

- 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

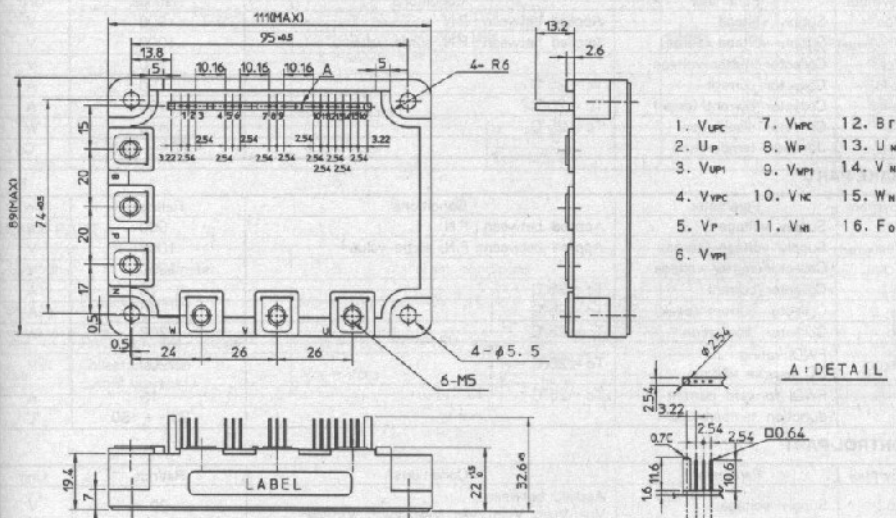
- 3 ϕ 50A, 1200V Current-sense IGBT type inverter
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APPLICATION

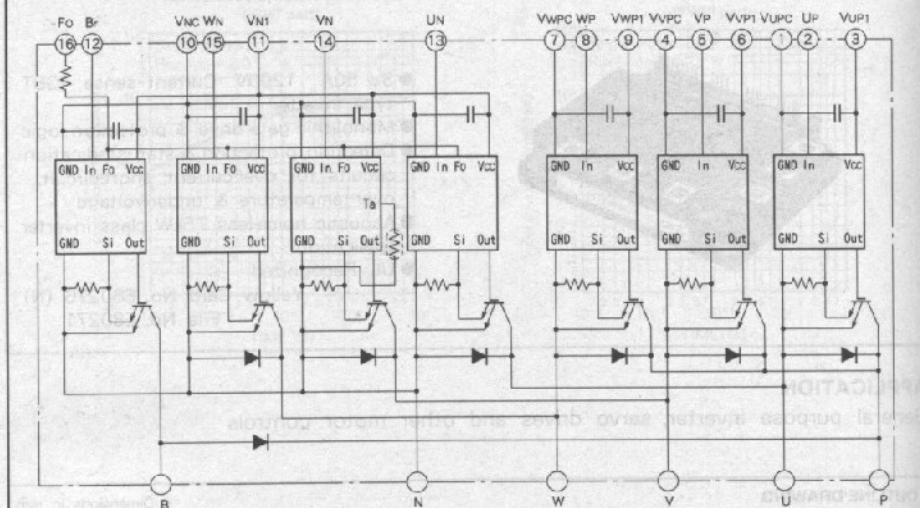
General purpose inverter, servo drives and other motor controls

OUTLINE DRAWING

OUTLINE DRAWING



EQUIVALENT CIRCUIT DIAGRAM


MAXIMUM RATINGS ($T_j = 25^\circ\text{C}$, 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
$\pm I_C$	Collector current	$T_C = 25^\circ\text{C}$	50	A
$\pm I_{CP}$	Collector current (peak)	$T_C = 25^\circ\text{C}$	100	A
P_C	Collector dissipation	$T_C = 25^\circ\text{C}$	416	W
T_j	Junction temperature		$-20 \sim +150$	$^\circ\text{C}$

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	$T_C = 25^\circ\text{C}$	15	A
I_{CP}	Collector current (peak)	$T_C = 25^\circ\text{C}$	30	A
P_C	Collector dissipation	$T_C = 25^\circ\text{C}$	208	W
$V_{R(DC)}$	FWDi rating DC reverse voltage	$T_C = 25^\circ\text{C}$	1200	V
I_F	FWDi forward current	$T_C = 25^\circ\text{C}$	15	A
T_j	Junction temperature		$-20 \sim +150$	$^\circ\text{C}$

CONTROL PART

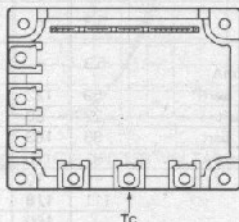
Symbol	Parameter	Conditions	Ratings	Unit
V_D	Supply voltage	Applied between : $V_{UP1} \sim V_{UPC}, V_{VP1} \sim V_{VPC}, V_{WN1} \sim V_{VNC}$	20	V
V_{CIN}	Input voltage	Applied between : $U_P \sim U_{PC}, V_P \sim V_{PC}, W_P \sim W_{PC}, U_N \sim V_N \cdot W_N \cdot B_r \sim V_{NC}$	20	V
V_{FO}	Fault output supply voltage	Applied between : $F_O \sim V_{NC}$	20	V
I_{FO}	Fault output current	Sink current of F_O terminal	20	mA

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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	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	$I_c = 50A, T_J = 25^\circ C$ $I_c = 50A, T_J = 125^\circ C$	— —	2.8 2.5	3.8 3.5	V
V_{EC}	FWDi forward voltage	$-I_c = 50A, V_D = 15V, V_{CIN} = 15V$		—	1.9	3.0	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)		0.5	1.0	2.5	μs
t_{rr}				—	0.3	0.6	μs
$t_{e(on)}$				—	0.4	1.5	μs
t_{off}				—	2.5	3.8	μs
$t_{e(off)}$				—	0.8	1.4	μs
I_{CES}	Collector-emitter cutoff current	$V_{CE} = V_{CES}$	$T_J = 25^\circ C$ $T_J = 125^\circ C$	— —	— —	1 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	$I_C = 15A, T_J = 25^\circ C$ $I_C = 15A, T_J = 125^\circ C$	— —	2.8 2.5	3.8 3.5	V
V_{FC}	FWDi forward voltage	$-I_C = 15A, V_D = 15V, V_{CIN} = 15V$		—	1.9	3.0	V
I_{CES}	Collector-emitter cutoff current	$V_{CE} = V_{CES}$	$T_J = 25^\circ C$ $T_J = 125^\circ C$	— —	— —	1 10	mA

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FLAT-BASE TYPE
INSULATED PACKAGE

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
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 _{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
OC	Over current trip level	- 20°C ≤ T _J ≤ 125°C V _D = 15V	59	122	—	
SC	Short circuit trip level	- 20°C ≤ T _J ≤ 125°C V _D = 15V	88	183	—	A
toff(cc)	Over current delay time	V _D = 15V	—	10	—	
OT	Over temperature	Trip level	111	118	125	°C
OTr	protection	Reset level	—	100	—	
UV	Supply circuit under	Trip level	11.5	12.0	12.5	V
UVr	voltage protection	Reset level	—	12.5	—	
I _{FO(H)}	Fault output current	V _D = 15V, V _{FO} = 15V	—	—	0.01	mA
I _{FO(L)}	(Note 2)		—	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 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(jc)Q}	Junction-to-case thermal resistances	Inverter IGBT part, per 1/6 module	—	—	0.3	°C/W
R _{th(jc)F}		Inverter FWDi part, per 1/6 module	—	—	1.0	°C/W
R _{th(jc)Q}		Brake IGBT	—	—	0.6	°C/W
R _{th(jc)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
—	Mounting torque	Main terminals part screw : M5	15	17	20	kg · cm
—	Weight	—	1.47	1.67	1.96	N · m
—	Weight	—	15	17	20	kg · cm
—	Weight	—	—	550	—	g

RECOMMENDED CONDITIONS FOR USE

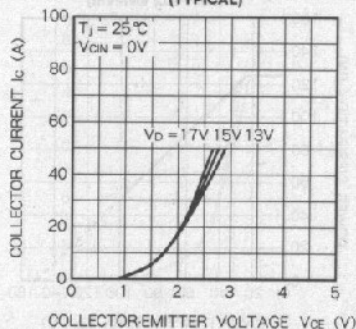
Symbol	Parameter	Test conditions	Value			Unit
			Min	Typ	Max	
V _{CC}	Supply voltage	Applied across P-N terminals	0	800	800	V
V _D		Applied between : V _{UP1} -V _{UPC} , V _{VP1} -V _{VPC} , V _{WP1} -V _{WPC} , V _{N1} -V _{NC}	13.5	15	16.5	V
V _{CIN(ON)}	Input on voltage	Applied between : U _P -V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

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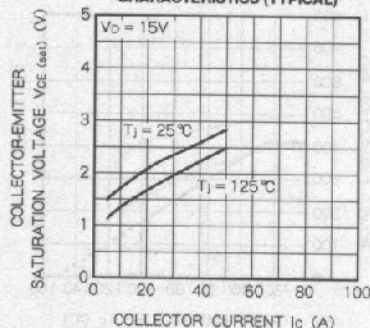
FLAT-BASE TYPE
INSULATED PACKAGE

PERFORMANCE CURVES (INVERTER PART)

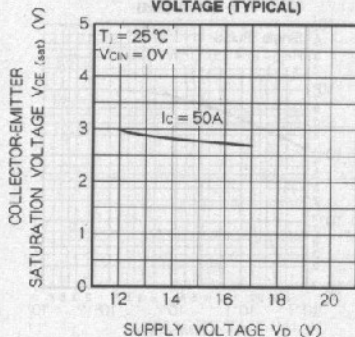
OUTPUT CHARACTERISTICS
(TYPICAL)



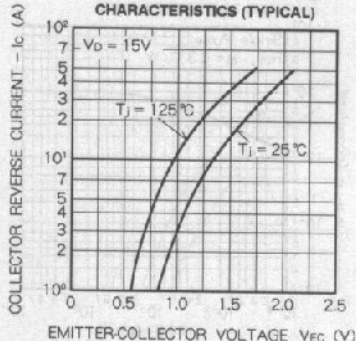
SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)



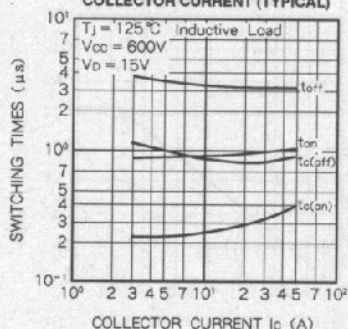
COLLECTOR-EMITTER SATURATION
VOLTAGE (TYPICAL)



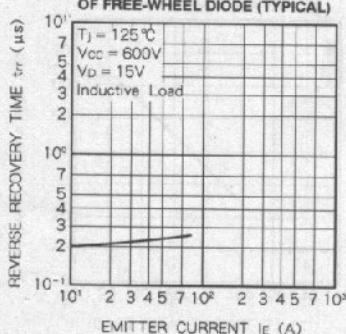
FREE-WHEEL DIODE FORWARD
CHARACTERISTICS (TYPICAL)



SWITCHING TIME VS.
COLLECTOR CURRENT (TYPICAL)



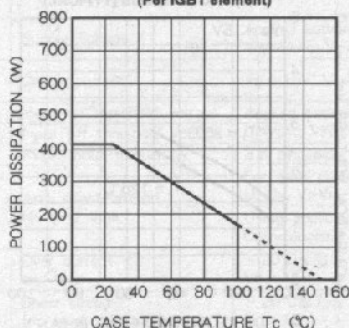
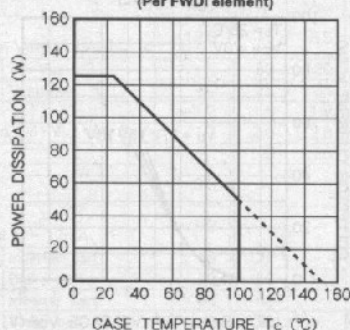
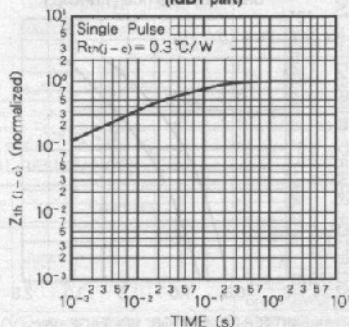
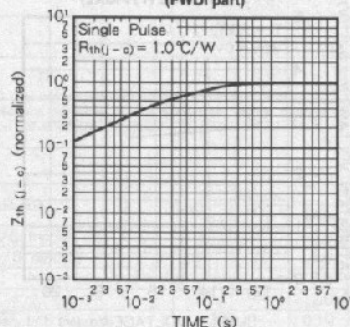
REVERSE RECOVERY CHARACTERISTICS
OF FREE-WHEEL DIODE (TYPICAL)



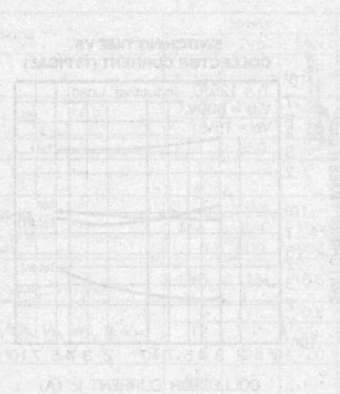
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FLAT-BASE TYPE
INSULATED PACKAGE

(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)

MECHANICAL RATINGS AND CHARACTERISTICS

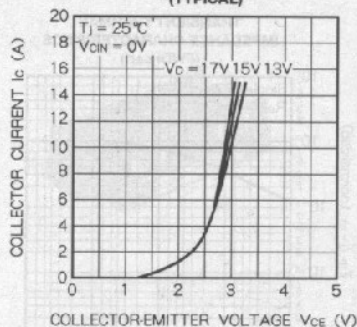


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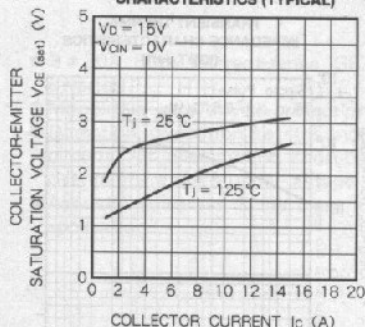
FLAT-BASE TYPE
INSULATED PACKAGE

PERFORMANCE CURVES (BRAKE PART)

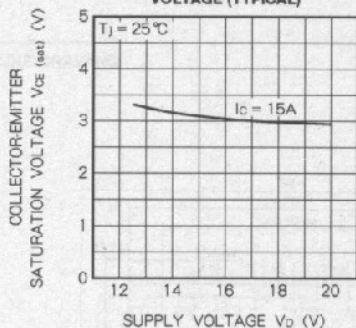
OUTPUT CHARACTERISTICS
(TYPICAL)



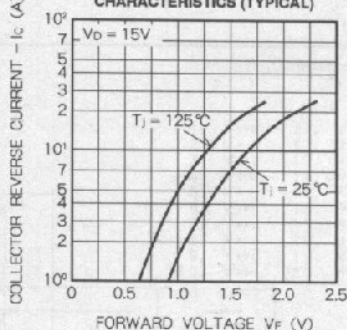
SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)



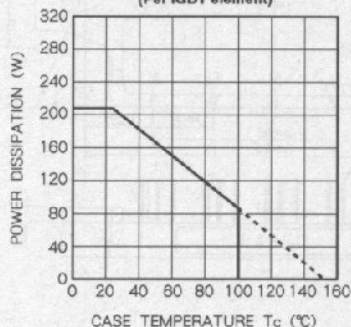
COLLECTOR-EMITTER SATURATION
VOLTAGE (TYPICAL)



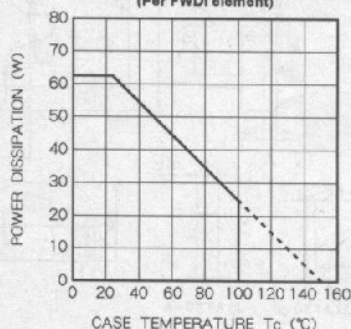
FREE-WHEEL DIODE FORWARD
CHARACTERISTICS (TYPICAL)



POWER DISSIPATION DERATING CURVE
(Per IGBT element)



POWER DISSIPATION DERATING CURVE
(Per FWDI element)



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FLAT-BASE TYPE
INSULATED PACKAGE

(BRAKE PART)

