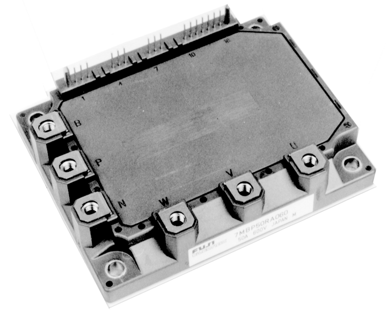
7MBP75RTB060

IPM-R3 series

600V / 75A 7 in one-package

Features

- **Temperature protection provided by directly detecting the junction temperature of the IGBTs**
- Low power loss and soft switching
- High performance and high reliability IGBT with overheating protection
- Higher reliability because of a big decrease in number of parts in built-in control circuit



Maximum ratings and characteristics

Absolute maximum ratings(at Tc=25°C unless otherwise specified)

Item			Symbol	Rating		Unit
				Min.	Max.	
Bus voltage (between terminal P and N)		DC	V_{DC}	0	450	V
		Surge	$V_{DC(surge)}$	0	500	V
		Shortoperating	V_{SC}	200	400	V
Collector-Emitter voltage			V_{CES} *1	0	600	V
Inverter	Collector current	DC	I_C	-	75	A
		1ms	I_{CP}	-	150	A
		Duty=75.0%	$-I_C$ *2	-	75	A
	Collector power dissipation	One transistor	P_C *3	-	198	W
Brake	Collector current	DC	I_C	-	50	A
		1ms	I_{CP}	-	100	A
	Forward Current of Diode		I_F	-	50	A
	Collector power dissipation	One transistor	P_C *3	-	198	W
Input voltage of power supply for Pre-Driver			V_{CC} *4	-0.5	20	V
Input signal voltage			V_{in} *5	-0.5	Vcc+0.5	V
Input signal current			I_{in}	-	3	mA
Alarm signal voltage			V_{ALM} *6	-0.5	Vcc	V
Alarm signal current			I_{ALM} *7	-	20	mA
Junction temperature			T_j	-	150	℃
Operating case temperature			T_{op}	-20	100	℃
Storage temperature			T_{stg}	-40	125	℃
Isolating voltage (Case-Terminal)			V_{iso} *8	-	AC2.5	kV
Screw torque		Mounting (M5)		-	3.5 *9	N·m
		Terminal (M5)		-	3.5 *9	N·m

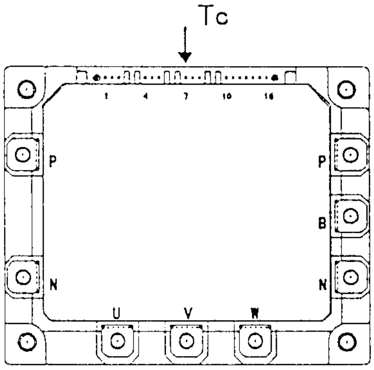


Fig.1 Measurement of case temperature

Note

*1 : Vces shall be applied to the input voltage between terminal P and U or V or W or DB, N and U or V or W or DB.

*2 : 125°C/FWD Rth(j-c)/(Ic x V_F MAX)=125/0.855/(75 x 2.6)x100=75.0%

*3 : P_C=125°C/IGBT Rth(j-c)=125/0.63=198W [Inverter]
P_C=125°C/IGBT Rth(j-c)=125/0.63=198W [Break]

*4 : Vcc shall be applied to the input voltage between terminal No. 3 and 1, 6 and 4, 9 and 7, 11 and 10.

*5 : Vin shall be applied to the input voltage between terminal No. 2 and 1, 5 and 4, 8 and 7, 12,13,14,15 and 10.

*6 : V_{ALM} shall be spplied to the voltage between terminal No. 16 and 10.

*7 : I_{ALM} shall be applied to the input current to terminal No. 16.

*8 : 50Hz/60Hz sine wave 1 minute.

*9 : Recommendable Value : 2.5 to 3.0 N·m

Weight

Item	Symbol	Min.	Typ.	Max.	Unit
Weight	Wt	-	450	-	g

*9 : (For 1 device, Case is under the device)

Electrical characteristics (at Tc=Tj=25°C, Vcc=15V unless otherwise specified.)

● **Main circuit**

	Item	Symbol	Condition		Min.	Typ.	Max.	Unit
Inverter	Collector current at off signal input	I_{CES}	V_{CE}=600V Vin terminal open.		-	-	1.0	mA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	Ic=75A	Terminal	-	-	2.4	V
				Chip	-	2.0	-	
	Forward voltage of FWD	V_F	Ic=75A	Terminal	-	-	2.6	V
				Chip	-	1.6	-	
Brake	Collector current at off signal input	I_{CES}	V_{CE}=600V Vin terminal open.		-	-	1.0	mA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	Ic=50A	Terminal	-	-	2.2	V
				Chip	-	1.75	-	
	Forward voltage of Diode	V_F	-Ic=50A	Terminal	-	-	3.3	V
				Chip	-	1.9	-	V
Turn-on time		ton	VDC=300V,Tj=125°C		1.2	-	-	µs
Turn-off time		toff	IC=75A Fig.1, Fig.6		-	-	3.6	
Reverse recovery time		trr	VDC=300V, IC=75A Fig.1, Fig.6		-	-	0.3	
Maximum Avalanche Energy (A non-repetition)		P_{AV}	Internal wiring inductance=50nH Main circuit wiring inductace=54nH		40	-	-	mJ

● **Control circuit**

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply current of P-line side pre-driver(one unit)	I_{ccp}	Switching Trequency : 0 to 15kHz	-	-	18	mA
Supply current of N-line side pre-driver	I_{CCN}	Tc=-20 to 125°C Fig.7	-	-	65	mA
Input signal threshold voltage (on/off)	$V_{in(th)}$	ON	1.00	1.35	1.70	V
		OFF	1.25	1.60	1.95	V
Input zener voltage	V_Z	Rin=20k ohm	-	8.0	-	V
Alarm signal hold time	t_{ALM}	Tc=-20°C Fig.2	1.1	-	-	ms
		Tc=25°C Fig.2	-	2.0	-	ms
		Tc=125°C Fig.2	-	-	4.0	ms
Limiting resistor for alarm	R_{ALM}		1425	1500	1575	ohm

● **Protection Section** (Vcc=15V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Over Current Protection Level of Inverter circuit	I_{OC}	Tj=125°C	113	-	-	A
Over Current Protection Level of brake circuit		Tj=125°C	75	-	-	A
Over Current Protection Delay time	t_{DOC}	Tj=125°C	-	5	-	µs
SC Protection Delay time	t_{SC}	Tj=125°C Fig.4	-	-	8	µs
IGBT Chip Over Heating	T_{jOH}	surface of IGBT chips	150		- -	℃
Over Heating Protection Hysteresis	T_{jH}		-	20	-	℃
Over Heating Protection Temperature Level	T_{COH}	VDC=0V, Ic=0A, Case temperature	110	-	125	℃
Over Heating Protection Hysteresis	T_{CH}		-	20	-	
Under Voltage Protection Level	V_{UV}		11.0	-	12.5	V
Under Voltage Protection Hysteresis	V_H		0.2	0.5	-	

● **Thermal characteristics**(Tc=25°C)

Item			Symbol	Min.	Typ.	Max.	Unit
Junction to Case thermal resistance	INV	IGBT	Rth(j-c)	-	-	0.63	°C/W
		FWD	Rth(j-c)	-	-	0.855	°C/W
	Brake	IGBT	Rth(j-c)	-	-	0.63	°C/W
Case to fin thermal resistance with compound			Rth(c-f)	-	0.05	-	°C/W

● **Noise Immunity** (VDC=300V, Vcc=15V, Test Circuit Fig.5)

Item	Condition	Min.	Typ.	Max.	Unit
Common mode rectangular noise	Pulse width 1µs, polarity ±,10minuets Judge : no over-current, no miss operating	±2.0	-	-	kV
Common mode lightning surge	Rise time 1.2µs, Fall time 50µs Interval 20s, 10 times Judge : no over-current, no miss operating	±5.0	-	-	kV

● **Recommendable value**

Item	Symbol	Min.	Typ.	Max.	Unit
DC Bus Voltage	V_{DC}	-	-	400	V
Operating Supply Voltage of Pre-Driver	V_{CC}	13.5	15.0	16.5	V
Screw torque (M5)	-	2.5	-	3.0	Nm

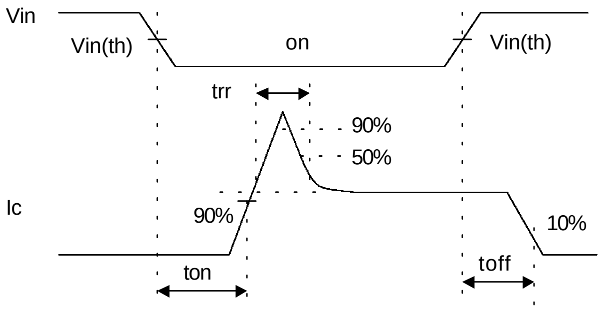
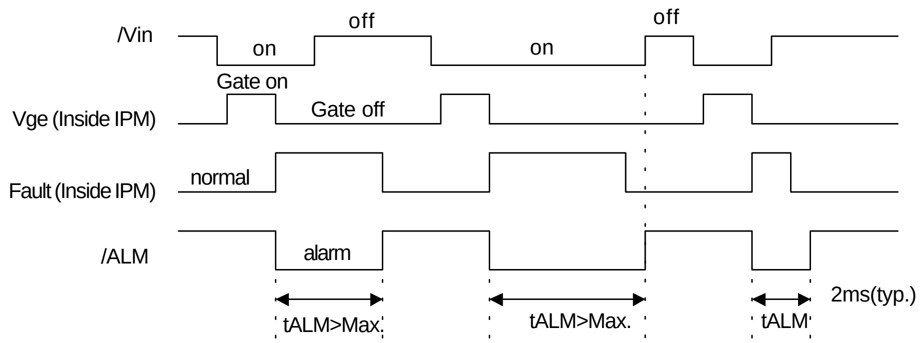


Figure 1. Switching Time Waveform Definitions



Fault : Over-current, Over-heat or Under-voltage

Figure 2. Input / Output Timing Diagram

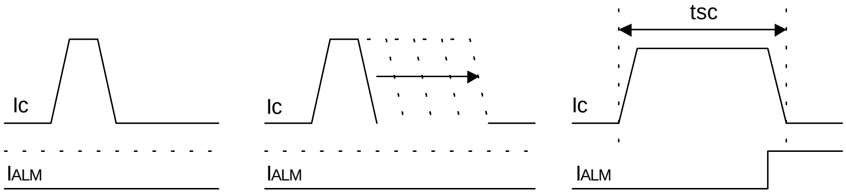


Figure. 4 Definition of tsc

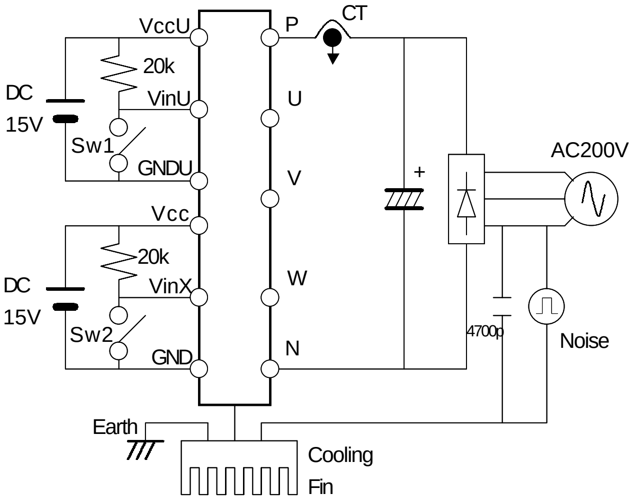


Figure 5. Noise Test Circuit

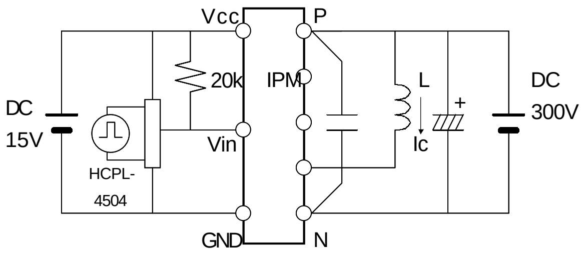


Figure 6. Switching Characteristics Test Circuit

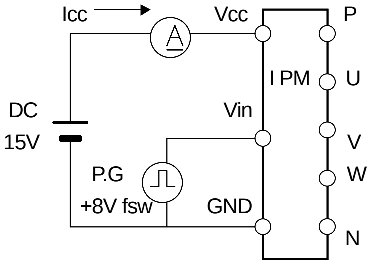
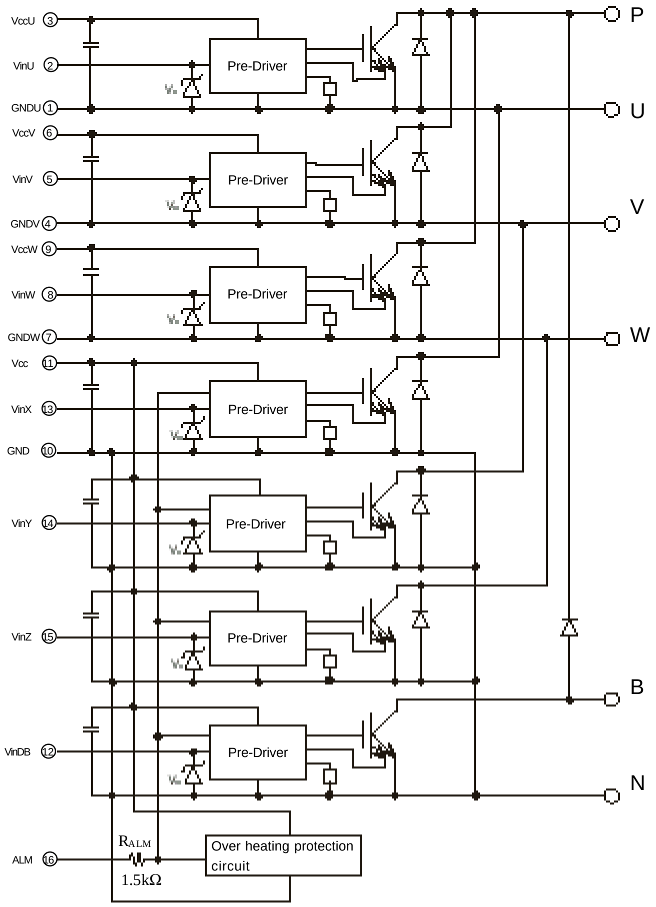


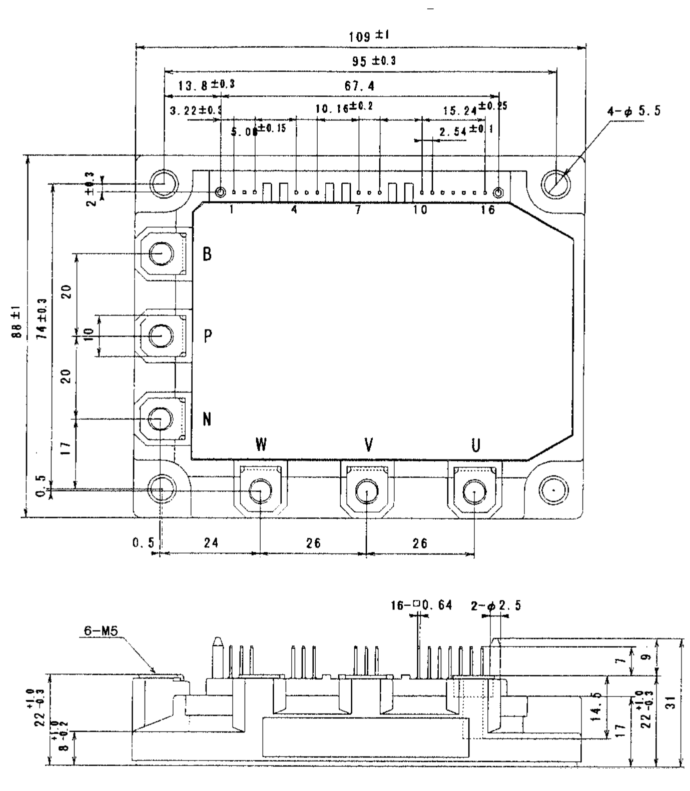
Figure 7. Icc Test Circuit

Block diagram



Pre-driver include following functions
① Amplifier for drive
② Short circuit protection
③ Under voltage lockout circuit
④ Over current protection
⑤ IGBT chip over heating protection

Outline drawings, mm

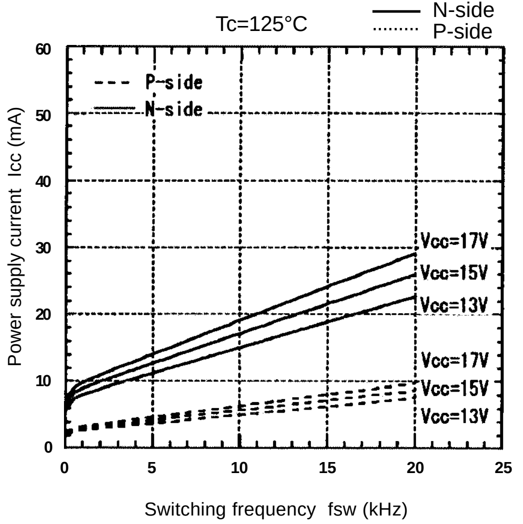


Mass : 450g

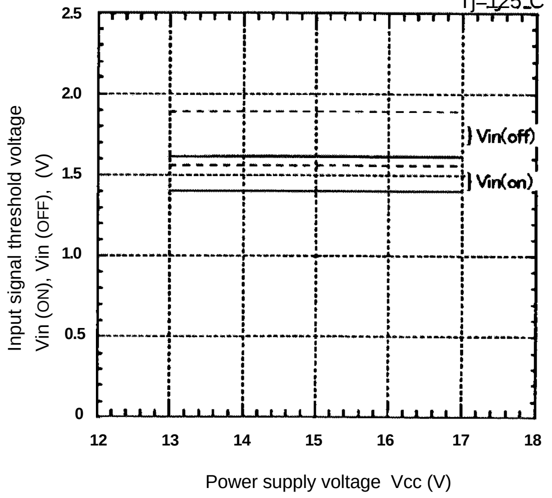
Characteristics

Control circuit characteristics (Respresentative)

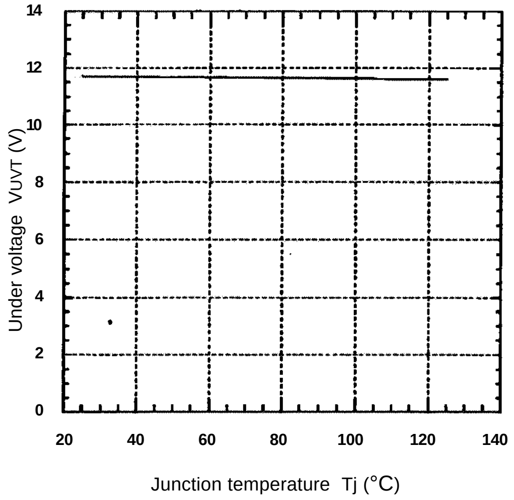
Power supply current vs. Switching frequency



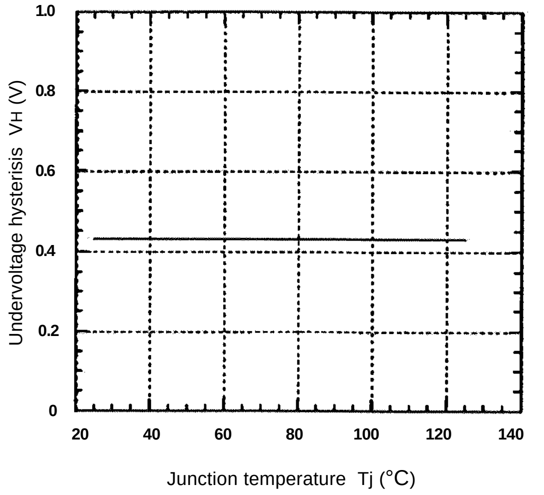
Input signal threshold voltage vs. Power supply voltage



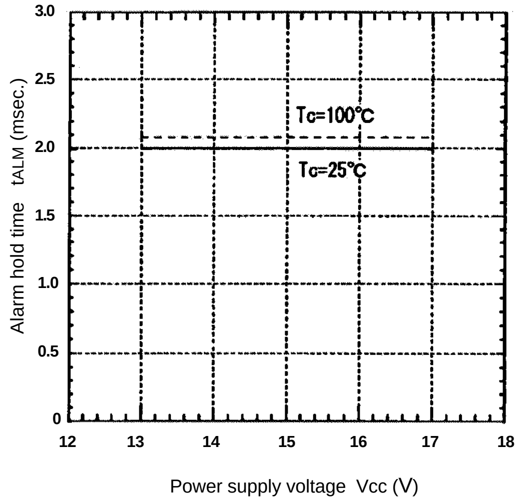
Under voltage vs. Junction temperature



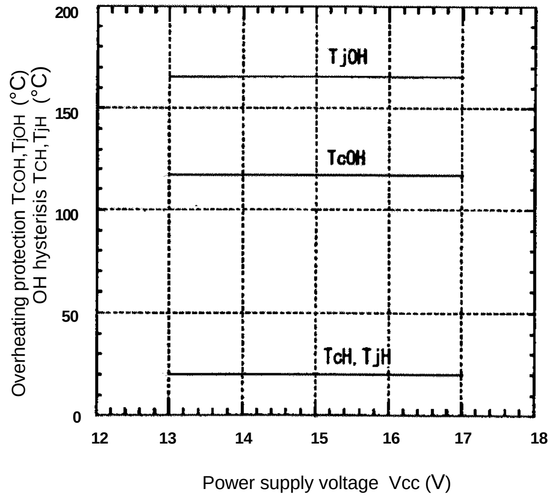
Under voltage hysterisis vs. Junction temperature



Alarm hold time vs. Power supply voltage

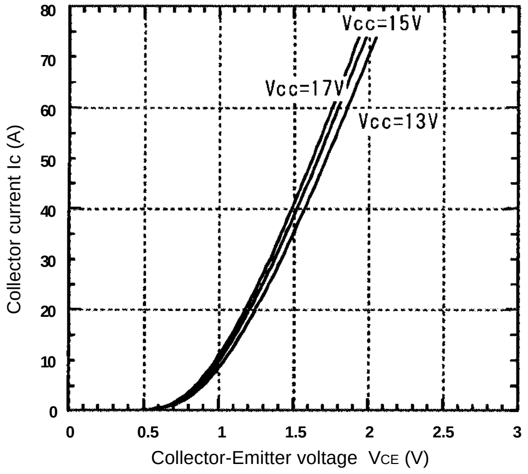


Overheating characteristics TCOH,TjOH,TCH,TjH vs. VCC

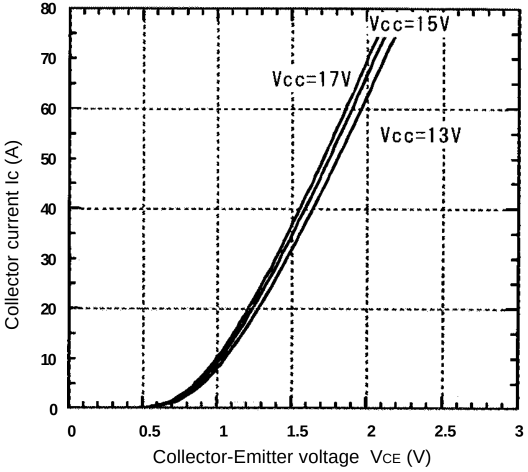


- **Main circuit characteristics (Respresentative)**

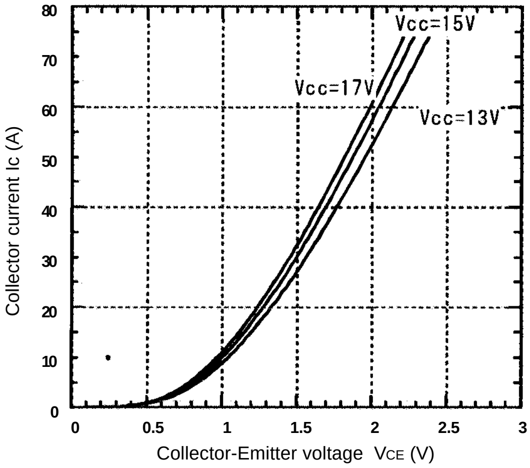
Collector current vs. Collector-Emitter voltage
Tj=25°C(Chip)



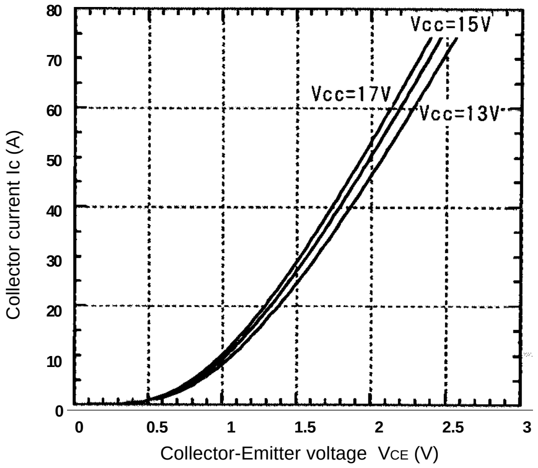
Collector current vs. Collector-Emitter voltage
Tj=25°C(Terminal)



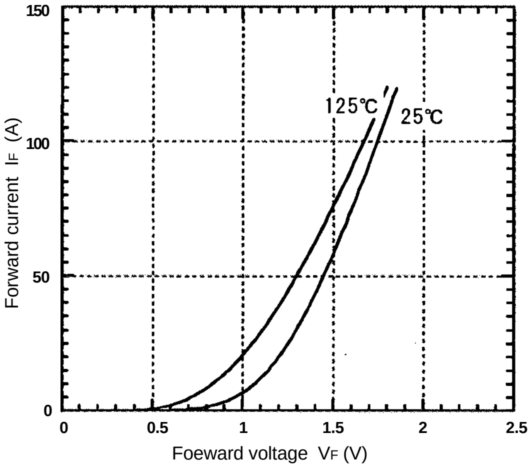
Collector current vs. Collector-Emitter voltage
Tj=125°C(Chip)



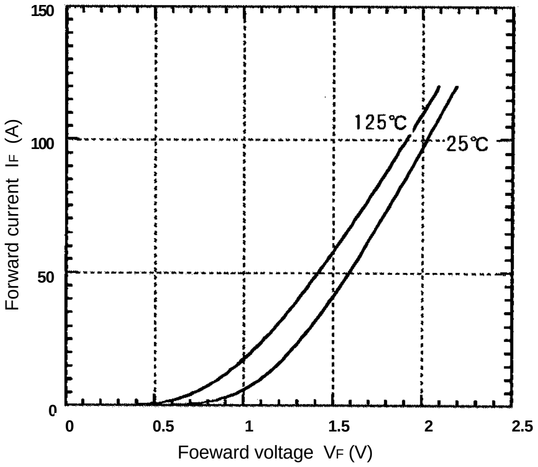
Collector current vs. Collector-Emitter voltage
Tj=125°C(Terminal)



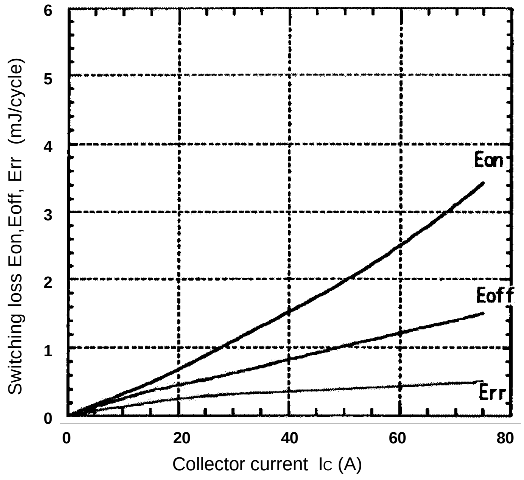
Forward current vs. Forward voltage
(Chip)



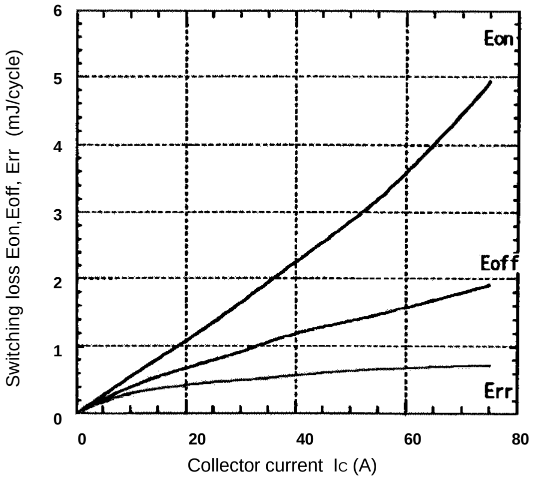
Forward current vs. Forward voltage
(Terminal)



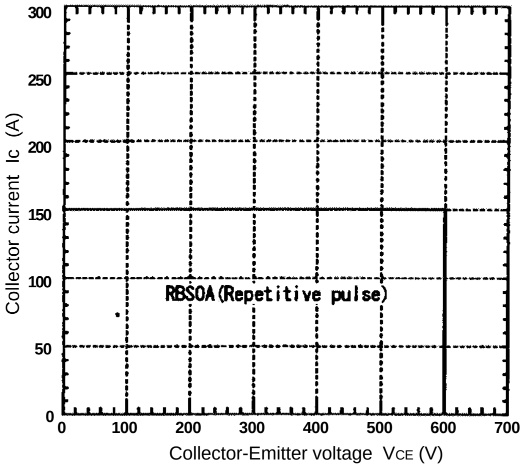
Switching Loss vs. Collector current
Edc=300V, Vcc=15V, Tj=25°C



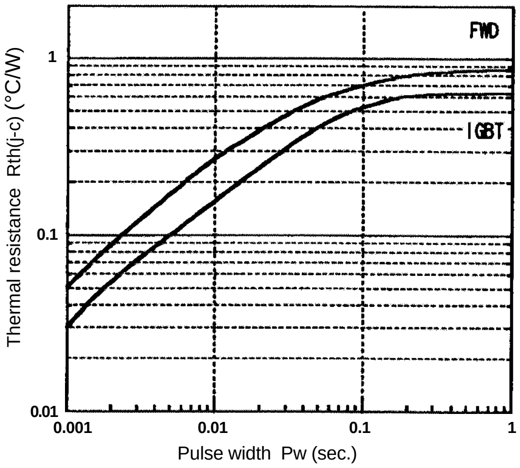
Switching Loss vs. Collector current
Edc=300V, Vcc=15V, Tj=125°C



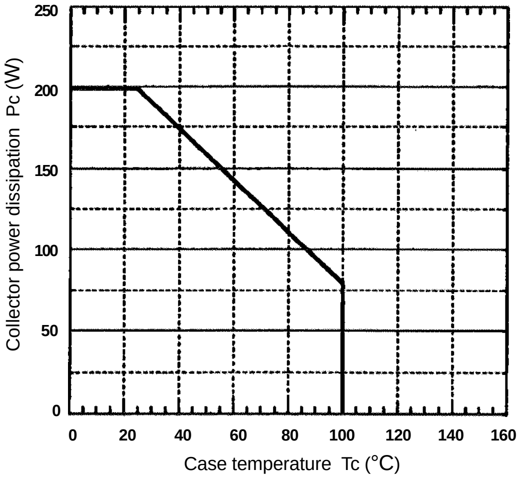
Reverse biased safe operating area
Vcc=15V, Tj ≦125°C



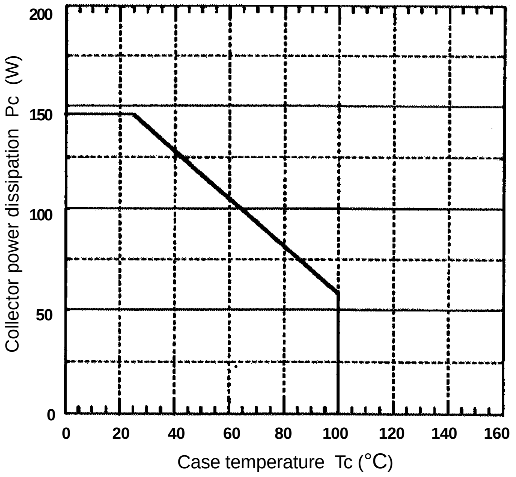
Transient thermal resistance



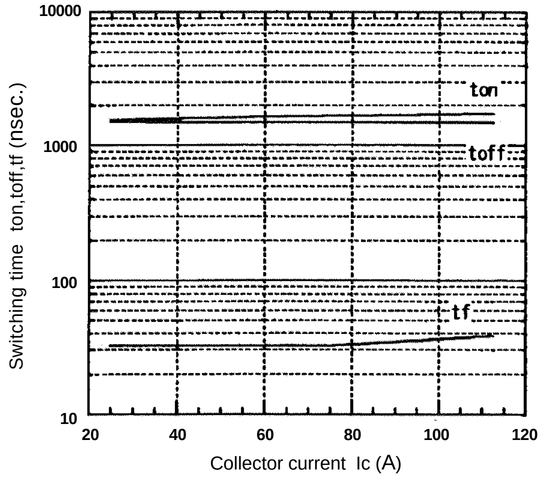
Power derating for IGBT (per device)



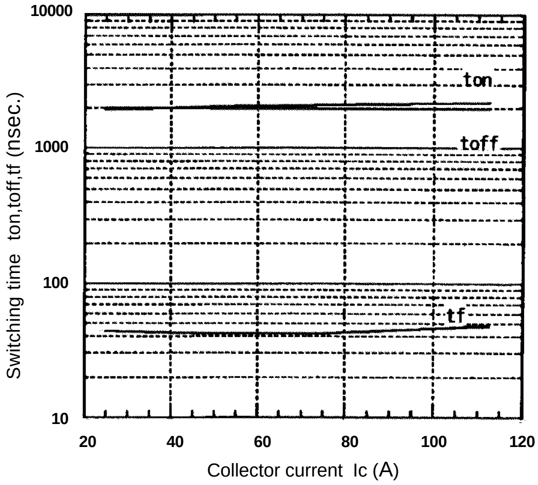
Power derating for FWD (per device)



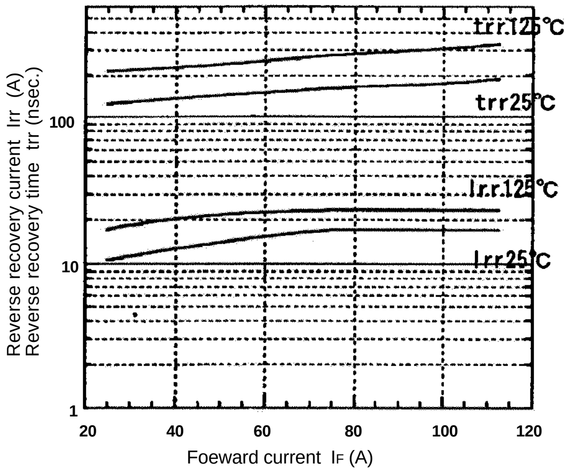
Switching time vs. Collector current
Edc=300V, Vcc=15V, Tj=25°C



Switching time vs. Collector current
Edc=300V, Vcc=15V, Tj=125°C

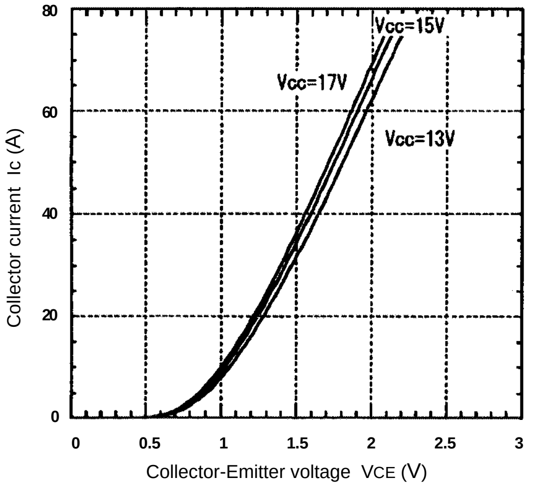


Reverse recovery characteristics
trr, Irr, vs. IF

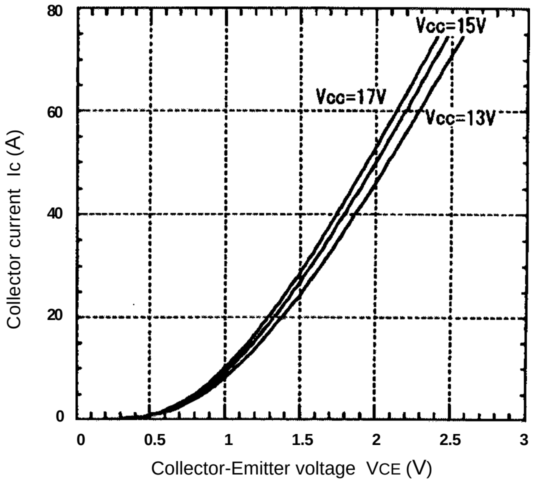


● Dynamic brake characteristics (Respresentative)

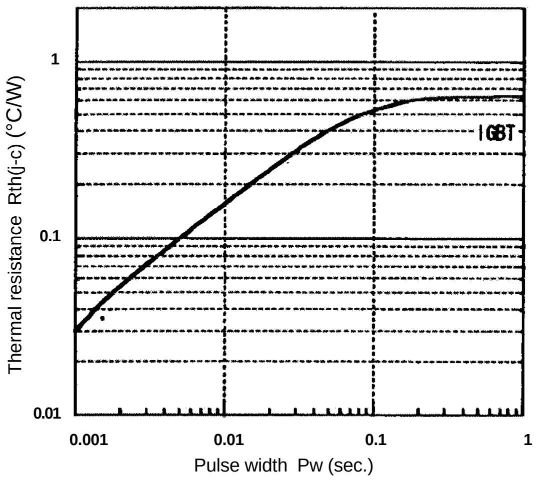
Collector current vs. Collector-Emitter voltage
Tj=25°C (Terminal)



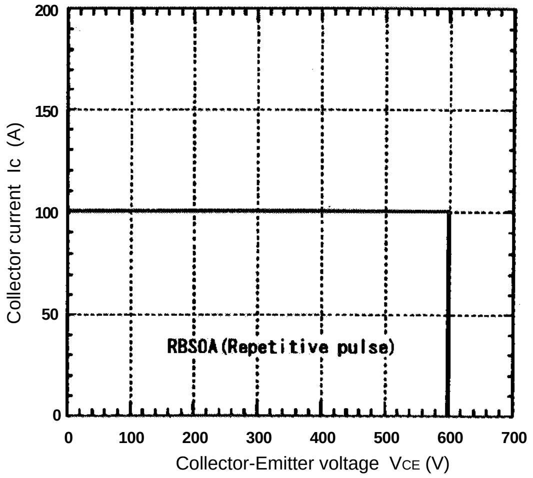
Collector current vs. Collector-Emitter voltage
Tj=125°C (Terminal)



Transient thermal resistance



Reverse biased safe operating area
Vcc=15V, Tj ≦125°C



Power derating for IGBT (per device)