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Apr.	T.Igarashi May 7, 2005			

TENTATIVE

- I_C.....15A
- V_{CES}.....1200V
- Insulated Type
- DIP-CIB Module
  3ΦInverter+3ΦConverter+Brake

APPLICATION

AC & DC motor controls, General purpose inverters

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

Inverter Part

Symbol	Parameter	Condition	Rating	Units
V_{CES}	Collector-emitter voltage	G-E Short	1200	V
V_{GES}	Gate-emitter voltage	C-E Short	±20	V
I_C	Collector current	DC, Tc=100° C (Note 1)	15	A
I_{CM}		Pulse (Note 3)	30	A
P_C	Maximum collector dissipation	Tc=25° C	(113)	W
$I_{E\ (Note2)}$	Emitter current	DC, Tc=64° C (Note 1)	15	A
$I_{EM\ (Note2)}$		Pulse (Note 3)	30	A

Brake Part

Symbol	Parameter	Condition	Rating	Units
V_{CES}	Collector-emitter voltage	G-E Short	1200	V
V_{GES}	Gate-emitter voltage	C-E Short	±20	V
I_C	Collector current	DC, Tc=100° C (Note 1)	10	A
I_{CM}		Pulse (Note 3)	20	A
$P_{C\ (Note4)}$	Maximum collector dissipation	Tc=25° C	(104)	W
V_{RRM}	Repetitive peak reverse voltage	Clamp diode part	1200	V
$I_{FM\ (Note4)}$	Forward current	Clamp diode part	10	A

Converter Part

Symbol	Parameter	Condition	Rating	Units
V_{RRM}	Repetitive peak reverse voltage		1600	V
E_a	Recommended AC input voltage		440	V
I_O	DC output current	3Φ rectifying circuit	15	A
I_{FSM}	Surge forward current	1/2cycle at 60Hz,Peak value Non-repetitive	(150)	A
I^2t	I^2t for fusing	Value for 1cycle of surge current	(93)	A^2s

Common Rating

Symbol	Parameter	Condition		Rating	Units
Tj	junction temperature (Note 5)	Inverter, brake, converter part		-20 ～ 125	°C
Tstg	Storage temperature			-20 ～ 125	°C
Viso	Isolation voltage	60Hz, Sinusoidal AC 1 min. Applied between pins and heat-sink		2500	Vrms
-	Mounting torque	Screw: M4	Recommended: 1.18N·m	(0.98～1.47)	N·m
-	Weight	Typical value		52	g

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

Inverter Part

Symbol	Parameter	Conditions		Characteristics			Units
				Min.	Typ.	Max.	
I_{CES}	Collector cutoff current	$V_{CE}=V_{CES}$, $V_{GE}=0V$		—	—	1	mA
$V_{GE(th)}$	Gate emitter threshold voltage	$I_C=1.5mA$, $V_{CE}=10V$		6.5	7.5	8.5	V
I_{GES}	Gate emitter cutoff current	$V_{GE}=20V$, $V_{CE}=0V$		—	—	1	μA
V_{CE}(sat)	Collector emitter saturation voltage	$I_C=15A$	Tj=25°C	—	1.8	(2.5)	V
		$V_{GE}=15V$ (Note6)	Tj=125°C	—	2.0	—	
Cies	Input capacitance	$V_{CE}=10V$, $V_{GE}=0V$ f=1MHz		—	—	(3.24)	nF
Coes	Output Capacitance			—	—	(0.3)	
Cres	Reverse transfer capacitance			—	—	(0.06)	
Q_G	Total gate charge	$V_{CC}=600V$, $I_C=15A$, $V_{GE}=15V$		—		—	nC
td(on)	Turn-on delay time	$V_{CC}=600V$, $I_C=15A$ $V_{GE}=15V$, $R_G=22\Omega$ Tj=25°C Inductive load		—	—	100	ns
tr	Turn-on rise time			—	—	75	
td(off)	Turn-off delay time			—	—	300	
tf	Turn-off fall time			—	—	400	
V_{EC} (Note1)	Emitter-collector voltage	$I_E=15A$, $V_{GE}=0V$		—	2.7	3.5	V
trr (Note1)	Reverse recovery time	$V_{CC}=600V$, $I_C=15A$, $V_{GE}=0V$ $R_G=22\Omega$, Tj=25°C		—	200	—	ns
Qrr (Note1)	Reverse recovery charge			—	0.5	—	μC
Rth(j-c)Q	Thermal resistance	IGBT part, per 1/6 module		—	—	(1.1)	°C/W
Rth(j-c)R		FWDi part, per 1/6 module		—	—	(1.7)	
Rg	External gate resistance			22	—	220	Ω

Brake Part

Symbol	Parameter	Conditions		Characteristics			Units
				Min.	Typ.	Max.	
I_{CES}	Collector cutoff current	$V_{CE}=V_{CES}$, $V_{GE}=0V$		—	—	1	mA
$V_{GE(th)}$	Gate emitter threshold voltage	I_C=1.0mA, V_{CE}=10V		6.5	7.5	8.5	V
I_{GES}	Gate emitter cutoff current	V_{GE}=20V, V_{CE}=0V		—	—	1	μA
VCE(sat)	Collector emitter saturation voltage	I_C=10A	Tj=25° C	—	1.8	(2.5)	V
		V_{GE}=15V (Note6)	Tj=125° C	—	2.0	—	
Cies	Input capacitance	V_{CE}=10V, V_{GE}=0V		—	—	(2.04)	nF
Coes	Output Capacitance	f=1MHz		—	—	(0.16)	
Cres	Reverse transfer capacitance			—	—	(0.04)	
Q_G	Total gate charge	V_{CC}=600V,I_C=10A,V_{GE}=15V		—	(100)	—	nC
td(on)	Turn-on delay time	V_{CC}=600V, I_C=10A		—	—	100	ns
Tr	Turn-on rise time	V_{GE}=15V, R_G=33Ω		—	—	75	
td(off)	Turn-off delay time	Tj=25° C		—	—	300	
Tf	Turn-off fall time	Inductive load		—	—	400	
V_{FM}	Forward voltage drop	IF=10A,Clamp diode part		—	2.7	3.5	V
Trr	Reverse recovery time	V_{CC}=600V, I_C=10A, V_{GE}=15V,		—	200	—	ns
Qrr	Reverse recovery charge	R_G=33Ω, Tj=25° C		—	0.3	—	μC
Rth(j-c)Q	Thermal resistance	IGBT part		—	—	(1.2)	°C/W
Rth(j-c)R		FWDi part		—	—	(1.7)	
Rg	External gate resistance			33	—	330	Ω

Converter Diode Part

Symbol	Parameter	Conditions	Characteristics			Units
			Min.	Typ.	Max.	
I_{RRM}	Repetitive reverse current	$V_R=V_{RRM}$, Tj=125° C	—	—	(1.0)	mA
V_{FM}	Forward voltage drop	I_F=15A	—	1.7	2.1	V
Rth(j-c)	Thermal resistance	Per 1/6 module	—	—	(1.3)	°C/W

NTC Thermistor Part

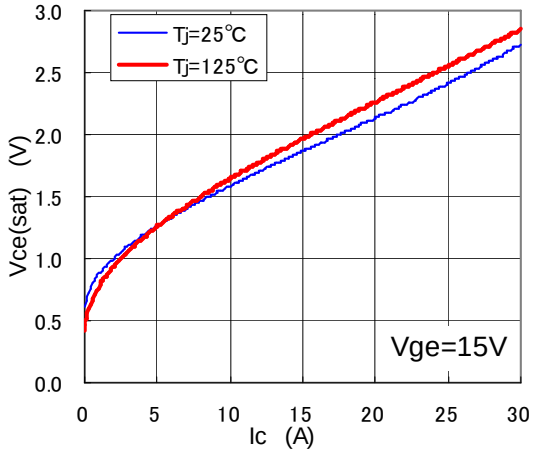
Symbol	Parameter	Conditions	Characteristics			Units
			Min.	Typ.	Max.	
R_{TH}	Resistance	Tc=25° C	(9.5)	10.0	(10.5)	kΩ
$B_{(25/100)}$	B Constant	Resistance at 25° C,100°C (Note 7)	—	3450	—	K

Common Rating

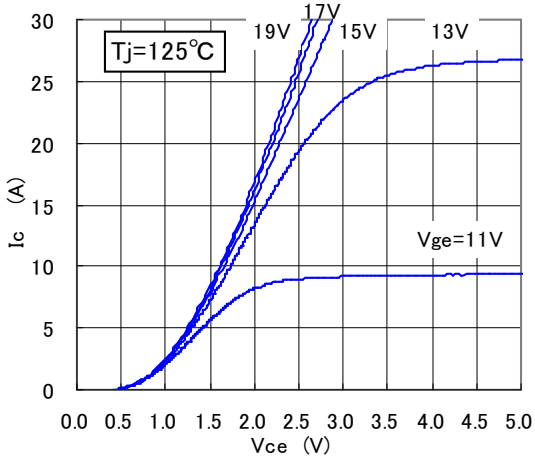
Symbol	Parameter	Conditions	Characteristics			Units
			Min.	Typ.	Max.	
Rth(c-f)	Contact thermal resistance	Case to fin,thermal compound applied (1module)	—	—	—	°C/W

Note1 Tc is measured at the position just underneath the power chip.
Note2 I_E, V_{EC}, trr, and Qrr represent characteristics of the anti-paralleled emitter to collector free-wheel diode(FWDi).
Note3 Pulse width and repetition rate should be such that the device junction temp.(Tj) does not exceed Tjmax rating.
Note4 Junction temperature(Tj) should not increase beyond 150° C.
Note5 The maximum junction temperature rating of the power chips integrated inside DIP-CIB is 150° C. However, to ensure safe operation of DIP-CIB, the average junction temperature should be limited to below 125° C.
Note6 Pulse width and repetition rate should be such as to cause negligible temperature rise.
Note7 B = (lnR1-lnR2)/(1/T1-1/T2) where R1 is the resistance at T1(K), R2 the resistance at T2(K)

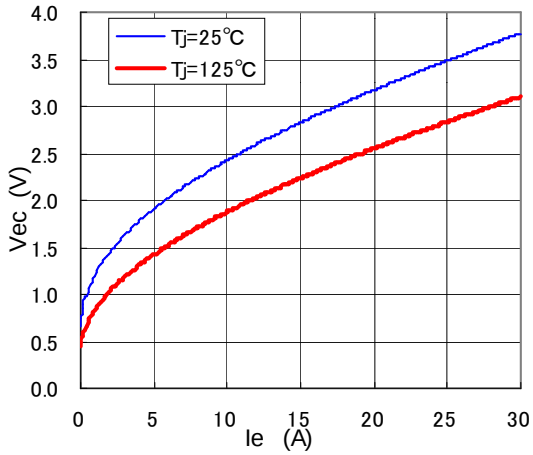
Performance Curves (Typical)



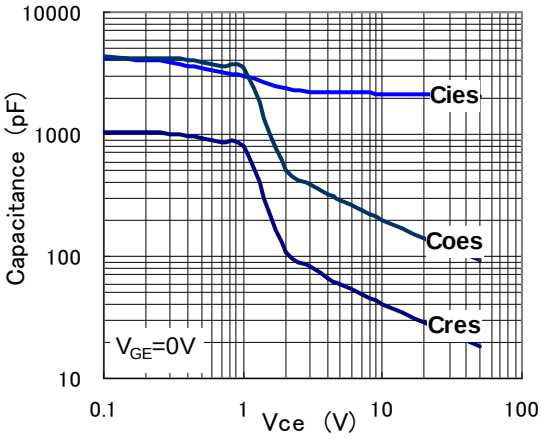
Inverter IGBT output characteristics



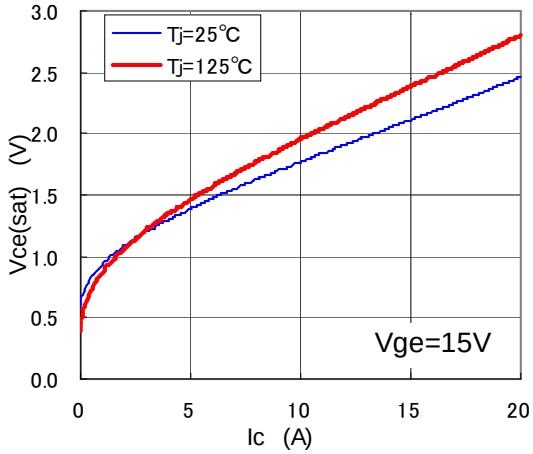
Inverter IGBT output characteristics



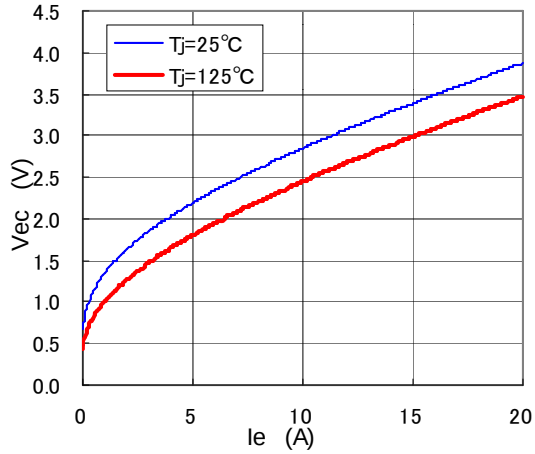
Inverter FWD forward characteristics



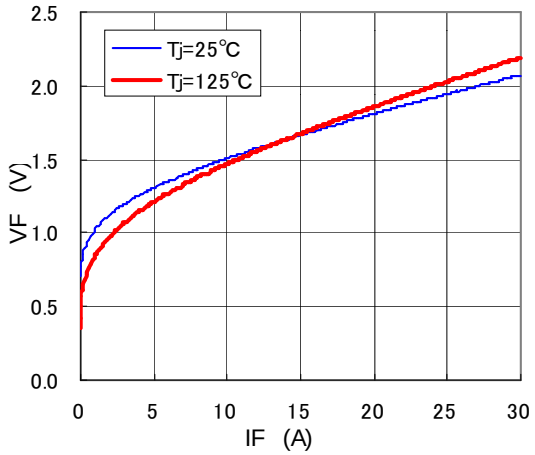
Inverter IGBT capacitance characteristics



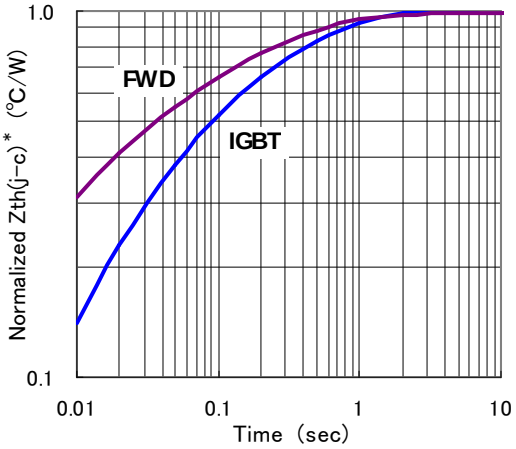
Brake-chopper IGBT output characteristics



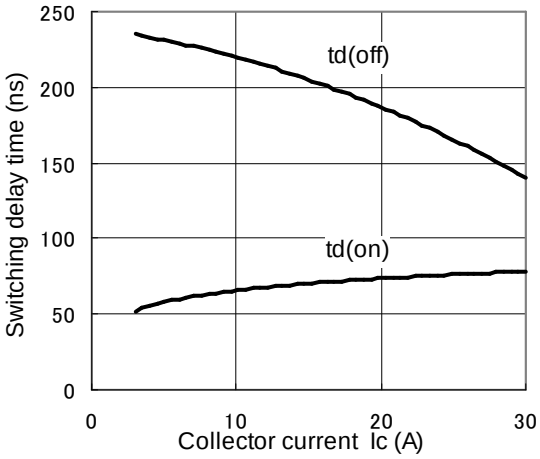
Brake-clamp FWD forward characteristics



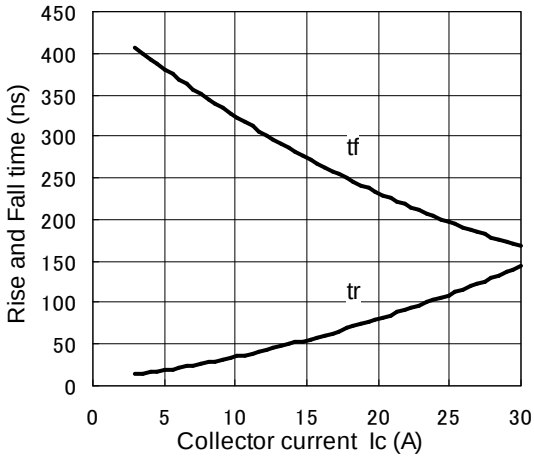
Converter diode forward characteristics



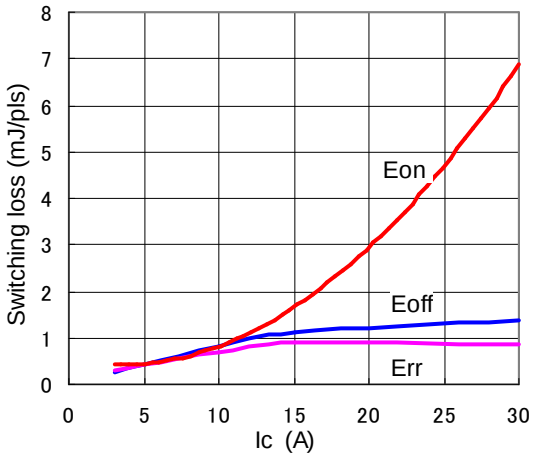
Inverter part transient thermal impedance



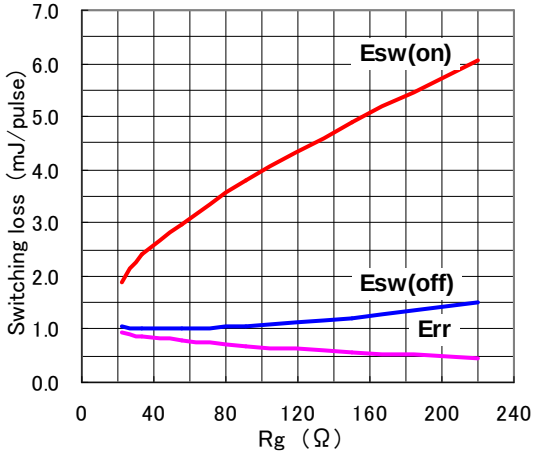
Inverter part switching delay time



Inverter part switching rise and fall time



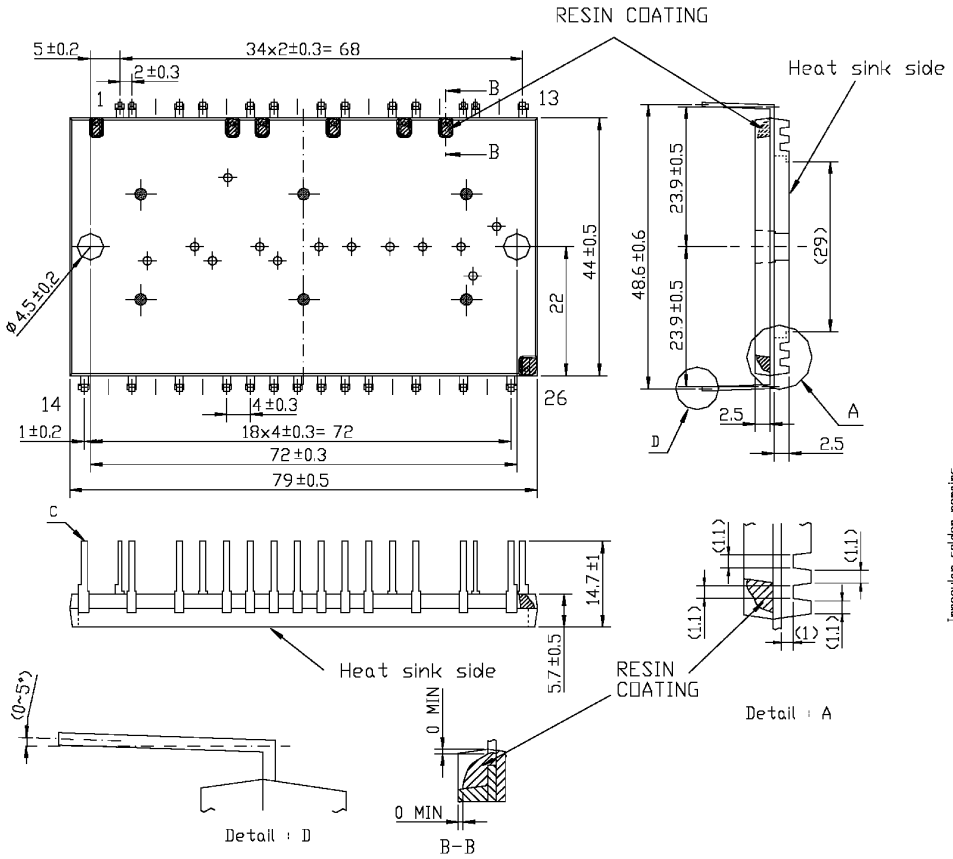
Inverter part switching loss



Inverter part switching loss

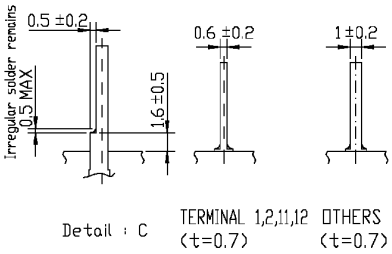
Note: Switching test condition: Vcc=600V, V_D=15V, R_G=22Ω, Tj=125℃, Inductive load.

Outline Drawing



TERMINAL CODE

1. TH1	15. S
2. TH2	16. T
3. P1	17. N1
4. P	18. GUN
5. GUP	19. UN
6. EUP	20. GVN
7. GVP	21. VN
8. EVP	22. GWN
9. GWP	23. WN
10. EWP	24. U
11. GB	25. V
12. N(B)	26. W
13. B	
14. R	



Circuit Diagram