

PM30RMC060

**FLAT-BASE TYPE
INSULATED PACKAGE**

PM30RMC060



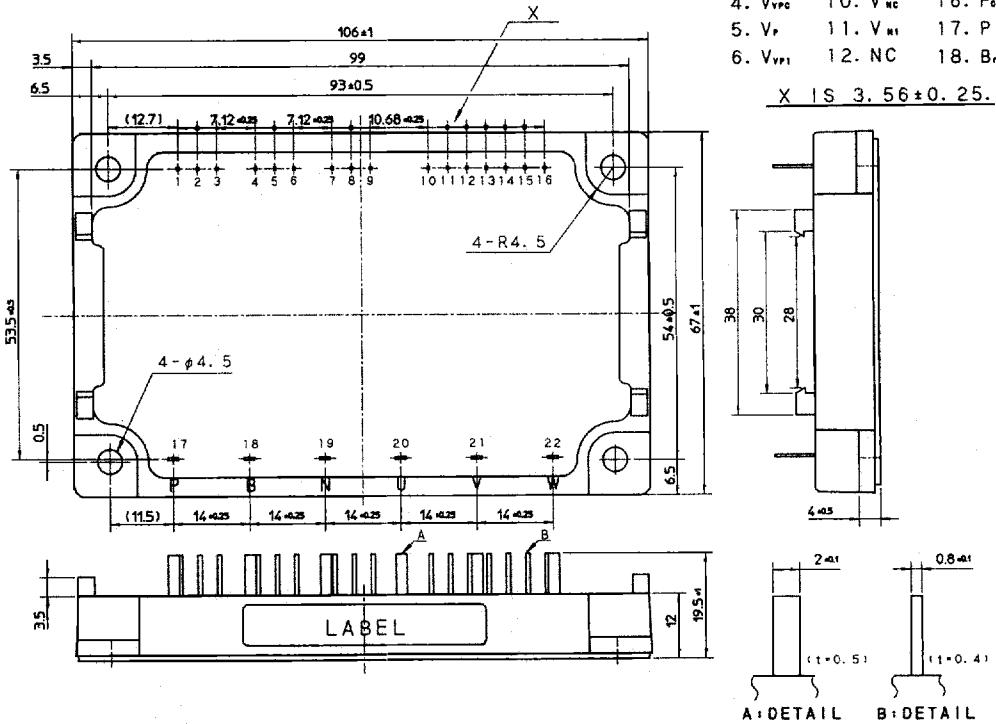
- 3 ϕ 30A, 600V Current-sense IGBT type inverter
 - Monolithic gate drive & protection logic
 - Detection, protection & status indication circuits for over-current, short-circuit, over-temperature & under-voltage
 - Acoustic noise-less 22kW class inverter application

APPLICATION

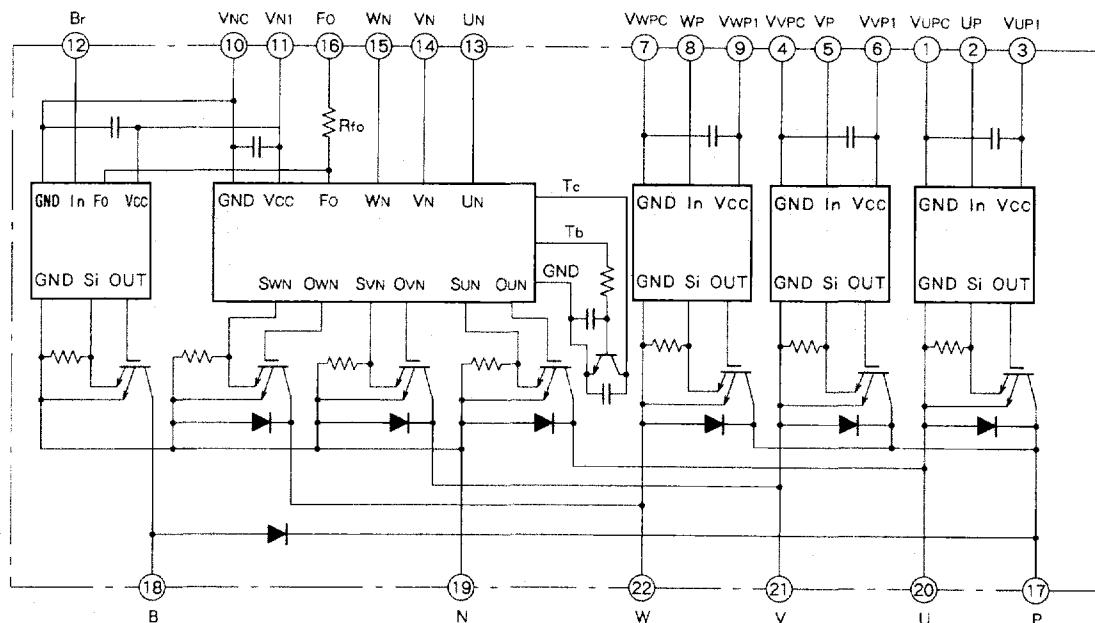
General Purpose Inverter, Servo drives and other motor controls

OUTLINE DRAWING

Dimensions in mm



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	$T_c = 25^\circ\text{C}$	30	A
$\pm I_{CP}$	Collector current (peak)	$T_c = 25^\circ\text{C}$	60	A
Pc	Collector dissipation	$T_c = 25^\circ\text{C}$	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	$T_c = 25^\circ\text{C}$	10	A
Icp	Collector current (peak)	$T_c = 25^\circ\text{C}$	20	A
Pc	Collector dissipation	$T_c = 25^\circ\text{C}$	41	W
VR(DC)	FWDi rating DC reverse voltage	$T_c = 25^\circ\text{C}$	600	V
If	FWDi forward current	$T_c = 25^\circ\text{C}$	10	A
Tj	Junction temperature		- 20 ~ + 150	°C

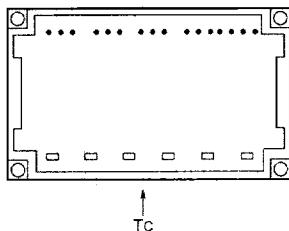
CONTROL PART

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

TOTAL SYSTEM

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC(prot)}	Supply voltage protected by OC & SC	V _D = 13.5~16.5V Inverter part, T _j = 125°C start	400	V
T _C	Module case operating temperature	(Note 1)	- 20~+ 100	°C
T _{stg}	Storage temperature	-	- 40~+ 125	°C
V _{iso}	Isolation voltage	60Hz, sinusoidal, AC, 1min	2000	V _{rms}

Note 1. TC measuring point is as shown below

**ELECTRICAL CHARACTERISTICS (T_j = 25°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	I _C = 30A, T _j = 25°C I _C = 30A, T _j = 125°C	-	2.7	3.5	V
V _{EC}	FWD _i forward voltage	- I _C = 30A, V _D = 15V, V _{CIN} = 15V		-	2.5	3.4	
t _{on}		V _D = 15V, V _{CIN} = 15V ↔ 0V		0.3	0.8	1.5	μs
t _{rr}		V _{CC} = 300V, I _C = 30A		-	0.15	0.4	μs
t _{c(on)}	Switching time	T _i = 125°C		-	0.4	1.2	μs
t _{off}		(Per 1 arm)		-	2.5	3.3	μs
t _{c(off)}		Inductive Load		-	0.6	1.2	μs
I _{CES}	Collector-emitter cutoff current	V _{CE} = V _{CES}	T _j = 25°C T _j = 125°C	-	-	1	mA
				-	-	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	I _C = 10A, T _j = 25°C I _C = 10A, T _j = 125°C	-	2.6	3.5	V
V _{EC}	FWD _i forward voltage	- I _C = 10A, V _D = 15V, V _{CIN} = 15V		-	2.9	4.0	
I _{CES}	Collector-emitter cutoff current	V _{CE} = V _{CES}	T _j = 25°C T _j = 125°C	-	1.6	2.2	mA
				-	-	1	
				-	-	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, V _{CIN} = 1mA	V _{N1} -V _{NC}	—	23	30
			V _{XP1} -V _{XPc}	—	7	10
V _{CIN(ON)}	Input on threshold voltage	Applied between :	1.2	1.5	1.8	V
V _{CIN(OFF)}	Input off threshold voltage	Up-V _{UPC} , V _P -V _{VPc} , W _P -V _{WPc} , U _N , V _N , W _N , Br-V _{NC}	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, Up-U _N , V _P -V _N , W _P -W _N	3.0	—	—	μs
		Using application circuit Opto-coupler's input signal I _F = 12mA	5.0	—	—	
OC	Over current trip level	— 20°C ≤ T _j ≤ 125°C, V _D = 15V	Inverter part	39	53	—
			Brake part	12	18	—
SC	Short circuit trip level	— 20°C ≤ T _j ≤ 125°C, V _D = 15V	Inverter part	—	80	—
			Brake part	—	27	—
t _{off(oc)}	Over current delay time	V _D = 15V	—	10	—	μs
OT	Over temperature protection	Trip level	Base-plate	100	110	120
OT _r		Reset level	Temperature detection	—	90	—
UV	Supply circuit under voltage protection	Trip level		11.5	12.0	12.5
UV _r		Reset level		—	12.5	—
I _{FO(H)}	Fault output current	(Note 2)	V _D = 15V, V _{FO} = 15V	—	—	0.01 mA
I _{FO(L)}				—	10	15 mA
t _{FO}	Minimum fault output pulse width	(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.

THERMAL RESISTANCES

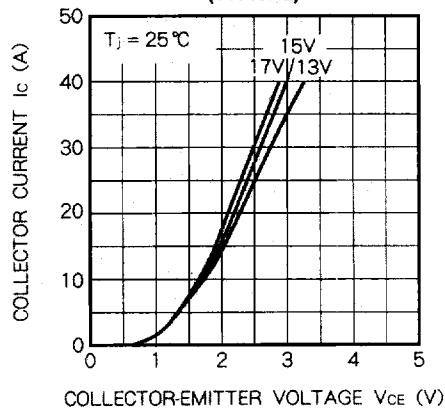
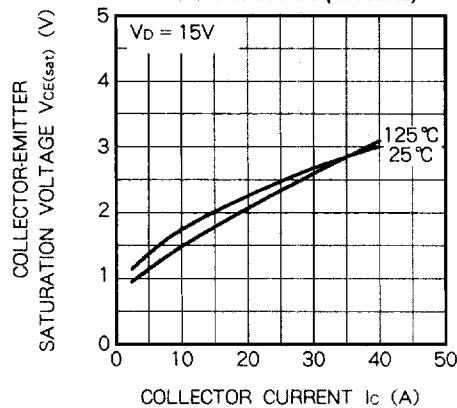
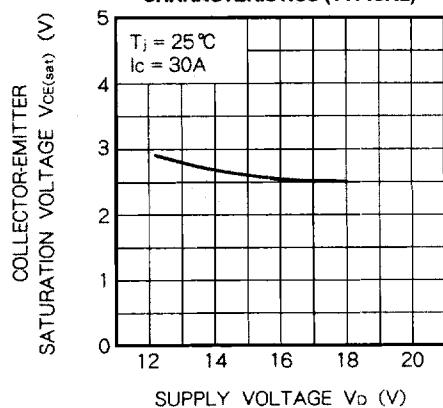
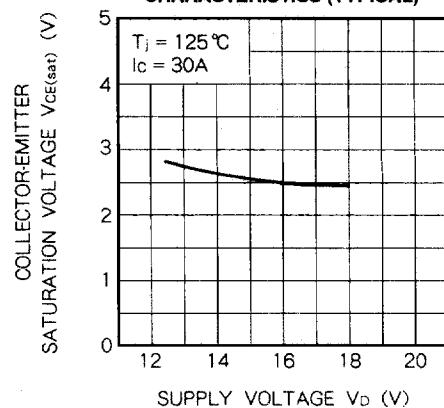
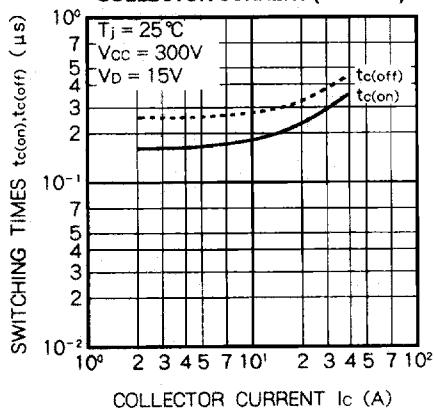
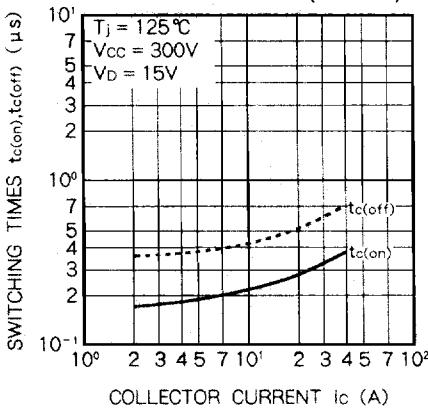
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
R _{th(j-c)Q}		Inverter IGBT part, per 1/6 module	—	—	1.3	°C/W
R _{th(j-c)F}	Junction-to-case thermal resistances	Inverter FWDI part, per 1/6 module	—	—	3.0	°C/W
R _{th(j-c)Q}		Brake IGBT part	—	—	3.0	°C/W
R _{th(j-c)F}		Brake FWDI part	—	—	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

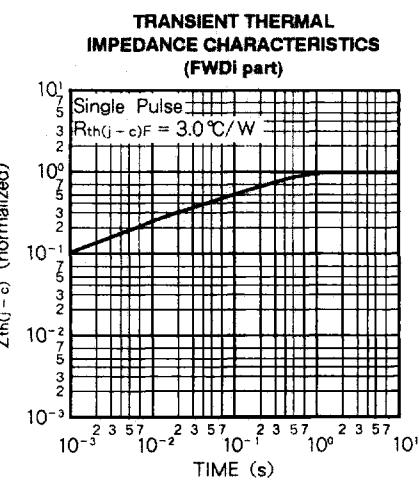
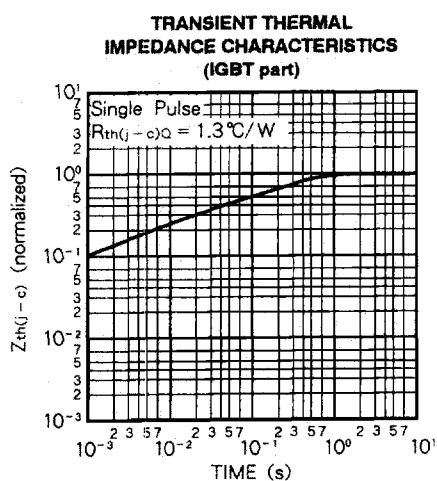
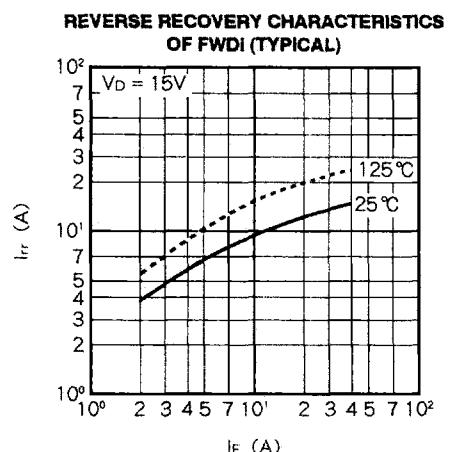
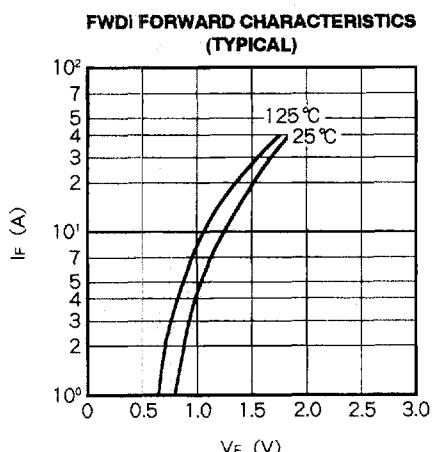
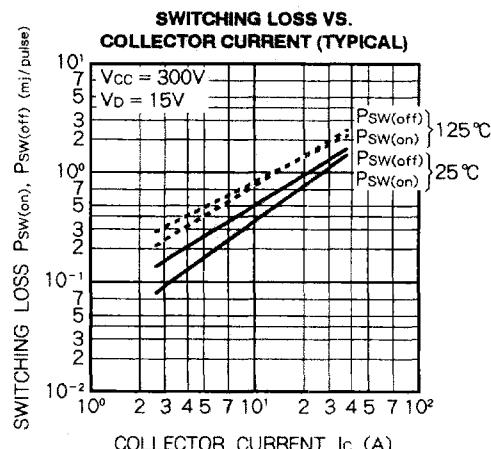
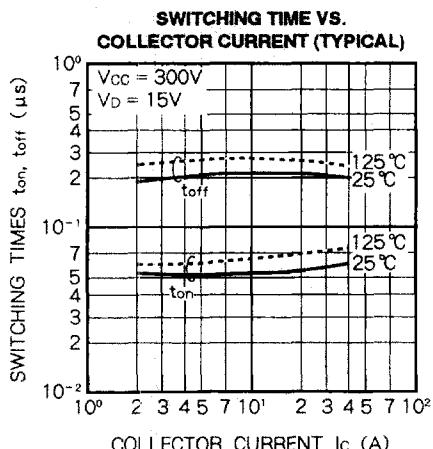
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
—	Mounting torque	Mounting part screw : M4	0.98	1.18	1.47	N · m
—	Weight		10	12	15	kg · cm
—			—	120	—	g

RECOMMENDED CONDITIONS FOR USE

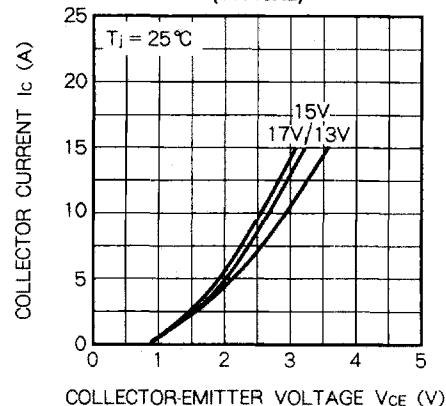
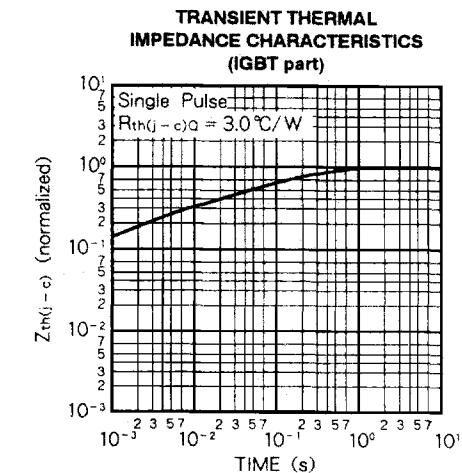
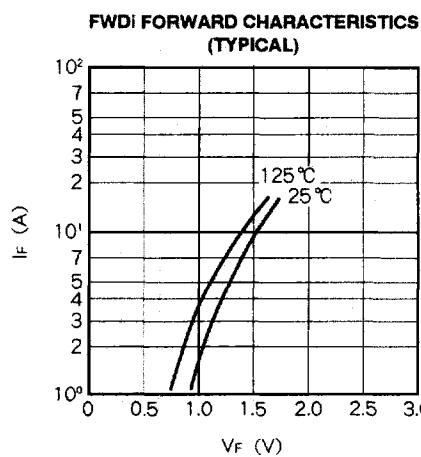
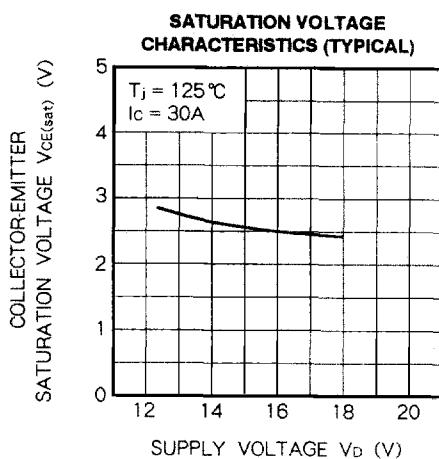
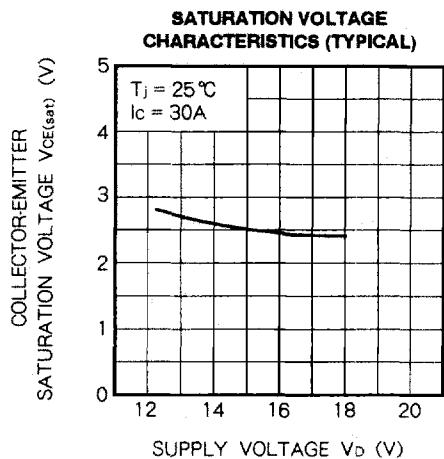
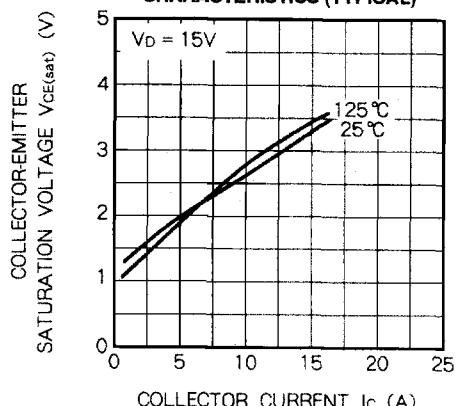
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V _{CC}		Applied across P-N terminals	0	300	400	V
V _D	Supply voltage	Applied between : V _{UP1} -V _{UPC} , V _{VP1} -V _{VPc} , V _{WP1} -V _{WPc} , V _{N1} -V _{NC}	13.5	15	16.5	V
V _{CIN(ON)}	Input on voltage	Applied between :	0	—	0.8	V
V _{CIN(OFF)}	Input off voltage	Up-V _{UPC} , V _P -V _{VPc} , W _P -V _{WPc} , U _N , V _N , W _N , Br-V _{NC}	4	—	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	5.0	—	—	μs

PERFORMANCE CURVES (INVERTER PART)**OUTPUT CHARACTERISTICS
(TYPICAL)****SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)****SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)****SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)****SWITCHING TIME VS.
COLLECTOR CURRENT (TYPICAL)****SWITCHING TIME VS.
COLLECTOR CURRENT (TYPICAL)**

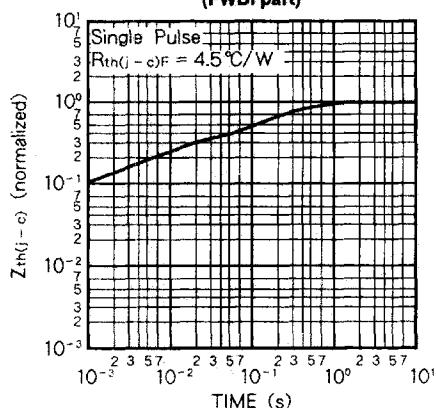
(INVERTER PART)



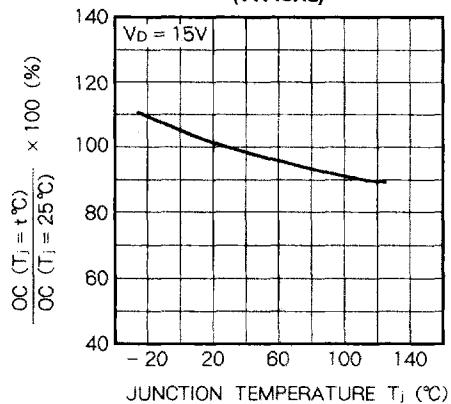
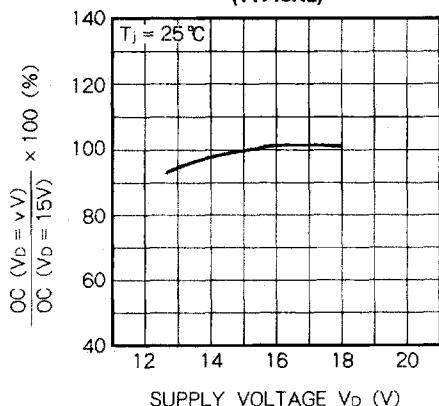
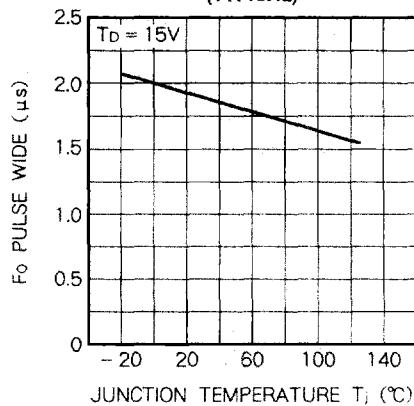
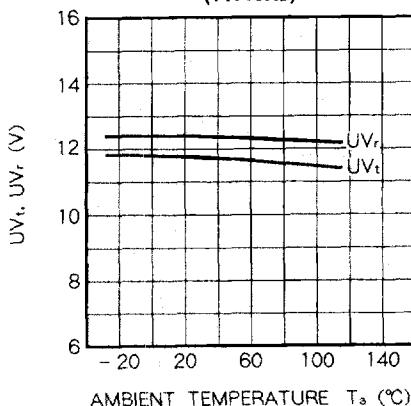
PERFORMANCE CURVES (BRAKE PART)

OUTPUT CHARACTERISTICS
(TYPICAL)SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)

(BRAKE PART)

TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDI part)

(CONTROL PART)

OC VS. T_j CHARACTERISTICS
(TYPICAL)OC VS. V_D CHARACTERISTICS
(TYPICAL)FO PULSE WIDTH VS. T_j CHARACTERISTICS
(TYPICAL)UV_I, UV_r VS. T_a CHARACTERISTICS
(TYPICAL)ID VS. fc CHARACTERISTICS
(TYPICAL)