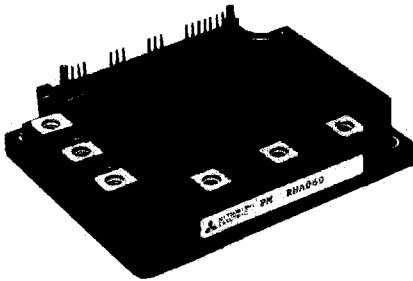


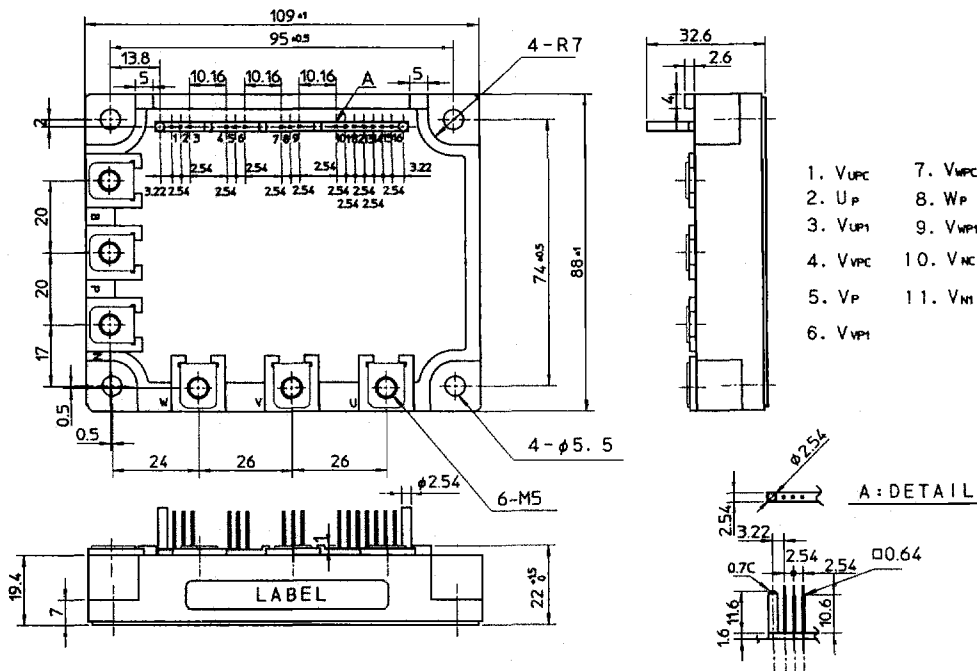
PM75RHA060



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

General purpose inverter, servo drives and other motor controls

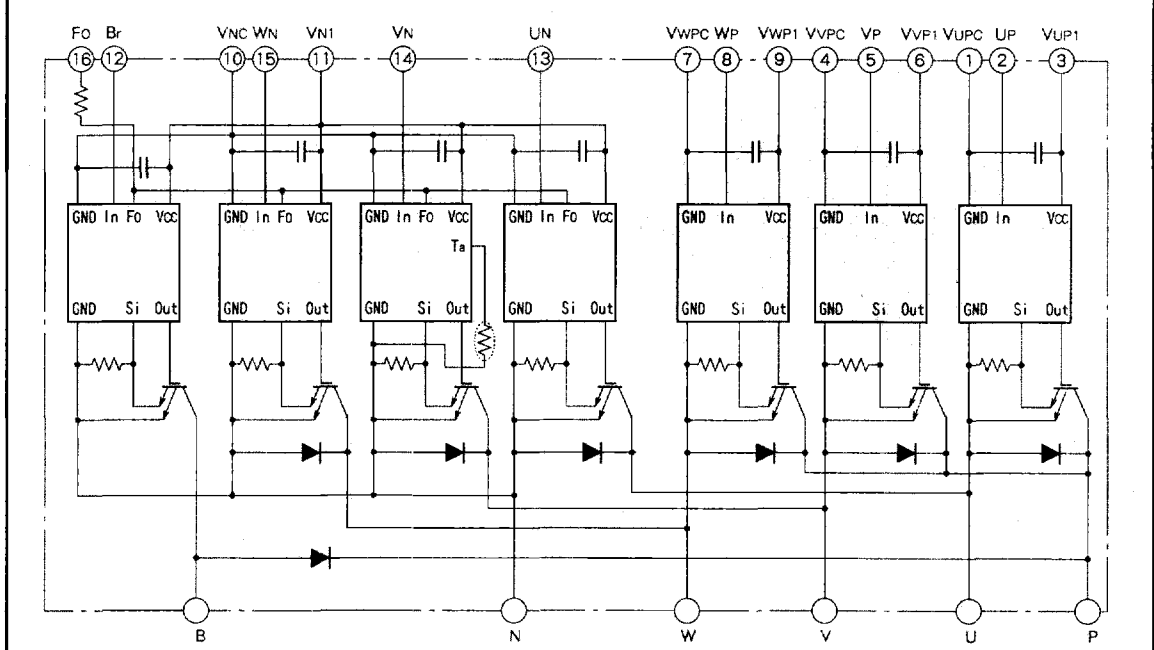
Dimensions in mm



PM75RHA060

FLAT-BASE TYPE
INSULATED PACKAGE

EQUIVALENT CIRCUIT DIAGRAM



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

INVERTER PART

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	Applied between : P-N	450	V
Vcc(surge)	Supply voltage (surge)	Applied between : P-N, surge value	500	V
Vces	Collector-emitter voltage		600	V
$\pm I_c$	Collector current	$T_c = 25^\circ\text{C}$	75	A
$\pm I_{cp}$	Collector current (peak)	$T_c = 25^\circ\text{C}$	150	A
Pc	Collector dissipation	$T_c = 25^\circ\text{C}$	312	W
Tj	Junction temperature		- 20 ~ + 150	$^\circ\text{C}$

BRAKE PART

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	Applied between : P-N	450	V
Vcc(surge)	Supply voltage (surge)	Applied between : P-N, surge value	500	V
Vces	Collector-emitter voltage		600	V
Ic	Collector current	$T_c = 25^\circ\text{C}$	30	A
Icp	Collector current (peak)	$T_c = 25^\circ\text{C}$	60	A
If	FWDi Forward current	$T_c = 25^\circ\text{C}$	30	A
VR(DC)	FWDi Rating DC reverse voltage	$T_c = 25^\circ\text{C}$	600	V
Pc	Collector dissipation	$T_c = 25^\circ\text{C}$	208	W
Tj	Junction temperature		- 20 ~ + 150	$^\circ\text{C}$

CONTROL PART

Symbol	Parameter	Conditions	Ratings	Unit
Vd	Supply voltage	Applied between : VUP1-VUPC, VVP1-VVPC, VWP1-VWPC, VN1-VNC	20	V
Vcin	Input voltage	Applied between : UF-UPC, VF-VPC, WP-WPC, UN • VN • WN • Br-VNC	20	V
Vfo	Fault output supply voltage	Applied between, Fo-VNC	20	V
Ifo	Fault output current	Sink current of Fo terminal	20	mA

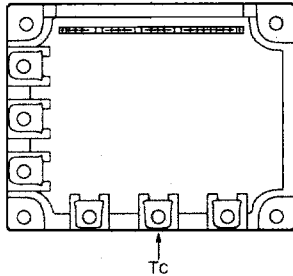
PM75RHA060

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	(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	Vrms

Note 1. T_c measuring point is as shown below



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	$V_D = 15V, V_{CIN} = 15V$ Pulsed	—	2.7	3.5	V
		$I_c = 75A, T_j = 25^\circ C$ $I_c = 75A, T_j = 125^\circ C$	—	2.5	3.4	
V_{EC}	FWDi forward voltage	$-I_c = 75A, V_D = 15V, V_{CIN} = 15V$	—	1.7	2.5	V
t_{on}	Switching time	$V_D = 15V, V_{CIN} = 0V \leftrightarrow 15V$ $V_{CC} = 300V, I_c = 75A$ $T_j = 125^\circ C$ (Per 1 arm) Inductive load	0.3	0.6	1.5	μs
t_{rr}			—	0.25	0.4	μs
$t_{c(on)}$			—	0.4	1.2	μs
t_{off}			—	2.0	3.3	μs
$t_{c(off)}$			—	0.6	1.2	μs
I_{CES}	Collector-emitter cutoff current	$V_{CE} = V_{CES}$	—	—	1	mA
		$T_j = 25^\circ C$ $T_j = 125^\circ C$	—	—	10	

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	—	2.7	3.5	V
		$I_c = 15A, T_j = 25^\circ C$ $I_c = 15A, T_j = 125^\circ C$	—	3.1	4.0	
V_{EC}	FWDi forward voltage	$-I_c = 30A, V_D = 15V, V_{CIN} = 15V$	—	1.7	2.7	V
I_{CES}	Collector-emitter cutoff current	$V_{CE} = V_{CES}$	—	—	1	mA
		$T_j = 25^\circ C$ $T_j = 125^\circ C$	—	—	10	

PM75RHA060

FLAT-BASE TYPE
INSULATED PACKAGE

CONTROL PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V _D	Supply voltage	Applied between : V _{UPI} -V _{UPC} , V _{VPI} -V _{VPC} , V _{WPI} -V _{WPC} , V _{N1} -V _{N2}	13.5	15	16.5	V
I _D	Circuit current	V _D = 15V, V _{CIN} = 15V V _{N1} -V _{N2} V _{XPI} -V _{XPC}	—	80 25	120 35	mA
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 _r -V _{N2}	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 U _P , V _P , W _P , U _N , V _N , W _N	—	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	3.0 5.0	— —	— —	μs
OC	Over current trip level	— 20°C ≤ T _J ≤ 125°C V _D = 15V Inverter part Brake part	115 39	161 53	— —	A
SC	Short circuit trip level	— 20°C ≤ T _J ≤ 125°C V _D = 15V Inverter part Brake part	— —	241 79	— —	A
t _{off(oc)}	Over current delay time	V _D = 15V	—	10	—	μs
OT	Over temperature	Trip level	111	118	125	°C
OT _r	protection	Reset level Temperature detection	—	100	—	°C
UV	Supply circuit under	Trip level	11.5	12.0	12.5	V
UV _r	voltage protection	Reset level T _J ≤ 125°C	—	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 (Note 2)	V _D = 15V	1.0	2.0	—	ms

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.

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 1/6 module	—	—	0.4	°C/W
R _{th(j-c)} F		Inverter FWDi part, per 1/6 module	—	—	1.0	°C/W
R _{th(j-c)} Q		Brake IGBT	—	—	0.6	°C/W
R _{th(j-c)} F		Brake FWDi	—	—	1.5	°C/W
R _{th(c-f)}	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 15	1.67 17	1.96 20	N · m kg · cm
—	Mounting torque	Main terminals part screw : M5	1.47 15	1.67 17	1.96 20	N · m kg · cm
—	Weight		—	550	—	g

RECOMMENDED CONDITIONS FOR USE

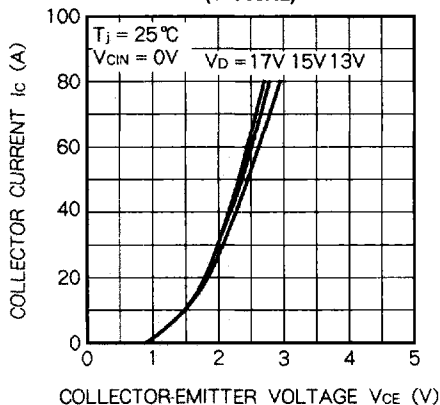
Symbol	Parameter	Test conditions	Value			Unit
			Min	Typ	Max	
V _{CC}	Supply voltage	Applied across P-N terminals	0	300	400	V
V _D		Applied between : V _{UPI} -V _{UPC} , V _{VPI} -V _{VPC} , V _{WPI} -V _{WPC} , V _{N1} -V _{N2}	13.5	15	16.5	V
V _{CIN(ON)}	Input on voltage	Applied between : U _P -V _{UPC} , V _P -V _{VPC} , W _P -V _{WPC} , U _N · V _N · W _N · B _r -V _{N2}	0	—	0.8	V
V _{CIN(OFF)}	Input off voltage		4.0	—	15	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	5.0	—	—	μs

PM75RHA060

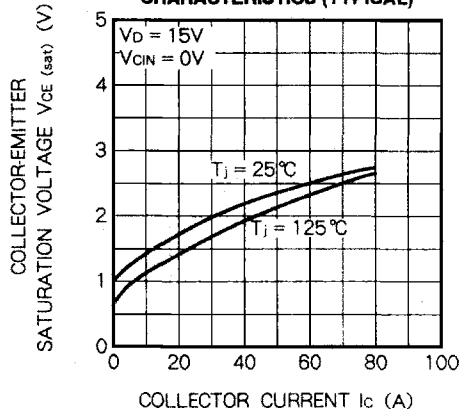
FLAT-BASE TYPE
INSULATED PACKAGE

PERFORMANCE CURVES (INVERTER PART)

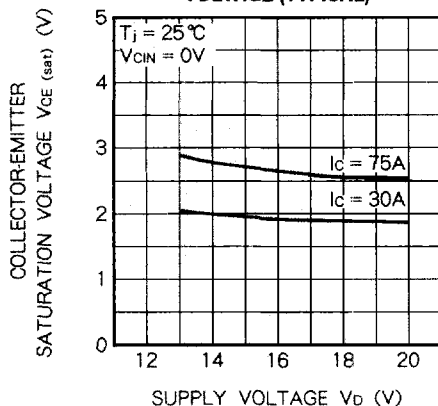
OUTPUT CHARACTERISTICS
(TYPICAL)



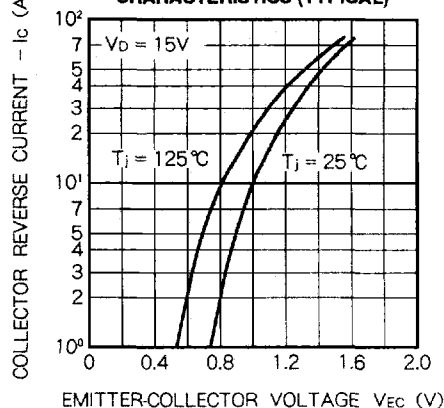
SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)



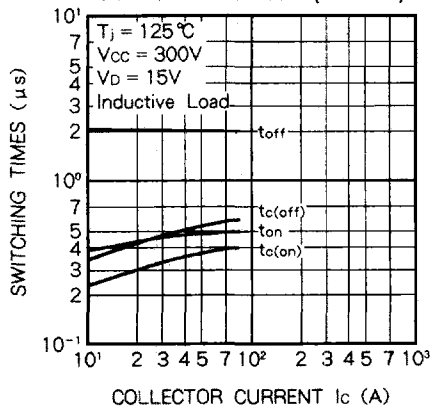
COLLECTOR-EMITTER SATURATION
VOLTAGE (TYPICAL)



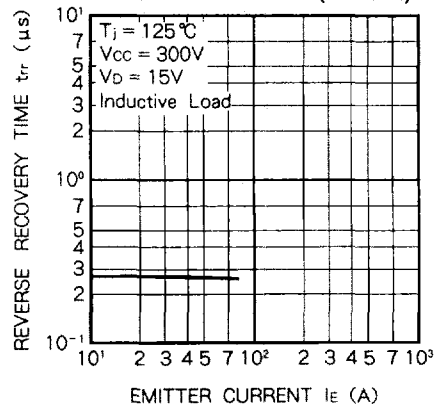
FREE-WHEEL DIODE FORWARD
CHARACTERISTICS (TYPICAL)



SWITCHING TIME VS.
COLLECTOR CURRENT (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS
OF FREE-WHEEL DIODE (TYPICAL)

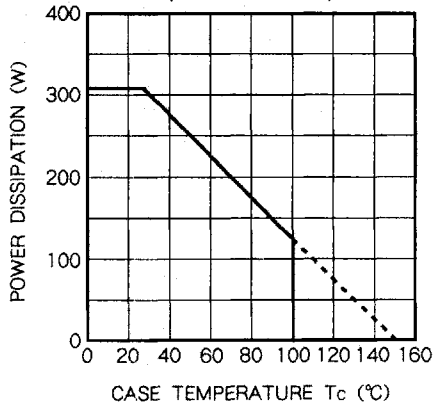


PM75RHA060

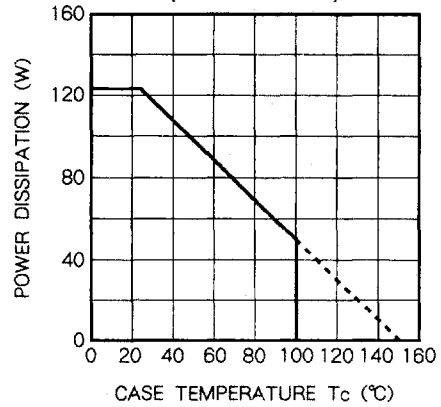
FLAT-BASE TYPE
INSULATED PACKAGE

(INVERTER PART)

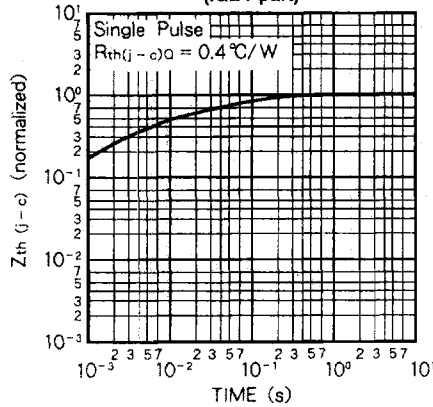
POWER DISSIPATION DERATING CURVE
(Per IGBT element)



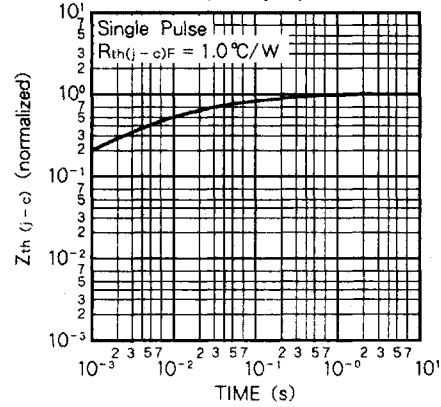
POWER DISSIPATION DERATING CURVE
(Per FWDI element)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT part)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDI part)

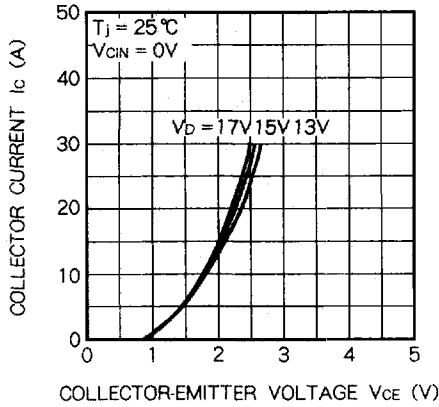


PM75RHA060

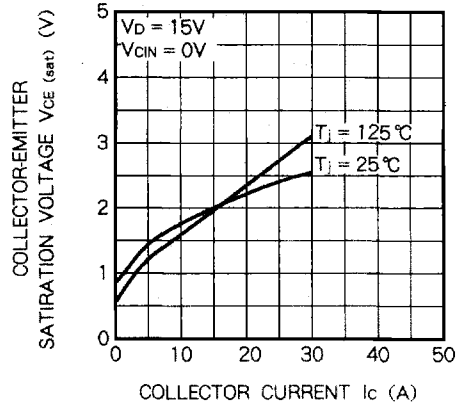
FLAT-BASE TYPE
INSULATED PACKAGE

PERFORMANCE CURVES (BRAKE PART)

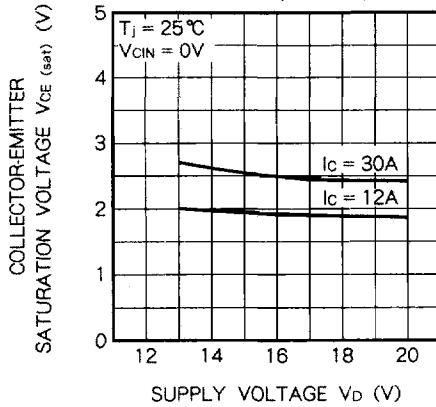
OUTPUT CHARACTERISTICS
(TYPICAL)



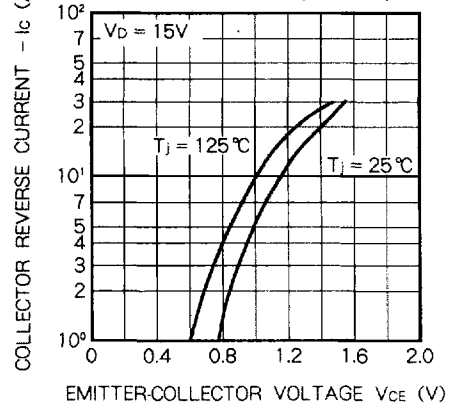
SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)



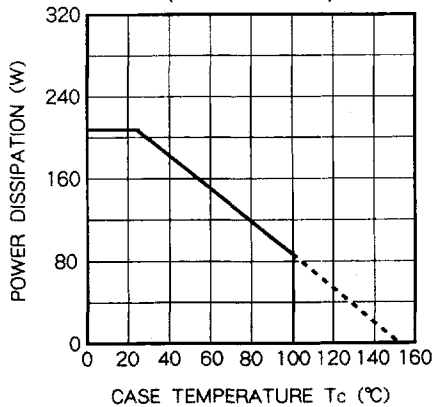
COLLECTOR-EMITTER SATURATION
VOLTAGE (TYPICAL)



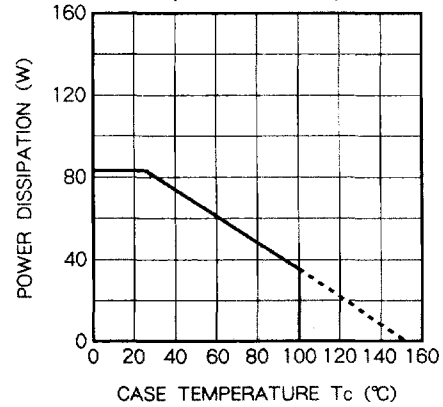
FREE-WHEEL DIODE FORWARD
CHARACTERISTICS (TYPICAL)



POWER DISSIPATION DERATING CURVE
(Per IGBT element)



POWER DISSIPATION DERATING CURVE
(Per FWDI element)

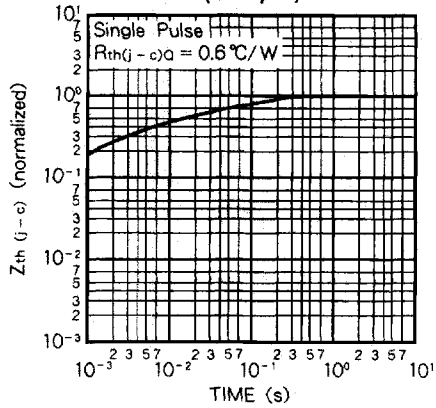


PM75RHA060

FLAT-BASE TYPE
INSULATED PACKAGE

(BRAKE PART)

TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT part)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDi part)

