

PM30RHC060

FLAT-BASE TYPE
INSULATED PACKAGE

PM30RHC060



- 3 ϕ 30A, 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 22kW class inverter application
- UL Recognized

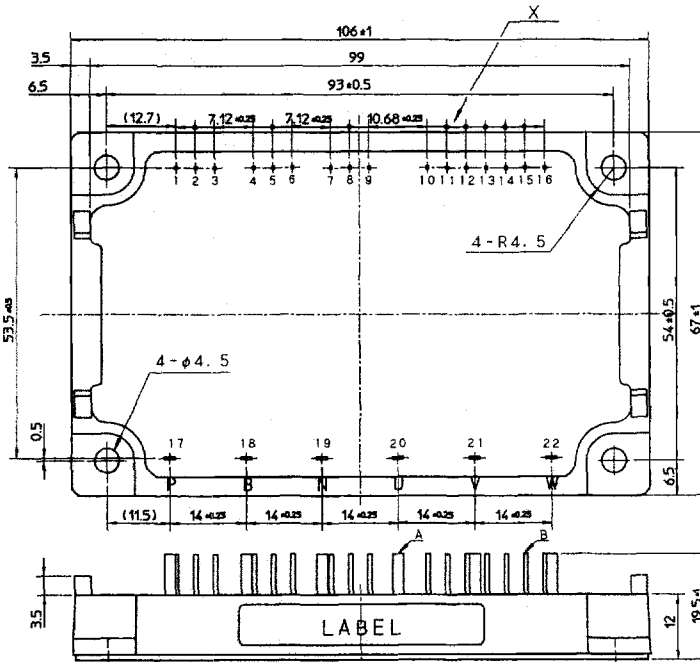
Yellow Card No. E80276 (N)
File No. E80271

APPLICATION

General Purpose Inverter, Servo drives and other motor controls

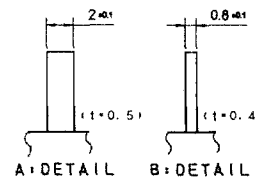
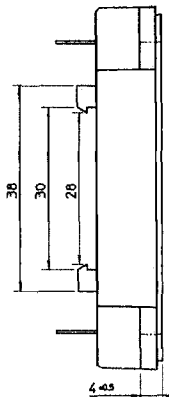
OUTLINE DRAWING

Dimensions in mm



1. V_{upc}	7. V_{upc}	13. U_N	19. N
2. U_r	8. W_r	14. V_N	20. U
3. V_{up1}	9. V_{up1}	15. W_N	21. V
4. V_{upc}	10. V_{uc}	16. F_0	22. W
5. V_r	11. V_{u1}	17. P	
6. V_{up1}	12. NC	18. B_r	

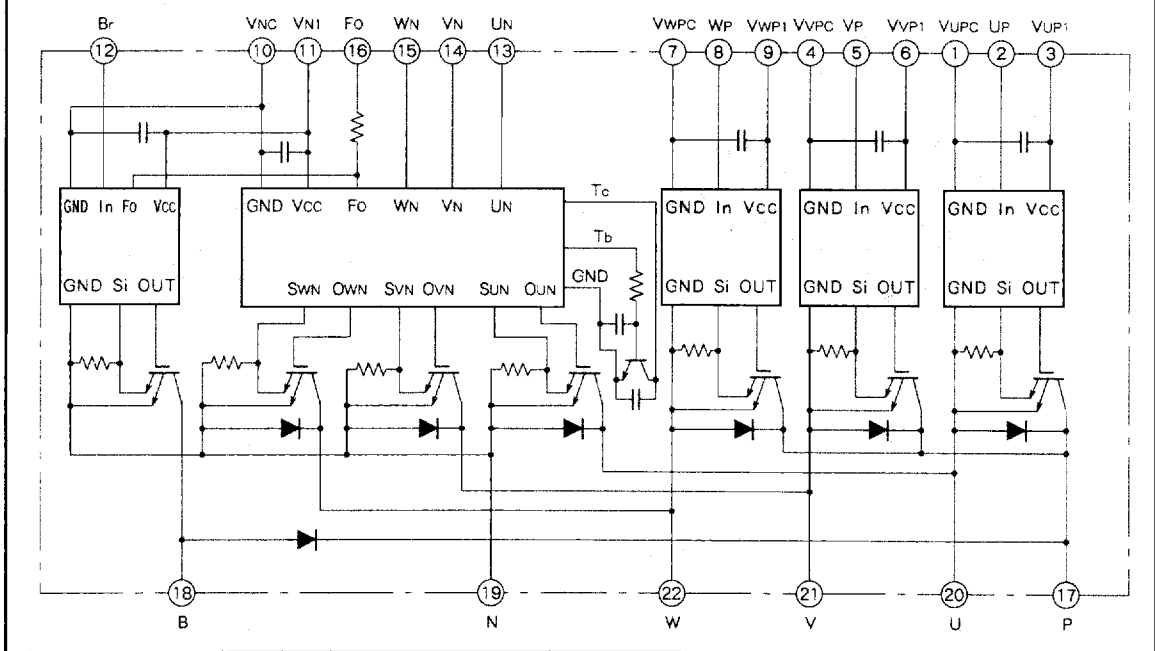
X IS 3.56 ± 0.25 .



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EQUIVALENT CIRCUIT DIAGRAM



MAXIMUM RATINGS (Tj = 25 °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
± Ic	Collector current	Tc = 25 °C	30	A
± Icp	Collector current (peak)	Tc = 25 °C	60	A
Pc	Collector dissipation	Tc = 25 °C	96	W
Tj	Junction temperature		- 20 ~ + 150	°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	Tc = 25 °C	10	A
Icp	Collector current (peak)	Tc = 25 °C	20	A
Pc	Collector dissipation	Tc = 25 °C	41	W
VR(DC)	FWDi rating DC reverse voltage	Tc = 25 °C	600	V
If	FWDi forward current	Tc = 25 °C	10	A
Tj	Junction temperature		- 20 ~ + 150	°C

CONTROL PART

Symbol	Parameter	Conditions	Ratings	Unit
Vd	Supply voltage	Applied between : VUP1-VUPC, VVP1-VVPC, VWP1-VWPC, VN1-VNC	20	V
ICIN	Input current	Applied between : UP, VP, WP, UN, VN, WN	20	mA
Vcin	Input voltage		20	V
Vfo	Fault output supply voltage	Applied between : Fo-Vnc	20	V
Ifo	Fault output current	Sink current of Fo terminal	20	mA

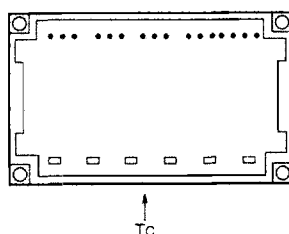
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TOTAL SYSTEM

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 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	$V_D = 15V, I_{CIN} = 0mA$ Pulsed	—	2.7	3.5	V
		$I_c = 30A, T_j = 125^\circ C$	—	2.5	3.4	
V_{EC}	FWDi forward voltage	$-I_c = 30A, V_D = 15V, I_{CIN} = 1mA$	—	1.7	2.5	V
t_{on}	Switching time	$V_D = 15V, I_{CIN} = 0mA \leftrightarrow 1mA$ $V_{CC} = 300V, I_c = 30A$ $T_i = 125^\circ C$ (Per 1 arm) Inductive Load	0.5	0.8	1.5	μs
t_{rr}			—	0.15	0.4	μs
$t_{c(on)}$			—	0.4	1.2	μs
t_{off}			—	2.0	3.4	μs
$t_{c(off)}$			—	0.6	1.2	μs
I_{CES}	Collector-emitter cutoff current	$V_{CE} = V_{CES}$	$T_j = 25^\circ C$		1	mA
			$T_j = 125^\circ C$		10	

BRAKE PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_D = 15V, I_{CIN} = 0mA$ Pulsed	—	2.6	3.5	V
		$I_c = 10A, T_j = 125^\circ C$	—	2.9	4.0	
V_{EC}	FWDi forward voltage	$-I_c = 10A, V_D = 15V, I_{CIN} = 1mA$	—	1.6	2.2	V
I_{CES}	Collector-emitter cutoff current	$V_{CE} = V_{CES}$	$T_j = 25^\circ C$		1	mA
			$T_j = 125^\circ C$		10	

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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 V _{N1} -V _{NC} V _{XP1} -V _{XPC}	—	41 7	63 12	mA
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
V _{CIN(ON)}	Input on threshold voltage	Applied between : B _r -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 Using application circuit Opto-coupler's input signal I _F = 12mA	2.9 5.4	— —	— —	μs
OC	Over current trip level	— 20°C ≤ T _J ≤ 125°C V _D = 15V Inverter part Brake part	39 12	53 18	— —	A
SC	Short circuit trip level	— 20°C ≤ T _J ≤ 125°C V _D = 15V Inverter part Brake part	— —	80 27	— —	A
t _{off(oc)}	Over current delay time	V _D = 15V	—	10	—	μs
OT	Over temperature Trip level	Base-plate	100	110	120	°C
OT _r	Reset level	Temperature detection, V _D = 15V	—	90	—	°C
UV	Supply circuit under Trip level	T _J ≤ 125°C	11.5	12.0	12.5	V
UV _r	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 Using application circuit opto-coupler's input signal, V _D = 15V	20 25	40 100	60 —	μs
	(Note 2)					

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	—	—	1.3	°C/W
R _{th(j-c)F}		Inverter FWDi part, per 1/6 module	—	—	3.0	°C/W
R _{th(j-c)Q}		Brake IGBT part	—	—	3.0	°C/W
R _{th(j-c)F}		Brake FWDi part	—	—	4.5	°C/W
R _{th(c-f)}	Contact thermal resistance	Thermal grease applied, per 1/6 module	—	—	0.3	°C/W

MECHANICAL RATINGS AND CHARACTERISTICS

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
—	Mounting torque	Mounting part screw : M4	0.98	1.18	1.47	N · m
—	Weight		10	12	15	kg · cm
—			—	140	—	g

RECOMMENDED CONDITIONS FOR USE

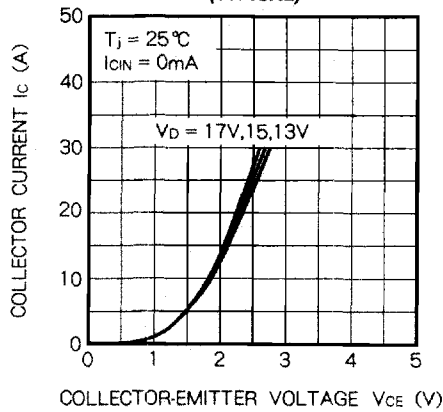
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V _{CC}	Supply voltage	Applied across P-N terminals	0	300	400	V
V _D		Applied between : V _{UP1} -V _{UPC} , V _{VP1} -V _{VPC} , V _{WP1} -V _{WPC} , V _{N1} -V _{NC}	13.5	15	16.5	V
I _{CIN(ON)}	Input on current	Applied between : U _P , V _P , W _P , U _N , V _N , W _N	0	—	0.05	mA
I _{CIN(OFF)}	Input off current		0.5	—	2	mA
V _{CIN(ON)}	Input on voltage	Applied between : B _r -V _{NC}	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	5.4	—	—	μs

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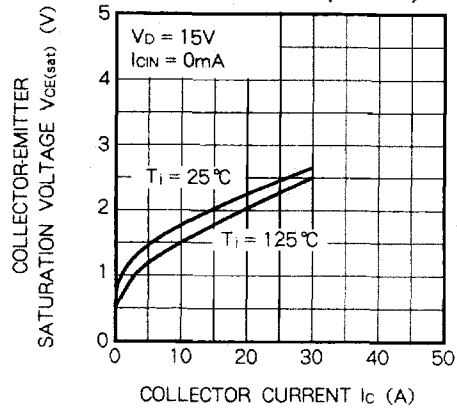
FLAT-BASE TYPE
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PERFORMANCE CURVES (INVERTER PART)

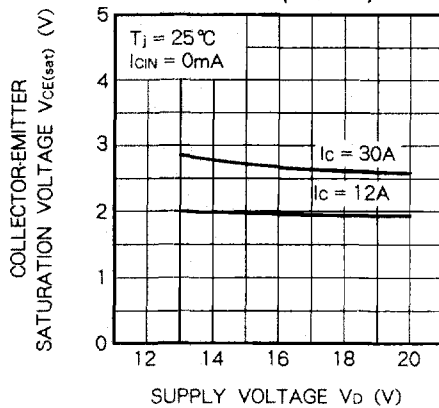
OUTPUT CHARACTERISTICS (TYPICAL)



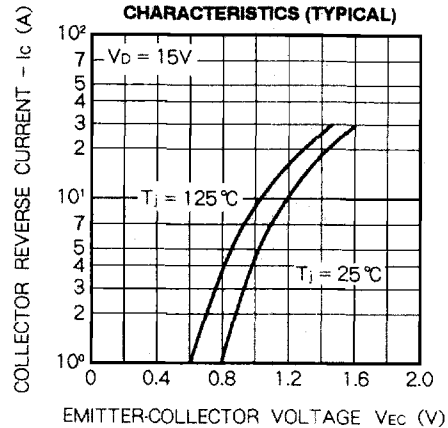
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



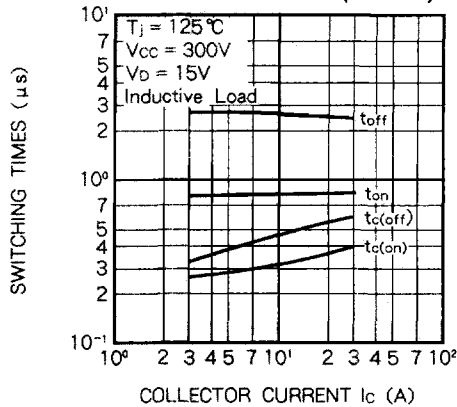
COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



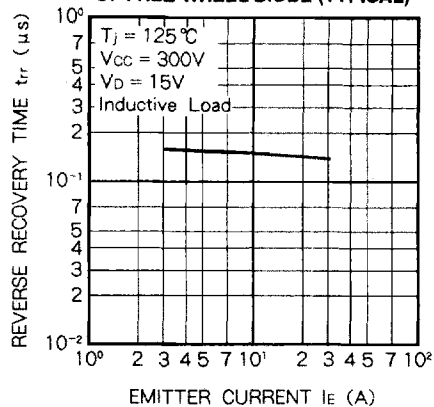
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)

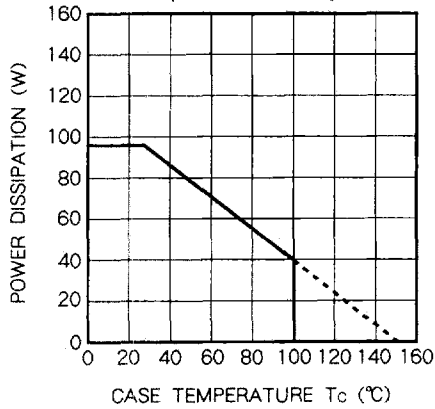


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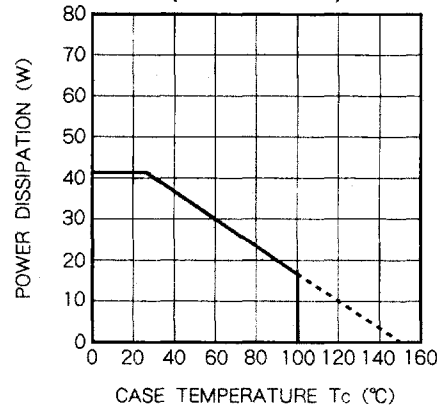
FLAT-BASE TYPE
INSULATED PACKAGE

(INVERTER PART)

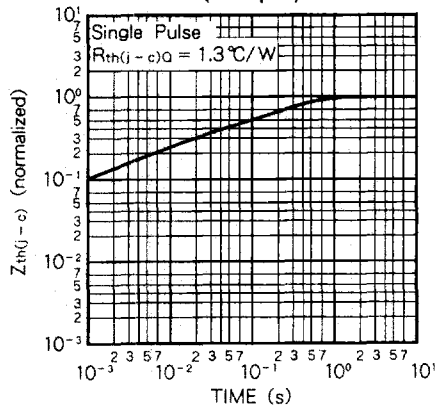
POWER DISSIPATION DERATING CURVE
(Per IGBT element)



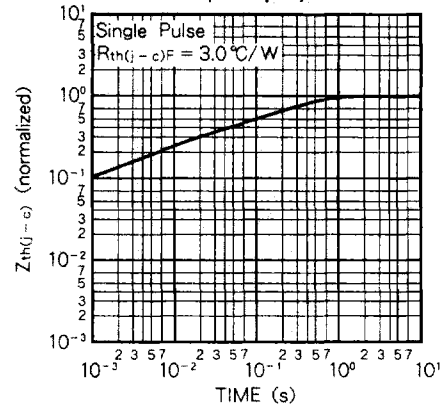
POWER DISSIPATION DERATING CURVE
(Per FWDi element)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT part)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDi part)

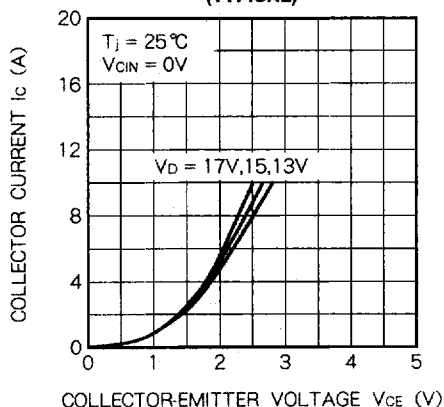


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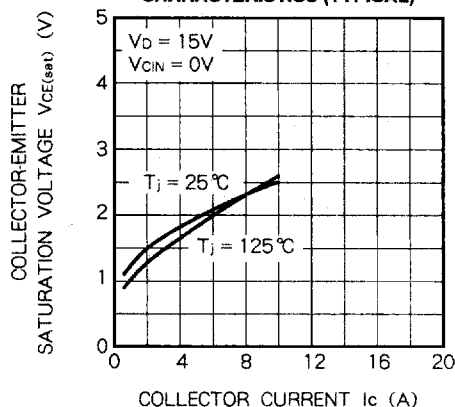
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PERFORMANCE CURVES (BRAKE PART)

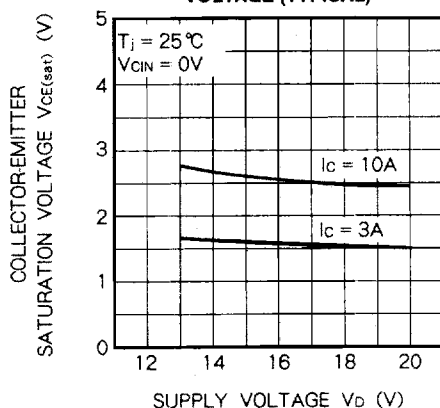
OUTPUT CHARACTERISTICS
(TYPICAL)



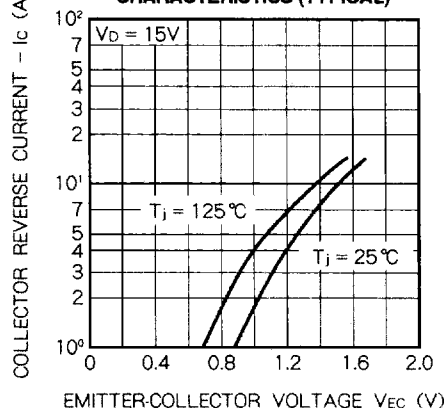
SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)



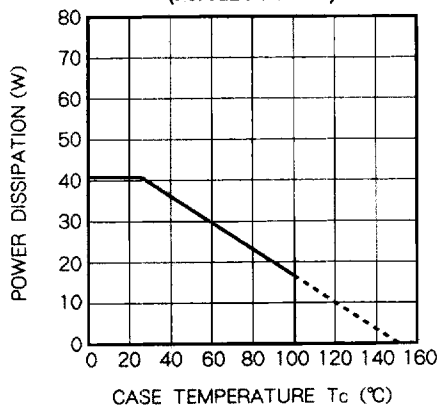
COLLECTOR-EMITTER SATURATION
VOLTAGE (TYPICAL)



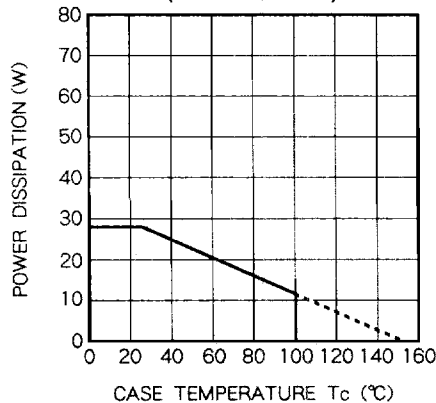
FREE-WHEEL DIODE FORWARD
CHARACTERISTICS (TYPICAL)



POWER DISSIPATION DERATING CURVE
(Per IGBT element)



POWER DISSIPATION DERATING CURVE
(Per FWDi element)

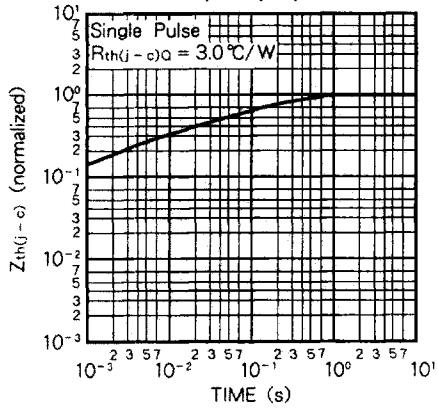


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(BRAKE PART)

TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT part)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDi part)

