

■ 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	900	V	
	Surge	V _{DC(surge)}	0	1000	V	
	Short operating	V _{SC}	200	800	V	
Collector-Emitter voltage *1		V _{CES}	0	1200	V	
Inverter	Collector current	DC	I _C	-	75	A
		1ms	I _{CP}	-	150	A
		Duty=76.1% *2	-I _C	-	75	A
Collector power dissipation		One transistor *3	P _C	-	500	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	
Isolating voltage (Terminal to base, 50/60Hz sine wave 1min.)		V _{iso}	-	AC2500	V	
Screw torque	Terminal (M5)		-	3.5	N·m	
	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 : $125^{\circ}\text{C}/\text{FWD } R_{\text{th(j-c)}}/(I_{\text{c}} \times V_{\text{F MAX}}) = 125/0.73/(75 \times 3.0) \times 100 = 76.1\%$

*3 : $P_{\text{c}} = 125^{\circ}\text{C}/\text{IGBT } R_{\text{th(j-c)}} = 125/0.25 = 500\text{W}$ [Inverter]

*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.

● **Electrical characteristics** (at $T_c=T_j=25^\circ\text{C}$, $V_{cc}=15\text{V}$ unless otherwise specified.)

Main circuit

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	
Inverter	Collector current at off signal input	ICES	$V_{CE}=1200\text{V}$ V_{in} terminal open.	-	-	1.0	mA	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	IC=75A	Terminal	-	-	2.6	V
				Chip	-	1.9	-	
	Forward voltage of FWD	VF	-IC=75A	Terminal	-	-	3.0	V
Chip				-	2.3	-		
Turn-on time	ton	$V_{DC}=600\text{V}$, $T_j=125^\circ\text{C}$		1.2	-	-	μs	
Turn-off time	toff	IC=75A Fig.1, Fig.6		-	-	3.6		
Reverse recovery time	trr	$V_{DC}=600\text{V}$, $I_F=75\text{A}$ Fig.1, Fig.6		-	-	0.3		

● **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	$R_{in}=20\text{k ohm}$	-	8.0	-	V
Alarm signal hold time	t _{ALM}	$T_c=-20^\circ\text{C}$ Fig.2	1.1	-	-	ms
		$T_c=25^\circ\text{C}$ Fig.2	-	2.0	-	ms
		$T_c=125^\circ\text{C}$ Fig.2	-	-	4.0	ms
Limiting Resistor for Alarm	R _{ALM}		1425	1500	1575	ohm

● **Protection Section** ($V_{cc}=15\text{V}$)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Over Current Protection Level of Inverter circuit	I _{OC}	$T_j=125^\circ\text{C}$	113	-	-	A
Over Current Protection Delay time	t _{DOC}	$T_j=125^\circ\text{C}$	-	10	-	μs
SC Protection Delay time	t _{SC}	$T_j=125^\circ\text{C}$ Fig.4	-	-	12	μs
IGBT Chip Over Heating Protection Temperature Level	T _{JOH}	Surface of IGBT chips	150	-	-	$^\circ\text{C}$
Over Heating Protection Hysteresis	T _{JH}		-	20	-	$^\circ\text{C}$
Over Heating Protection Protection Temperature Level	T _{COH}	$V_{DC}=0\text{V}$, $I_C=0\text{A}$ Case Temperature	110	-	125	$^\circ\text{C}$
Over Heating Protection Hysteresis	T _{dH}		-	20	-	$^\circ\text{C}$
Under Voltage Protection Level	V _{UV}		11.0	-	12.5	V
Under Voltage Protection Hysteresis	V _H		0.2	0.5	-	V

● **Thermal characteristics**($T_c=25^\circ\text{C}$)

Item			Symbol	Min.	Typ.	Max.	Unit
Junction to Case thermal resistance *8	Inverter	IGBT	R _{th(j-c)}	-	-	0.25	$^\circ\text{C/W}$
		FWD	R _{th(j-c)}	-	-	0.73	$^\circ\text{C/W}$
Case to fin thermal resistance with compound			R _{th(c-f)}	-	0.05	-	$^\circ\text{C/W}$

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

● **Noise Immunity** ($V_{DC}=300\text{V}$, $V_{cc}=15\text{V}$, Test Circuit Fig.5)

Item	Condition	Min.	Typ.	Max.	Unit
Common mode rectangular noise	Pulse width 1 μs , polarity \pm , 10minuets Judge : no over-current, no miss operating	± 2.0	-	-	kV
Common mode lightning surge	Rise time 1.2 μs , Fall time 50 μs 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}	-	-	800	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	Wt	-	450	-	g

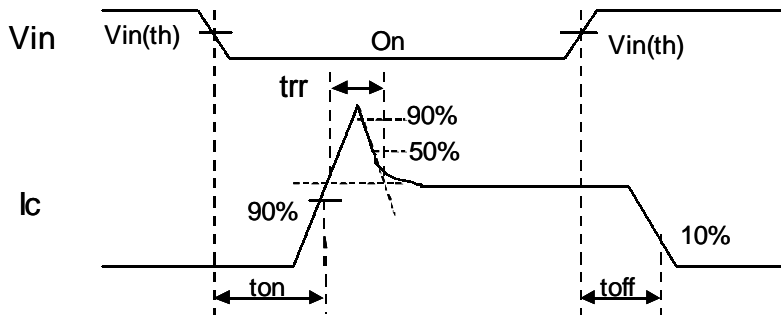


Figure 1. Switching Time Waveform Definitions



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

Figure 2. Input/Output Timing Diagram

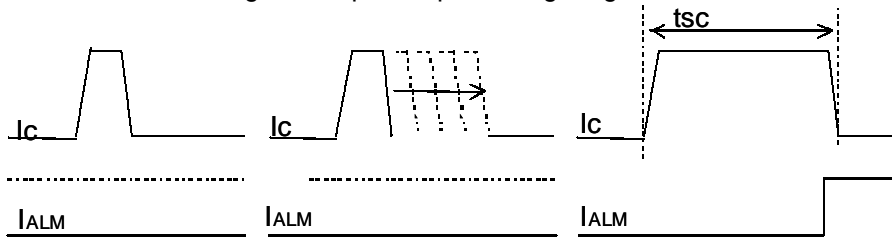


Figure.4 Definition of tsc



Figure 5. Noise Test Circuit

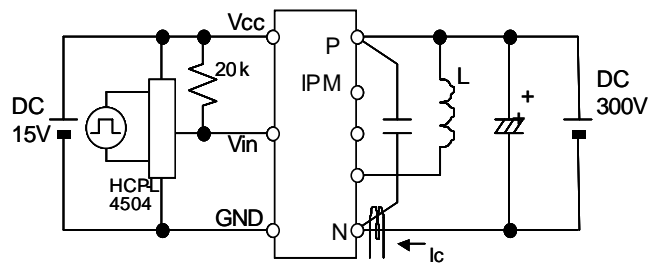


Figure 6. Switching Characteristics Test Circuit

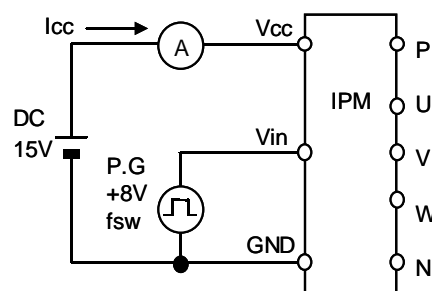
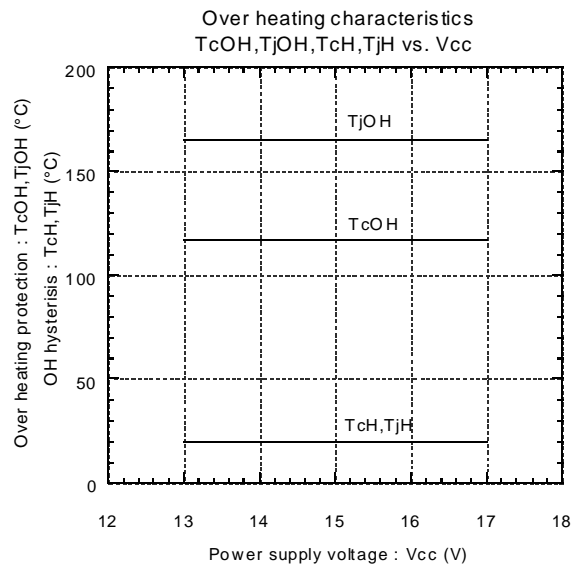
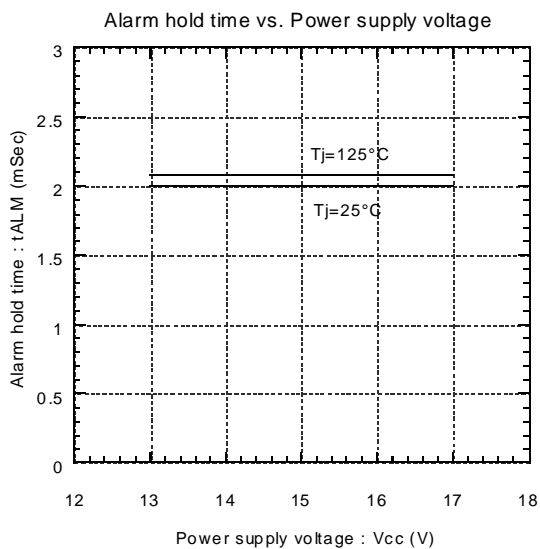
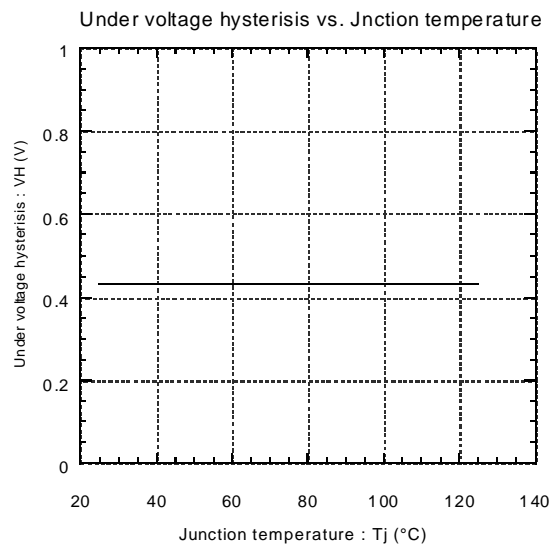
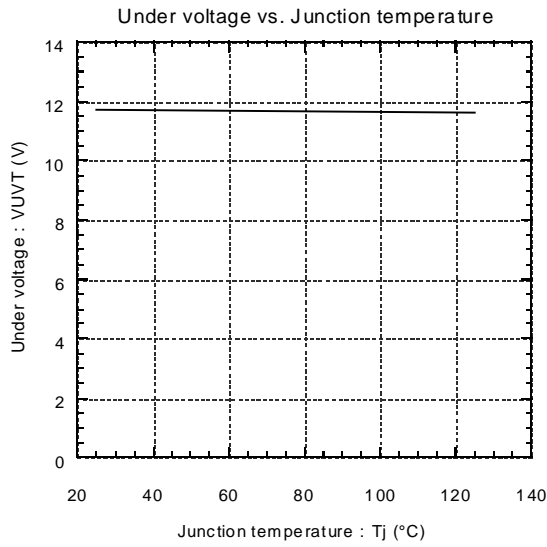
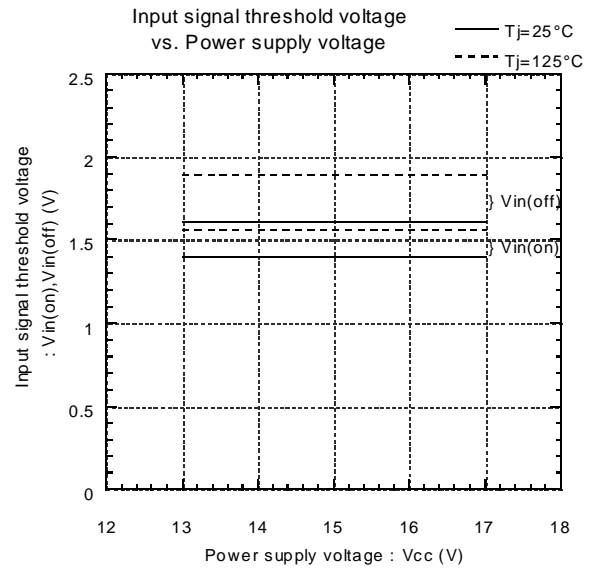
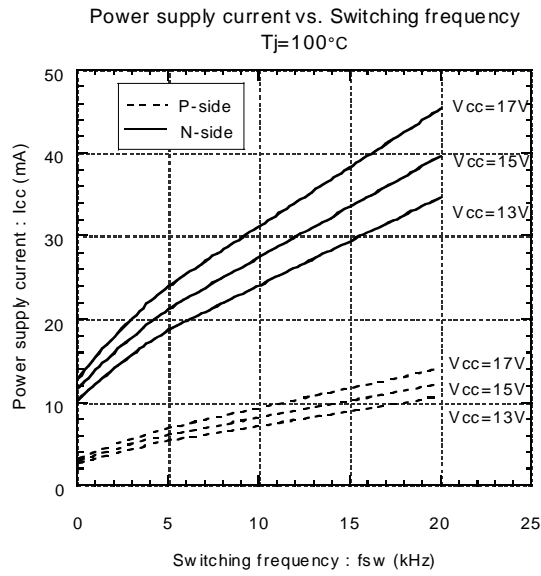


Figure 7. Icc Test Circuit

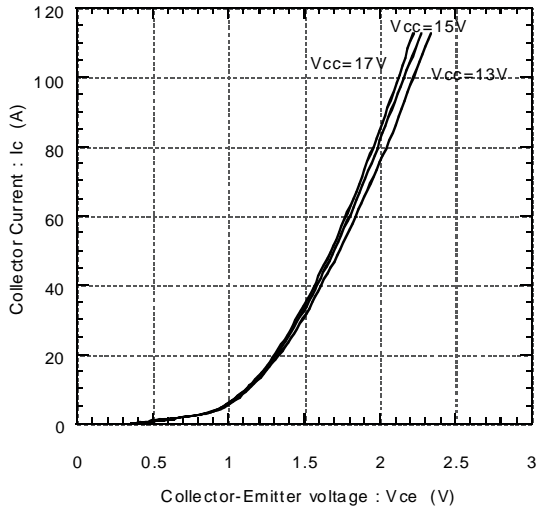
Characteristics

Control circuit characteristics (Representative)

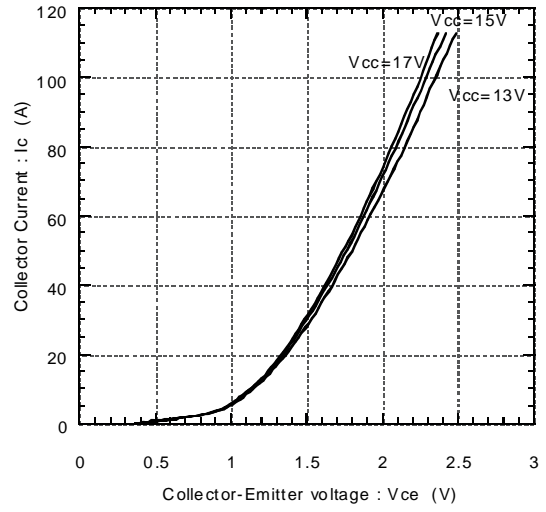


● Main circuit characteristics (Representative)

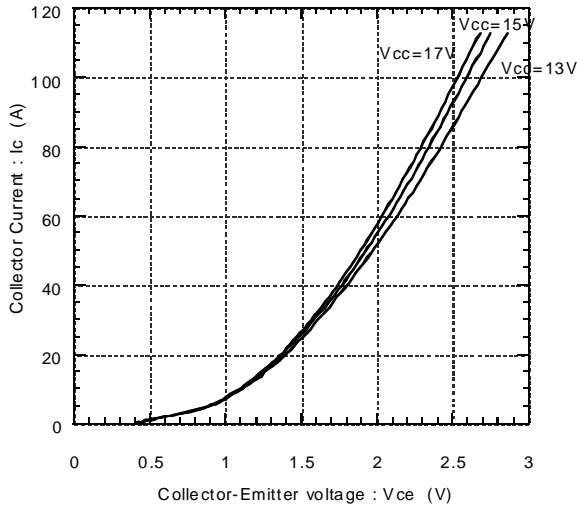
Collector current vs. Collector-Emitter voltage
Tj=25°C(Chip)



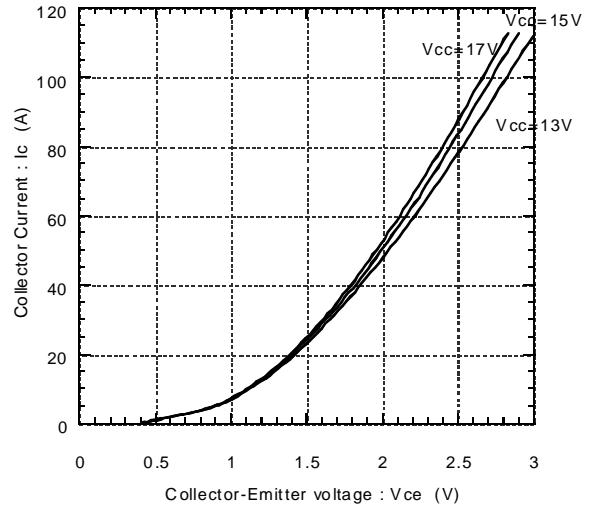
Collector current vs. Collector-Emitter voltage
Tj=25°C(Terminal)



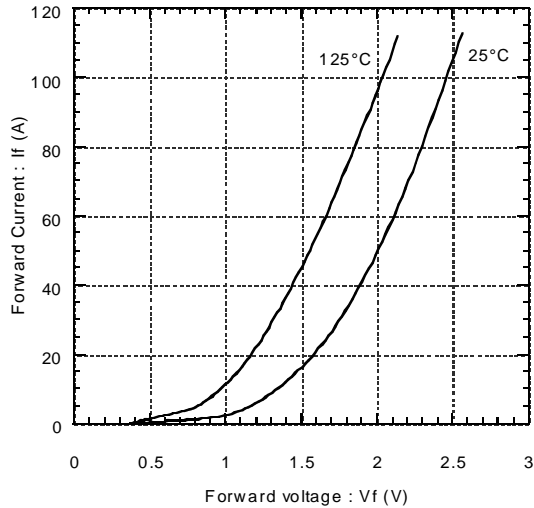
Collector current vs. Collector-Emitter voltage
Tj=125°C(Chip)



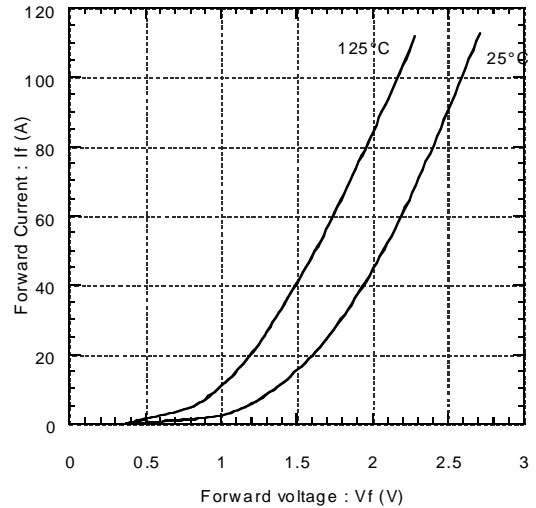
Collector current vs. Collector-Emitter voltage
Tj=125°C(Terminal)



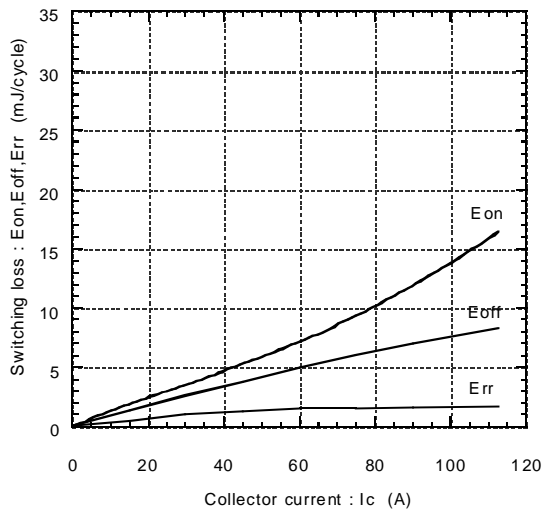
Forward current vs. Forward voltage
(Chip)



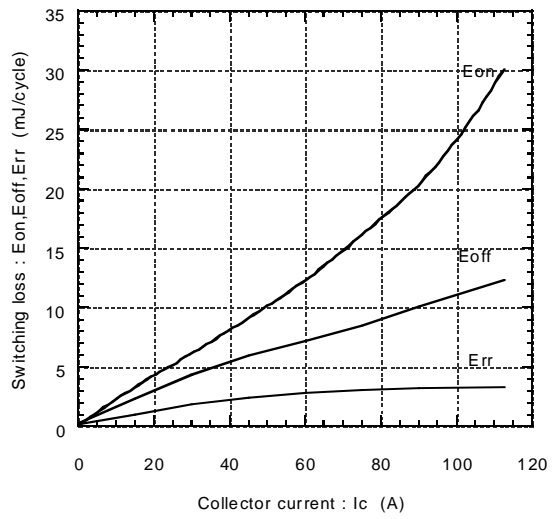
Forward current vs. Forward voltage
(Terminal)



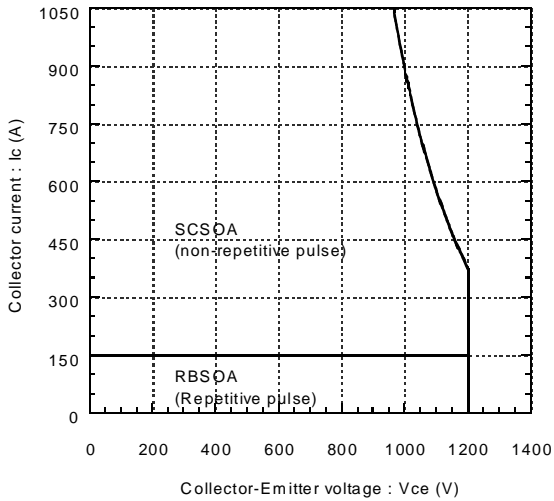
Switching Loss vs. Collector Current
 $E_{dc}=600V, V_{cc}=15V, T_j=25^\circ C$



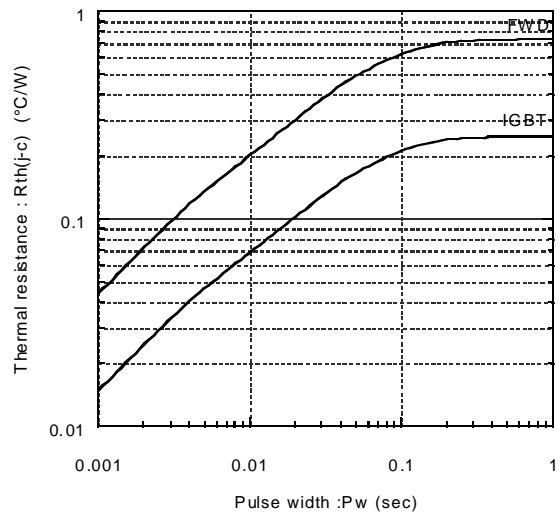
Switching Loss vs. Collector Current
 $E_{dc}=600V, V_{cc}=15V, T_j=125^\circ C$



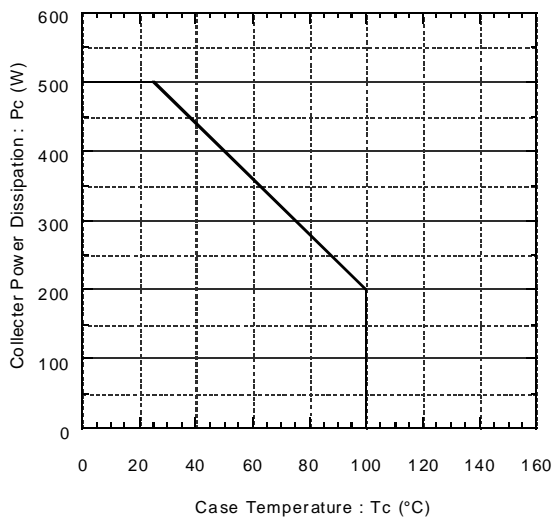
Reversed biased safe operating area
 $V_{cc}=15V, T_j \le 125^\circ C$



Transient thermal resistance



Power derating for IGBT
(per device)



Power derating for FWD
(per device)

