{CIN(ON)}$	Input ON Voltage	Applied between : U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}	≤ 0.8	V
$V_{CIN(OFF)}$	Input OFF Voltage	U_N • V_N • W_N-V_{NC}	≥ 4.0	
t_{dead}	Arm Shoot-through Blocking Time	For IPM's each input signals	≥ 3.0	μs
f_{PWM}	PWM Input Frequency	Using Application Circuit input signal of IPM, 3ϕ Sinusoidal PWM VVVF inverter	≤ 20	kHz

PERFORMANCE CURVES

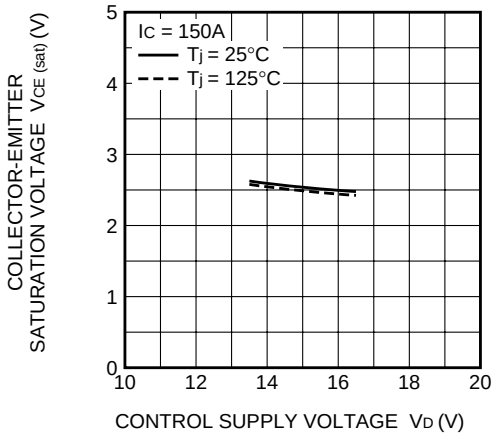
OUTPUT CHARACTERISTICS (TYPICAL)



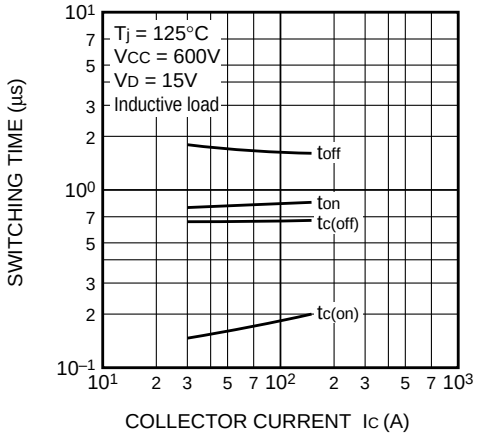
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



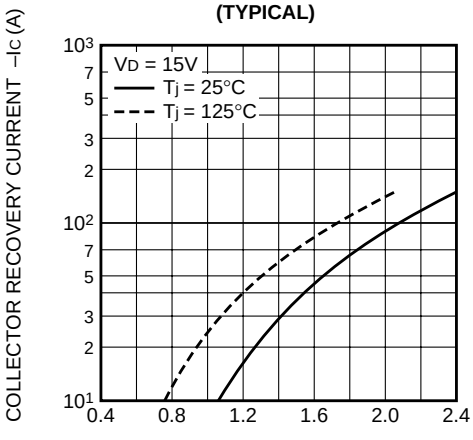
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



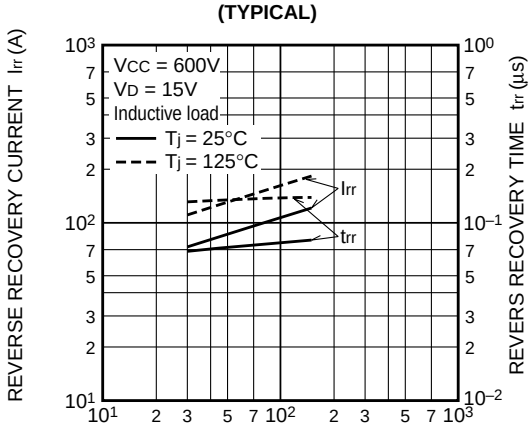
SWITCHING CHARACTERISTICS (TYPICAL)



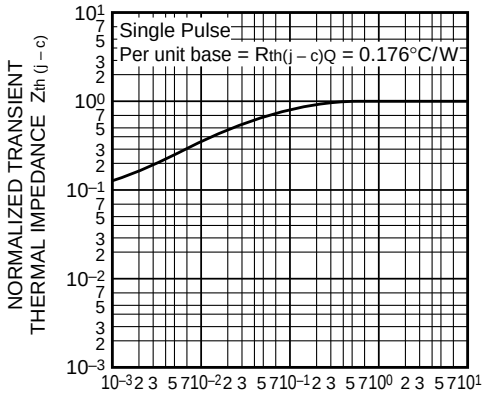
DIODE FORWARD CHARACTERISTICS (TYPICAL)



DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT per 1 element)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi per 1 element)