

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	DC	V _{DC}	0	450	V	
	Surge	V _{DC(surge)}	0	500	V	
	Short operating	V _{sc}	200	400	V	
Collector-Emitter voltage *1	V _{CES}	0	600	V		
Inverter	Collector current	DC	I _C	-	75	A
		1ms	I _{CP}	-	150	A
		Duty=75.0% *2	-I _C	-	75	A
Collector power dissipation	One transistor *3	P _C	-	198	W	
Collector current	DC	I _C	-	50	A	
		I _{CP}	-	100	A	
	Forward current diode	I _F	-	50	A	
	Collector power dissipation	One transistor *3	P _C	-	198	W
Supply voltage of Pre-Driver *4	V _{CC}	-0.5	20	V		
Input signal voltage *5	V _{in}	-0.5	V _{CC} +0.5	V		
Input signal current	I _{in}	-	3	mA		
Alarm signal voltage *6	V _{ALM}	-0.5	V _{CC}	V		
Alarm signal current *7	I _{ALM}	-	20	mA		
Junction temperature	T _j	-	150	°C		
Operating case temperature	T _{opr}	-20	100	°C		
Storage temperature	T _{stg}	-40	125	°C		
Solder temperature *8	T _{sol}	-	260	°C		
Isolating voltage (Terminal to base, 50/60Hz sine wave 1min.)	V _{iso}	-	AC2500	V		
Screw torque	Mounting (M5)	-	3.5	N·m		

Note

*1 : V_{ces} shall be applied to the input voltage between terminal P and U or ,u or W, N and U or V or W

*2 : 125°C/FWD R_{th(j-c)}/(I_c x V_F MAX)=125/0.855/(75 x 2.6) x 100=75.0%

*3 : P_C=125°C/IGBT R_{th(j-c)}=125/0.63=198W [Inverter]

P_C=125°C/IGBT R_{th(j-c)}=125/0.63=198W [Breake]

*4 : V_{CC} shall be applied to the input voltage between terminal No.4 and 1, 8 and 5, 12 and 9, 14 and 13

*5 : V_{in} shall be applied to the input voltage between terminal No.3 and 1, 7 and 5, 11 and 9, 16,17,18 and 13.

*6 : V_{ALM} shall be applied to the voltage between terminal No.2 and 1, No6 and 5, No10 and 9, No.19 and 13.

*7 : I_{ALM} shall be applied to the input current to terminal No.2,6,10 and 19.

*8 : Immersion time 10±1sec.

Electrical characteristics (at T_c=T_j=25°C, V_{cc}=15V unless otherwise specified.)

● Main circuit

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	
Inverter	Collector current at off signal input	ICES	V _{CE} =600V V _{in} terminal open.	-	-	1.0	mA	
	Collector-Emitter saturation voltage	V _{CE(sat)}	I _c =75A	Terminal	-	-	2.4	V
				Chip	-	2.0	-	
	Forward voltage of FWD	V _F	-I _c =75A	Terminal	-	-	2.6	V
Chip				-	1.6	-		
Brake	Collector current at off signal input	ICES	V _{CE} =600V V _{in} terminal open.	-	-	1.0	mA	
	Collector-Emitter saturation voltage	V _{CE(sat)}	I _c =50A	Terminal	-	-	2.2	V
				Chip	-	1.75	-	
	Forward voltage of Diode	V _F	-I _c =50A	Terminal	-	-	3.3	V
Chip				-	1.9	-		
Turn-on time	ton	V _{DC} =300V, T _j =125°C		1.2	-	-	μs	
Turn-off time	toff	I _c =75A Fig.1, Fig.6		-	-	3.6		
Reverse recovery time	trr	V _{DC} =300V, I _c =75A Fig.1, Fig.6		-	-	0.3		
Maximum Avalanche Energy (A non-repetition)	P _{AV}	Internal wiring inductance=50nH Main circuit wiring inductance=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 Frequency : 0 to 15kHz T _c =-20 to 125°C Fig.7	-	-	18	mA
Supply current of N-line side pre-driver	I _{ccn}		-	-	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	R _{in} =20k ohm	-	8.0	-	V
Alarm signal hold time	t _{ALM}	T _c =-20°C Fig.2	1.1	-	-	ms
		T _c =25°C Fig.2	-	2.0	-	ms
		T _c =125°C Fig.2	-	-	4.0	ms
Current limit resistor	R _{ALM}	Alarm terminal	1425	1500	1575	ohm

● Protection Section (V_{cc}=15V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Over Current Protection Level of Inverter circuit	I _{oc}	T _j =125°C	113	-	-	A
Over Current Protection Level of Brake circuit	I _{oc}	T _j =125°C	75	-	-	A
Over Current Protection Delay time	t _{DOC}	T _j =125°C	-	5	-	μs
SC Protection Delay time	t _{SC}	T _j =125°C Fig.4	-	-	8	μs
IGBT Chip Over Heating	T _{jOH}	Surface of IGBT chips	150	-	-	°C
Over Heating Protection Hysteresis	T _{jH}		-	20	-	°C
Under Voltage Protection Level	V _{UV}		11.0	-	12.5	V
Under Voltage Protection Hysteresis	V _H		0.2	0.5	-	V

● Thermal characteristics(T_c=25°C)

Item			Symbol	Min.	Typ.	Max.	Unit
Junction to Case thermal resistance *9	Inverter	IGBT	R _{th(j-c)}	-	-	0.63	°C/W
		FWD	R _{th(j-c)}	-	-	0.855	°C/W
	Brake	IGBT	R _{th(j-c)}	-	-	0.63	°C/W
Case to fin thermal resistance with compound			R _{th(c-f)}	-	0.05	-	-°C/W

*9 For 1 device, Case is under the device

● Noise Immunity (V_{DC}=300V, V_{cc}=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

● Weight

Item	Symbol	Min.	Typ.	Max.	Unit
Weight	W _t	-	270	-	g

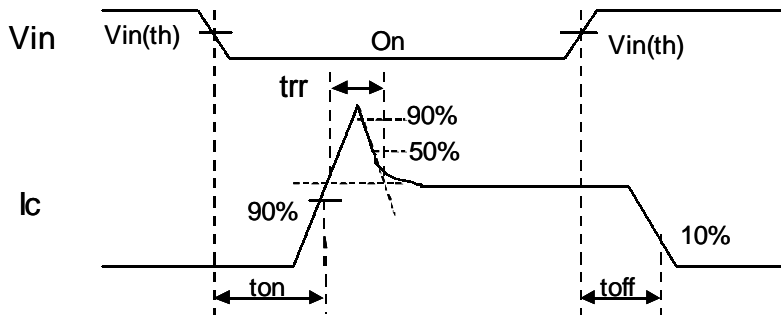


Figure 1. Switching Time Waveform Definitions



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

Figure 2. Input/Output Timing Diagram

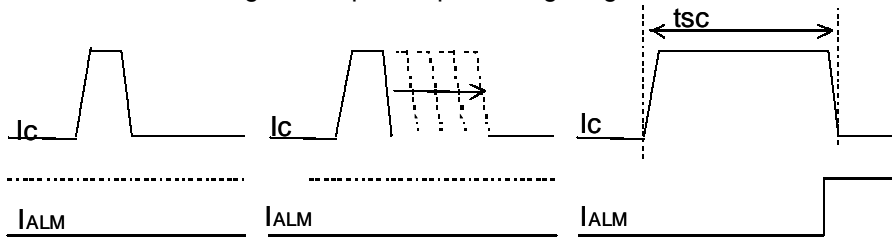


Figure.4 Definition of tsc



Figure 5. Noise Test Circuit

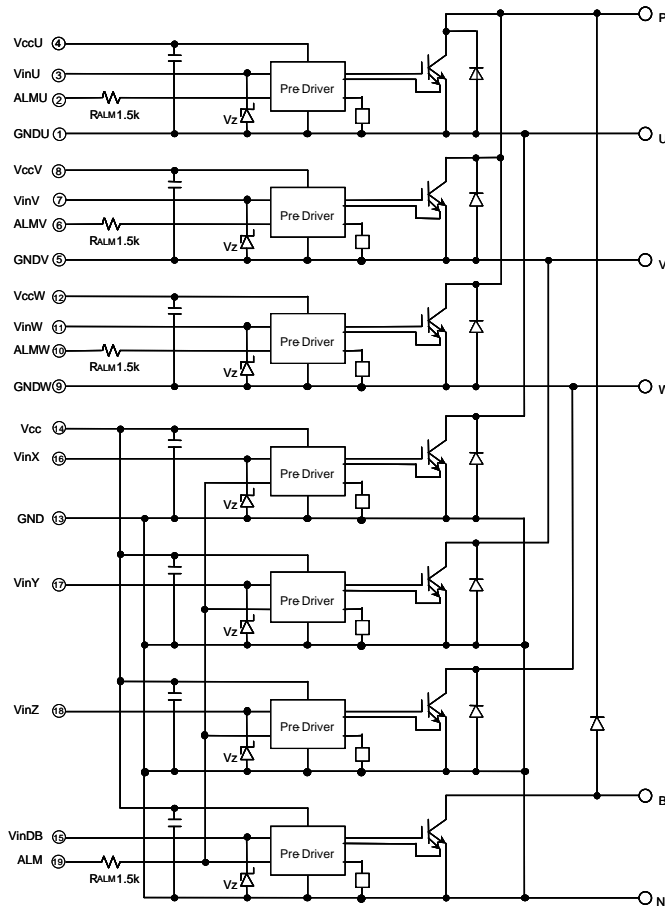


Figure 6. Switching Characteristics Test Circuit



Figure 7. Icc Test Circuit

Block diagram

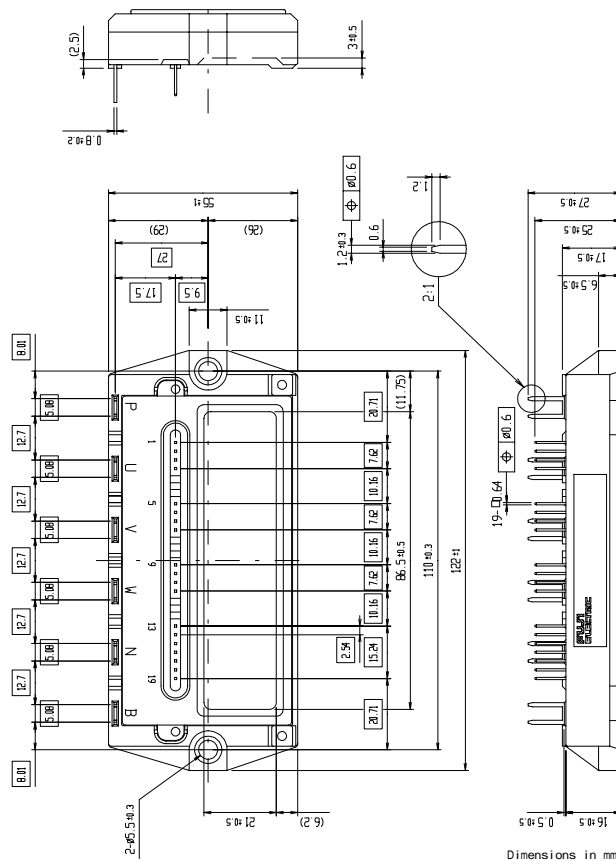


Pre-drivers include following functions

1. Amplifier for driver
2. Short circuit protection
3. Under voltage lockout circuit
4. Over current protection
5. IGBT chip over heating protection

Outline drawings, mm

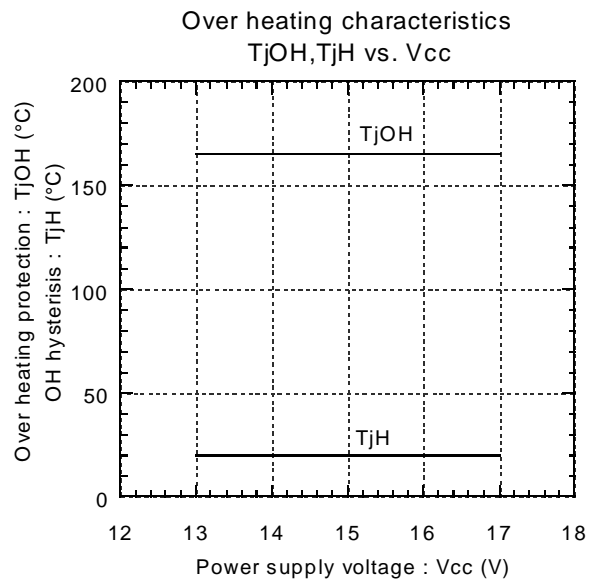
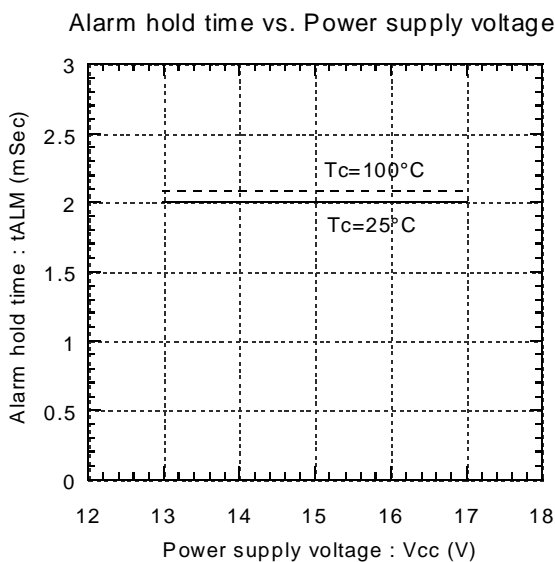
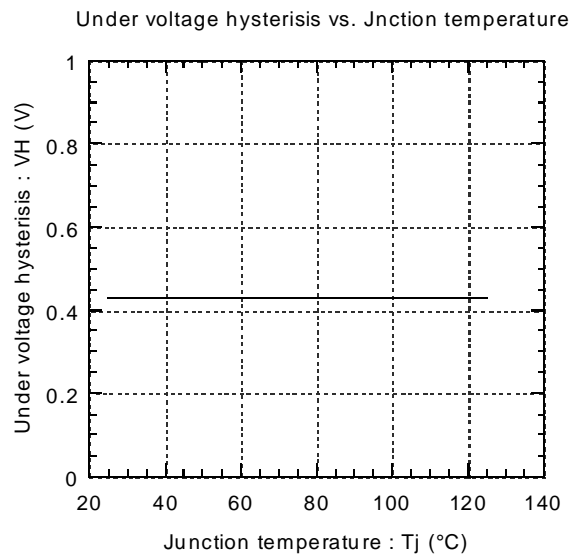
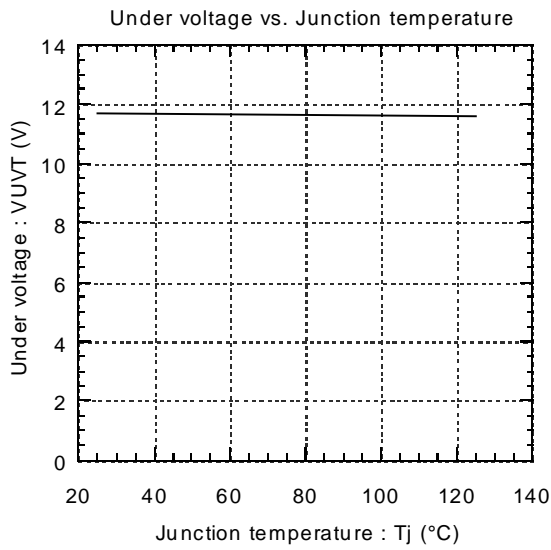
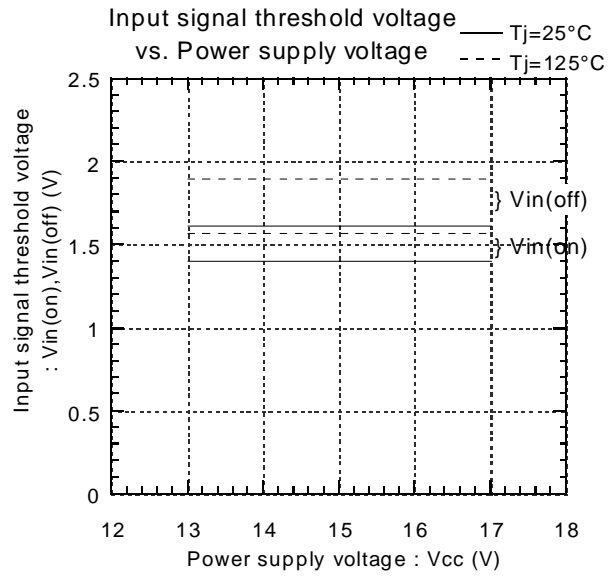
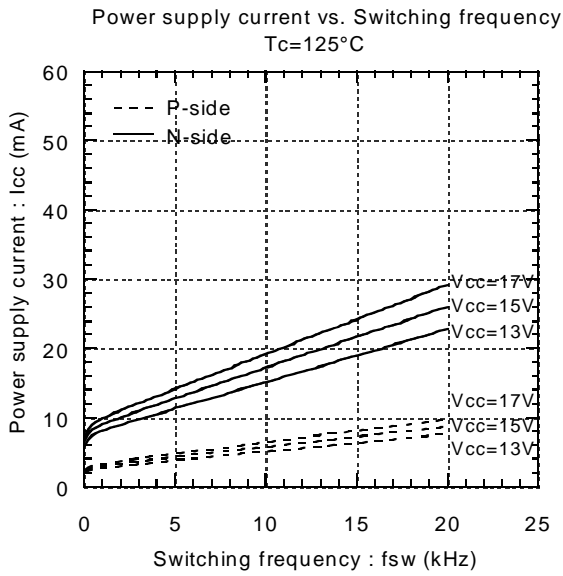
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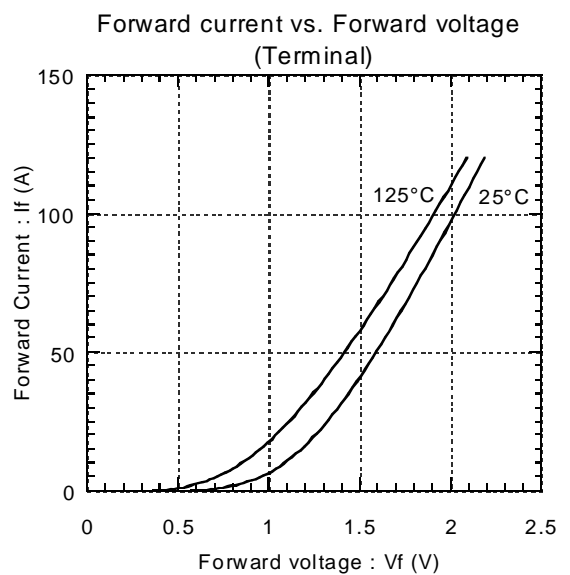
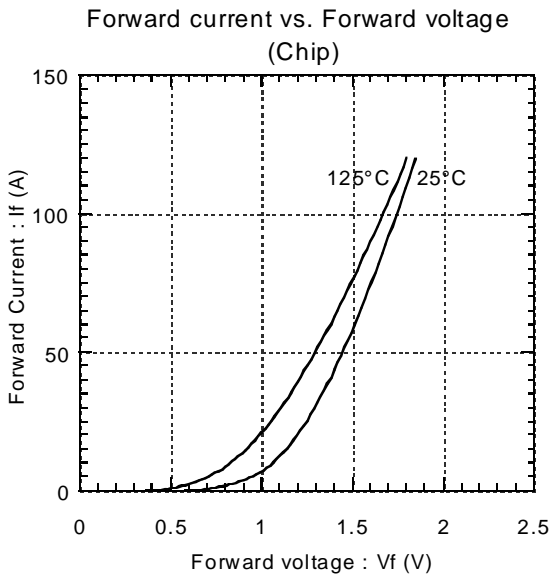
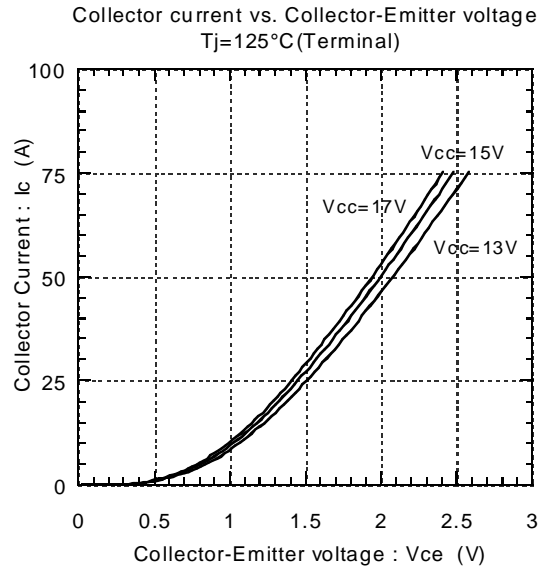
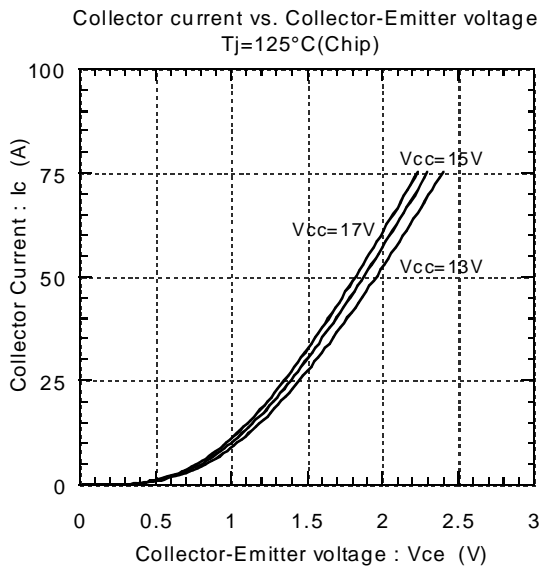
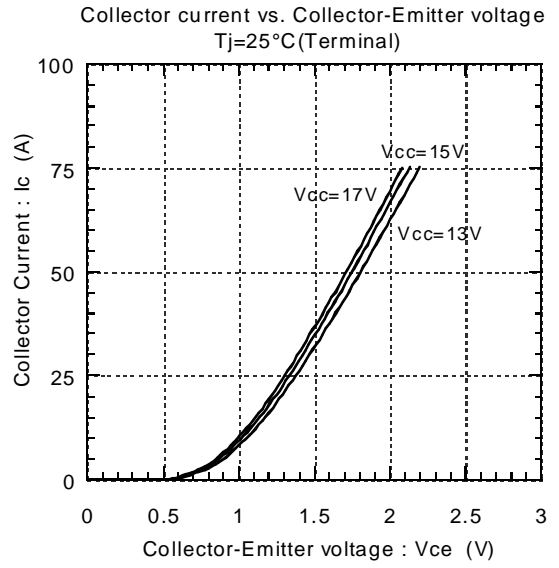
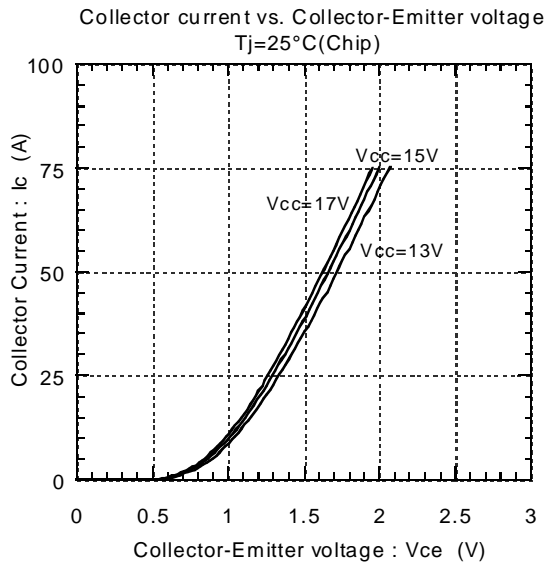
Mass : 270g

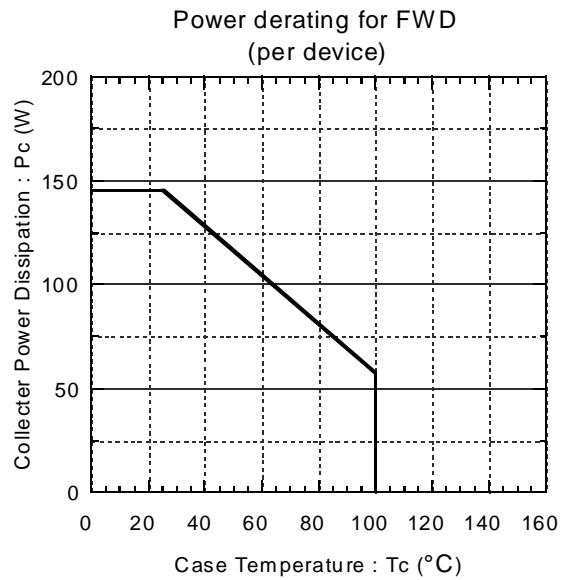
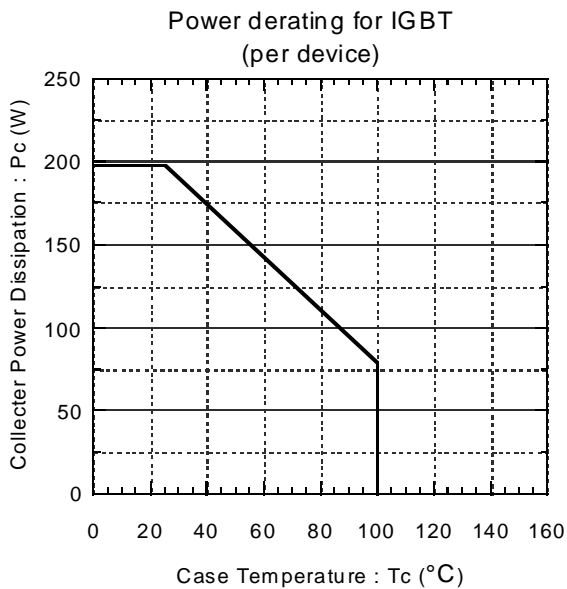
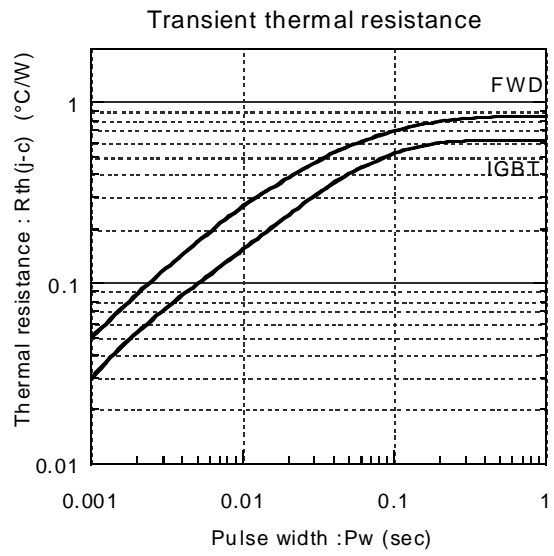
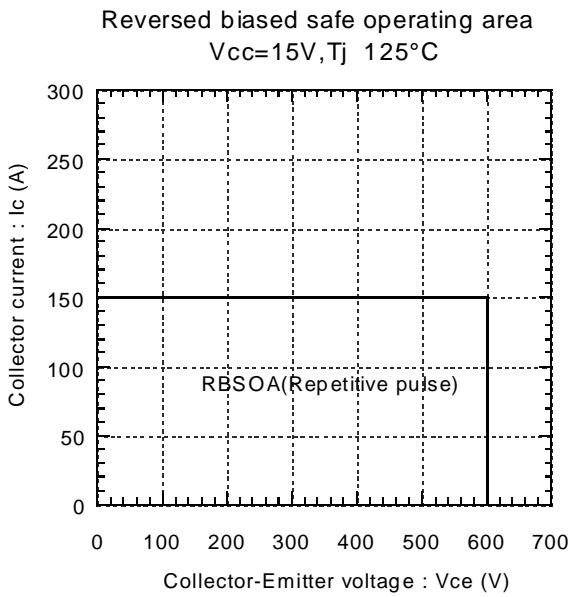
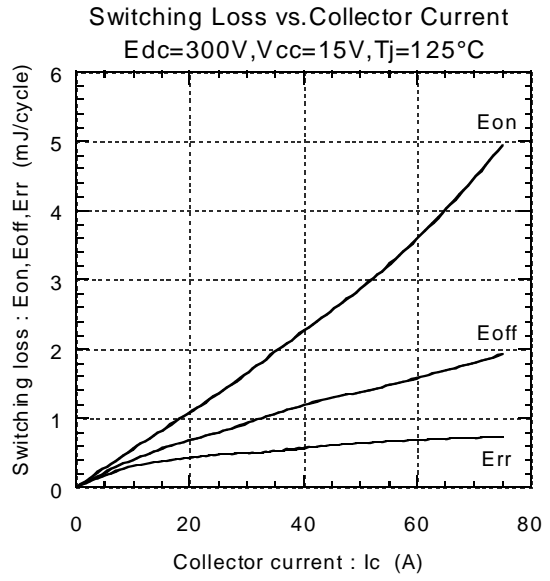
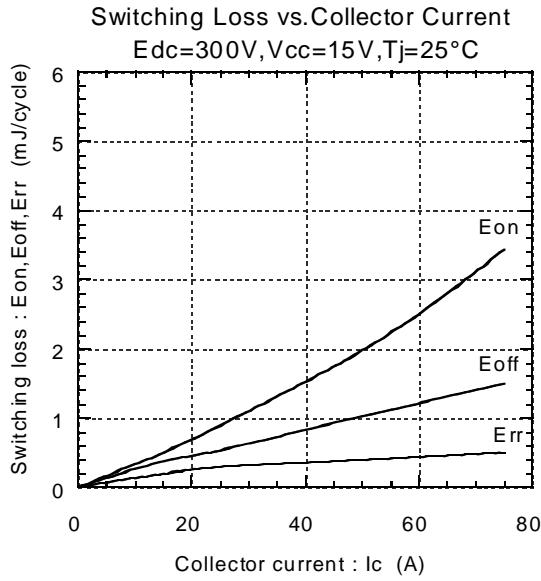
Characteristics

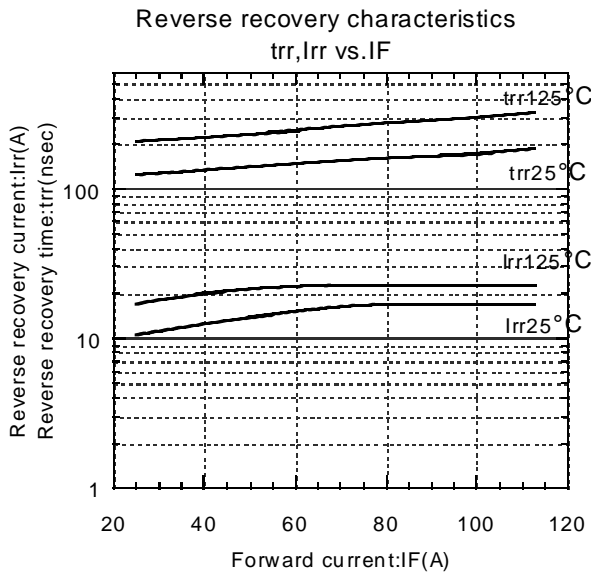
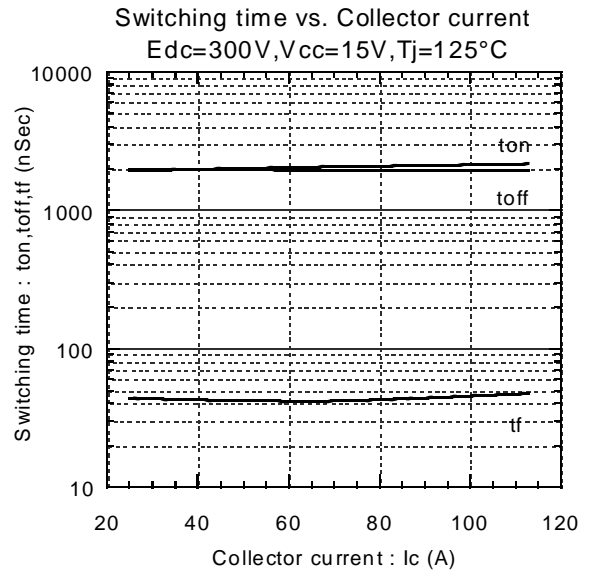
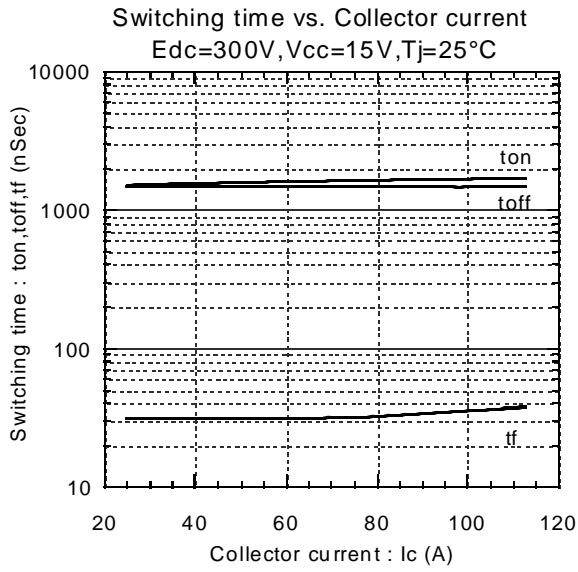
Control circuit characteristics (Representative)



● Main circuit characteristics (Representative)



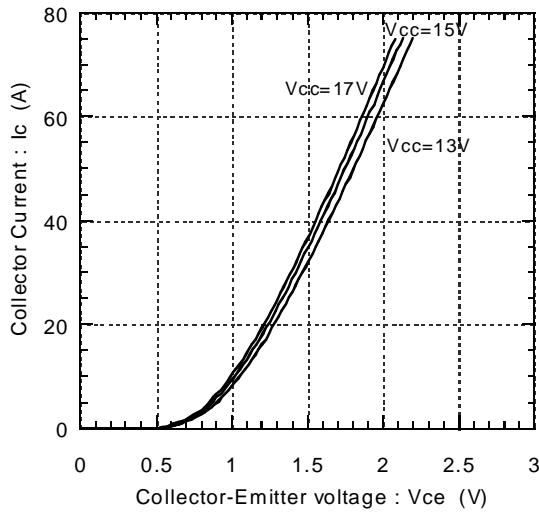




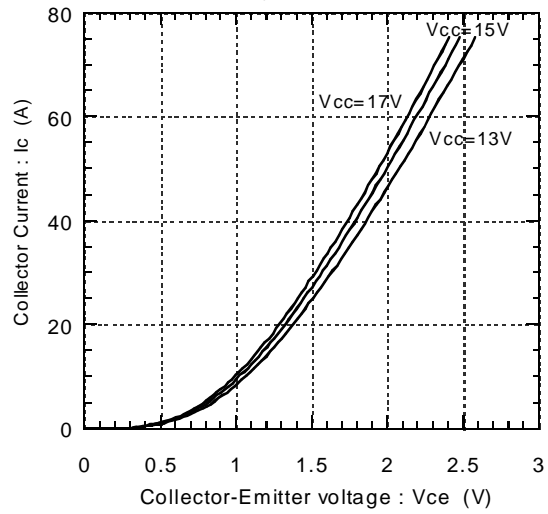
Characteristics

Dynamic Brake Characteristics (Representative)

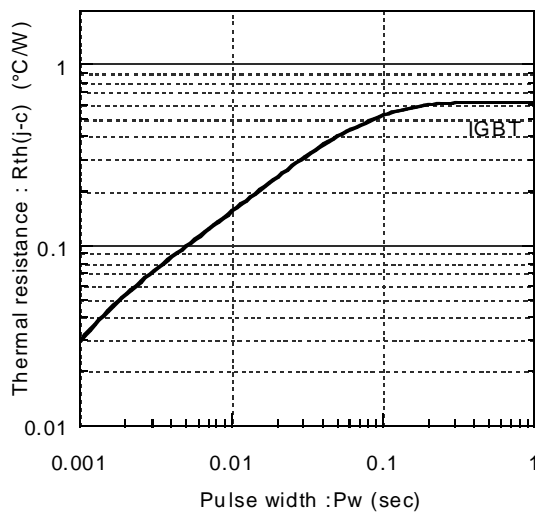
Collector current vs. Collector-Emmitter voltage
T_j=25°C



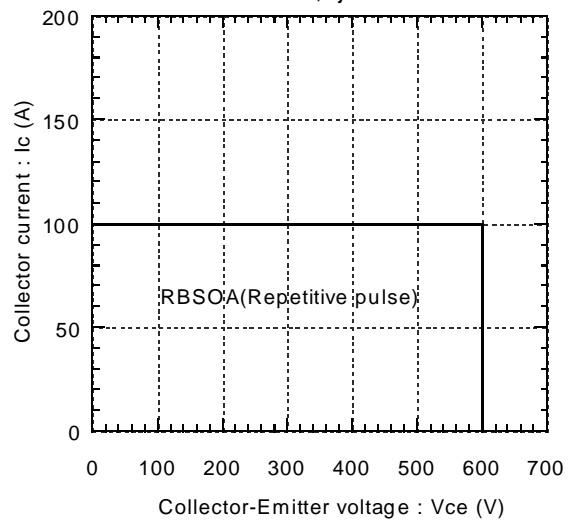
Collector current vs. Collector-Emmitter voltage
T_j=125°C



Transient thermal resistance



Reversed biased safe operating area
V_{cc}=15V, T_j 125°C



Power derating for IGBT
(per device)

