

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.
- Both P-side and N-side alarm output available.
- 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	-	25	A
		1ms	I _{CP}	-	50	A
		DC	-I _C	-	25	A
Brake	Collector power dissipation	One transistor *3	P _C	-	198	W
	Collector current	DC	I _C	-	15	A
		1ms	I _{CP}	-	30	A
	Forward Current of Diode		I _F	-	15	A
	Collector power dissipation	One transistor *3	P _C		120	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 V or W or DB, N and U or V or W or DB.

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

P_C=125°C/IGBT R_{th(j-c)}=125/1.04=120W [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, 15,16,17,18 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	I_{CES} $V_{CE}=1200\text{V}$ V_{in} terminal open.	-	-	1.0	mA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ $I_c=25\text{A}$	-	-	2.6	V
	Forward voltage of FWD	V_F $-I_c=25\text{A}$	-	-	3.0	V
Brake	Collector current at off signal input	I_{CES} $V_{CE}=1200\text{V}$ V_{in} terminal open.	-	-	1.0	mA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ $I_c=15\text{A}$ Terminal	-	-	2.6	V
	Forward voltage of Diode	V_F $-I_c=15\text{A}$ Terminal	-	-	3.3	V
Turn-on time			0.3	-	-	μs
Turn-off time			-	-	3.6	
Reverse recovery time			-	-	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}	$T_j=125^\circ\text{C}$	38	-	-	A
Over Current Protection Level of Brake circuit	I_{oc}	$T_j=125^\circ\text{C}$	23	-	-	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_{cH}		-	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	$R_{th(j-c)}$	-	0.63	$^\circ\text{C/W}$
		FWD	$R_{th(j-c)}$	-	1.33	$^\circ\text{C/W}$
	Brake	IGBT	$R_{th(j-c)}$	-	1.04	$^\circ\text{C/W}$
Case to fin thermal resistance with compound			$R_{th(c-f)}$	-	0.05	-

*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 $1\mu\text{s}$, polarity $\pm 10\text{minuets}$ Judge : no over-current, no miss operating	± 2.0	-	-	kV
Common mode lightning surge	Rise time $1.2\mu\text{s}$, Fall time $50\mu\text{s}$ 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	W_t	-	450	-	g

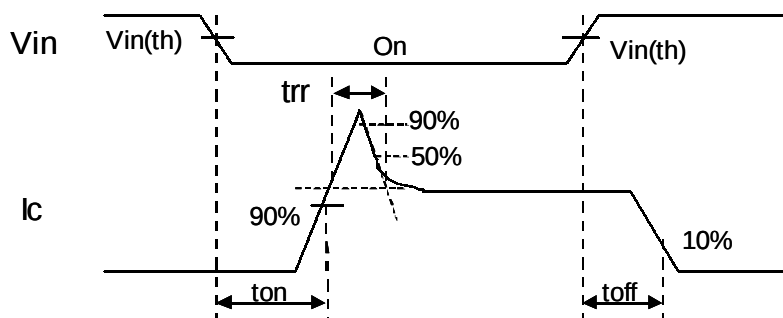
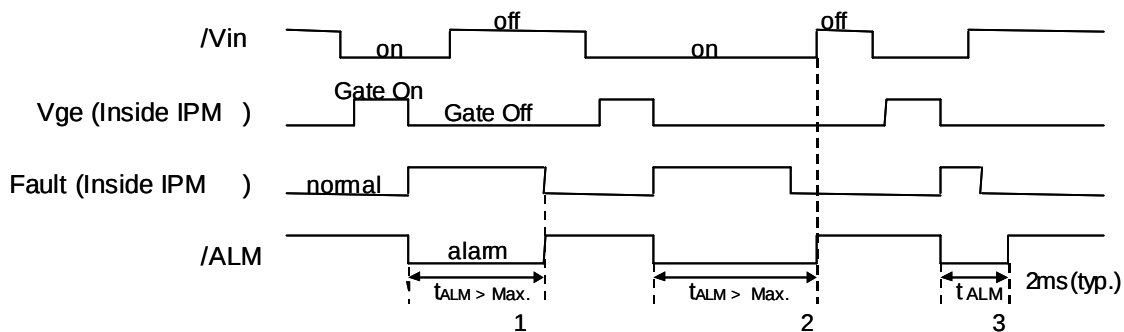


Figure 1. Switching Time Waveform Definitions



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

Figure 2. Input/Output Timing Diagram

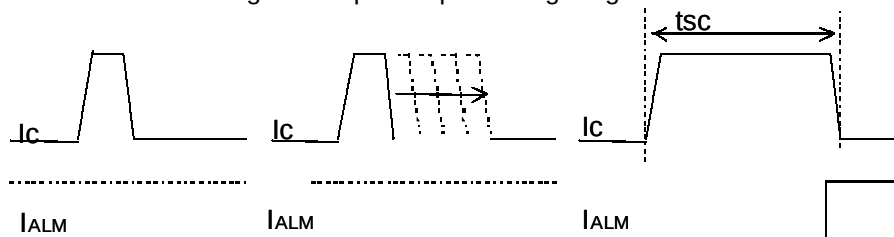


Figure.4 Definition of tsc

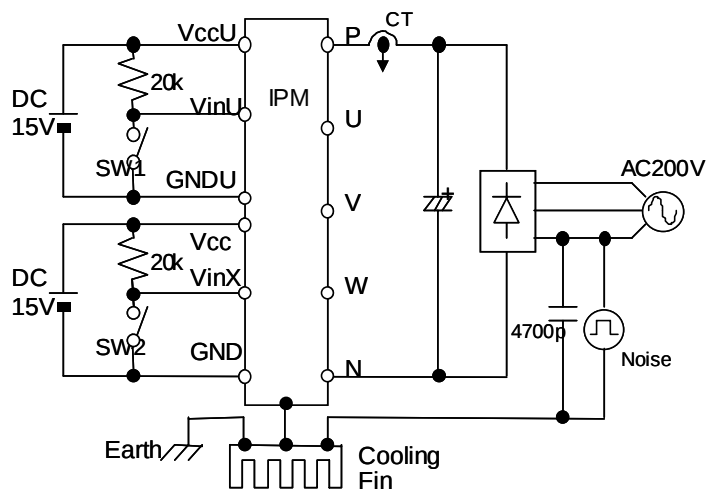


Figure 5. Noise Test Circuit

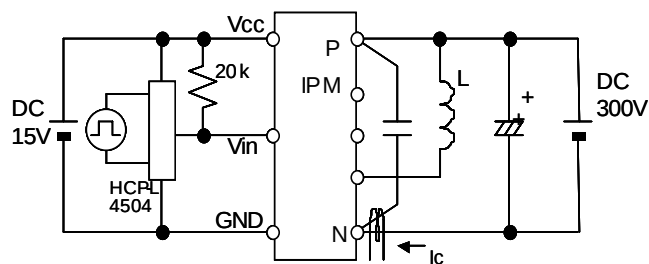


Figure 6. Switching Characteristics Test Circuit

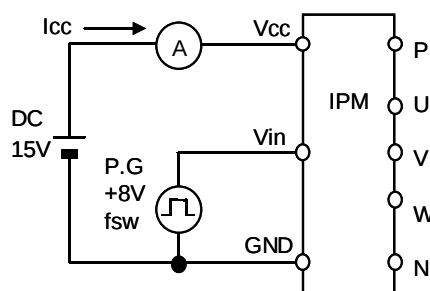
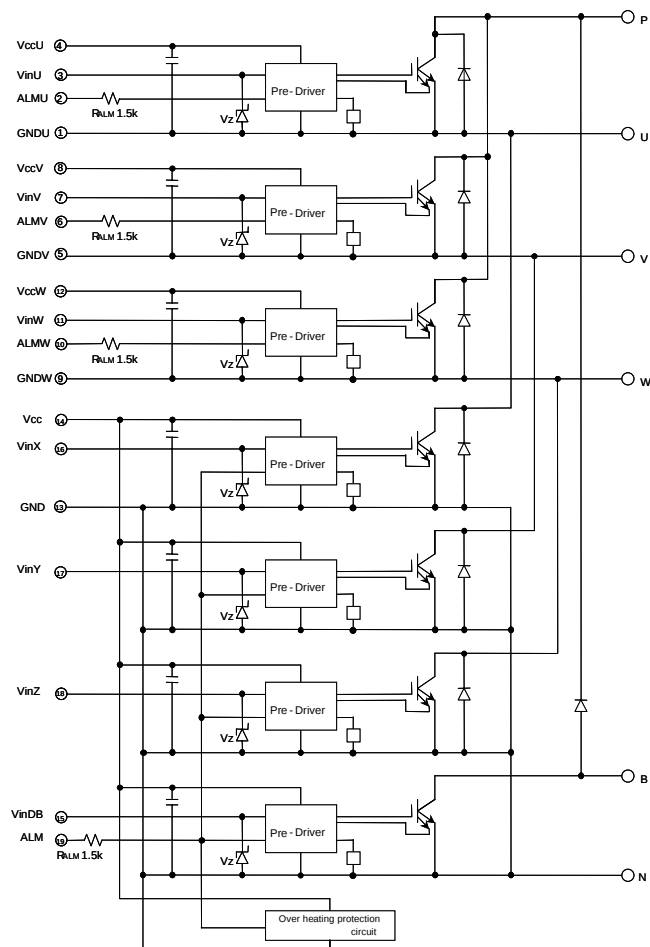


Figure 7. Icc Test Circuit

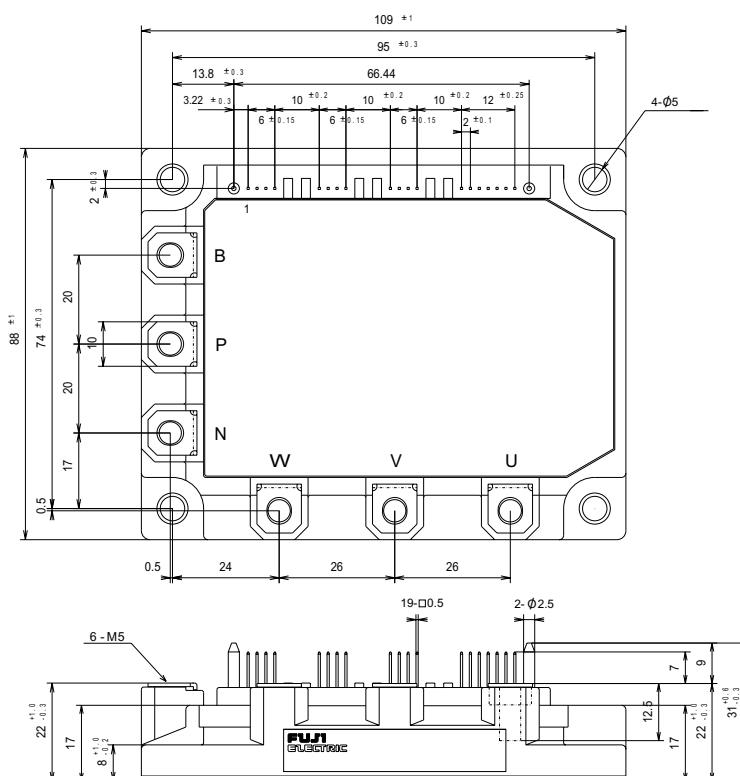
Block diagram



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

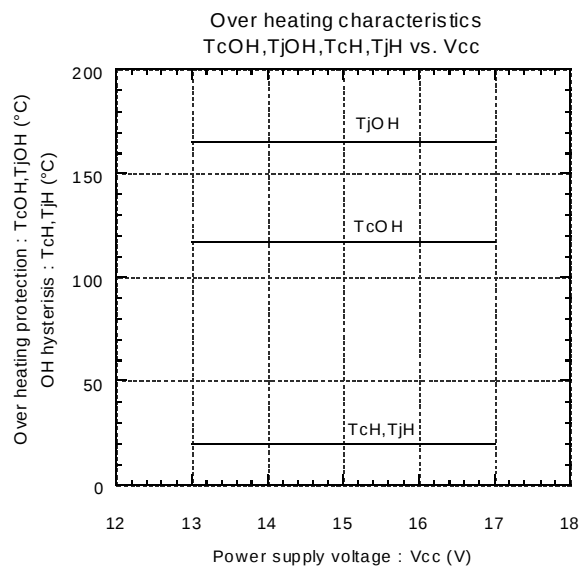
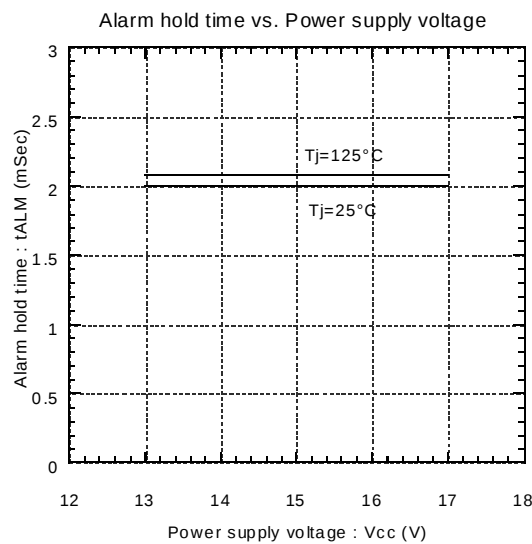
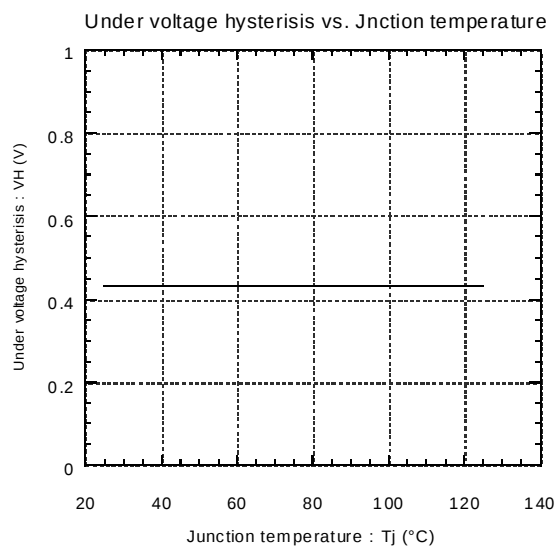
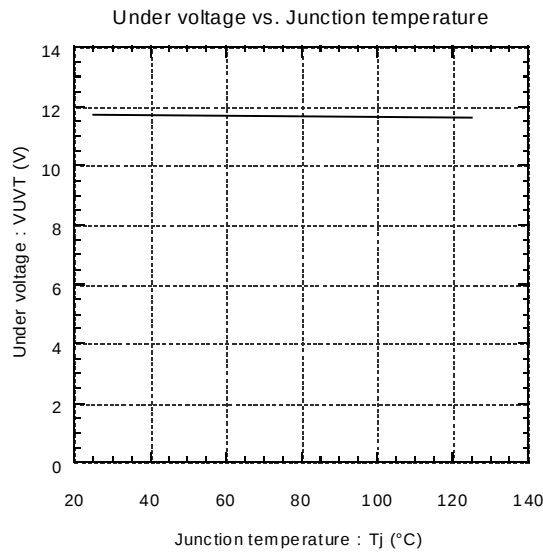
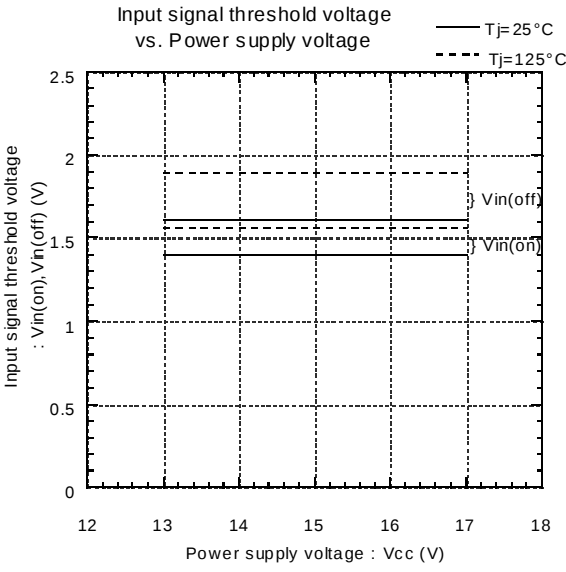
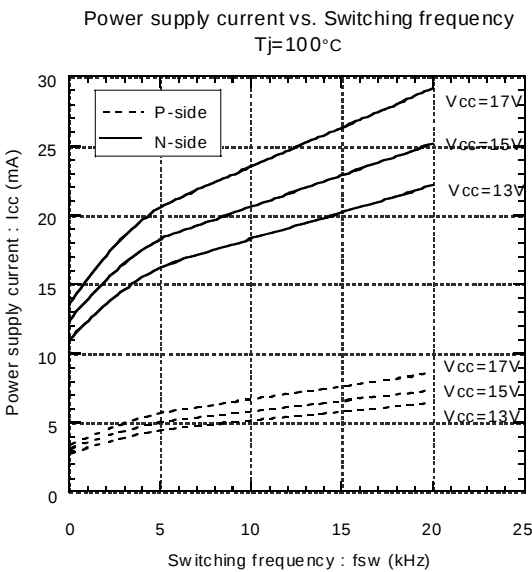
Outline drawings, mm



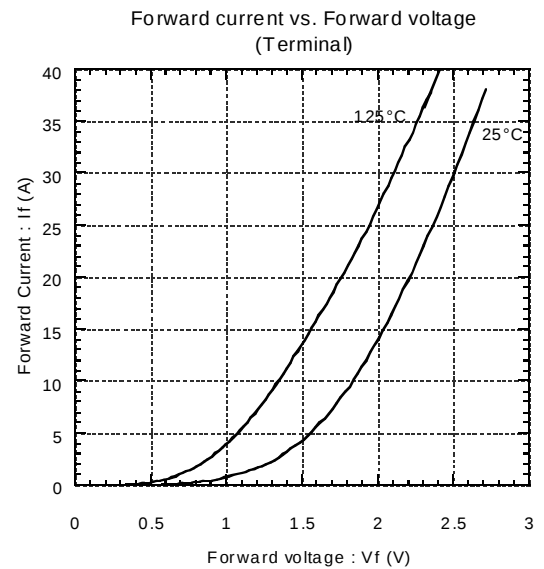
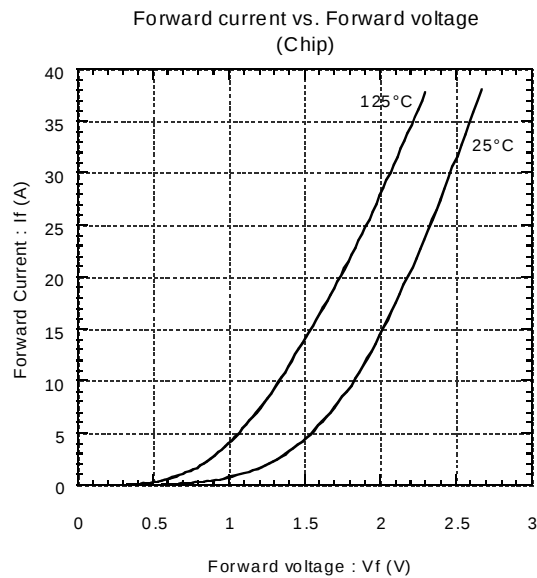
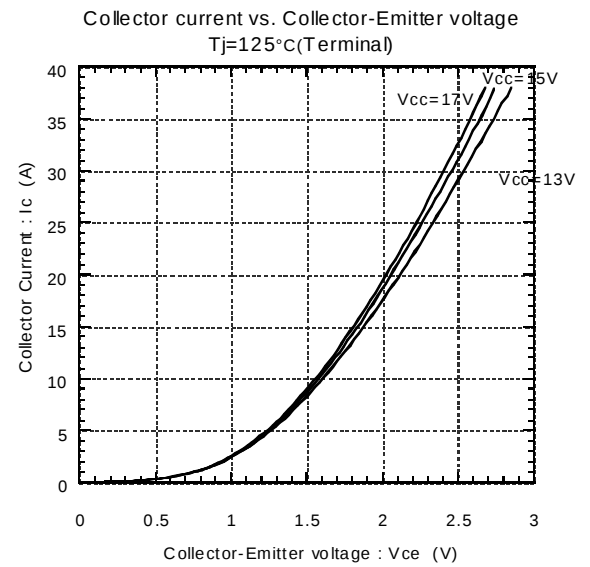
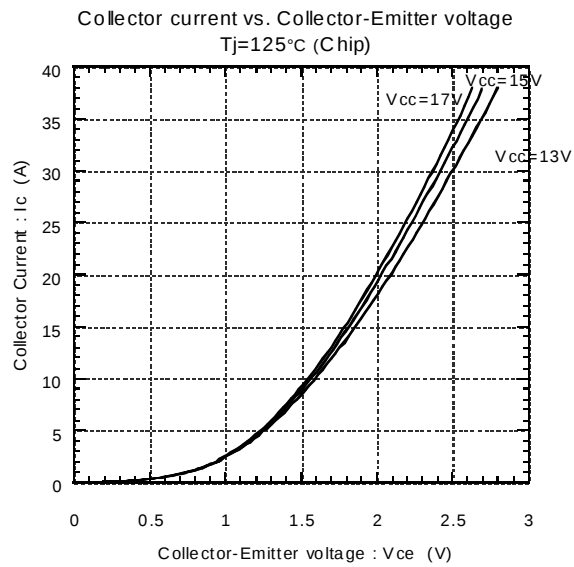
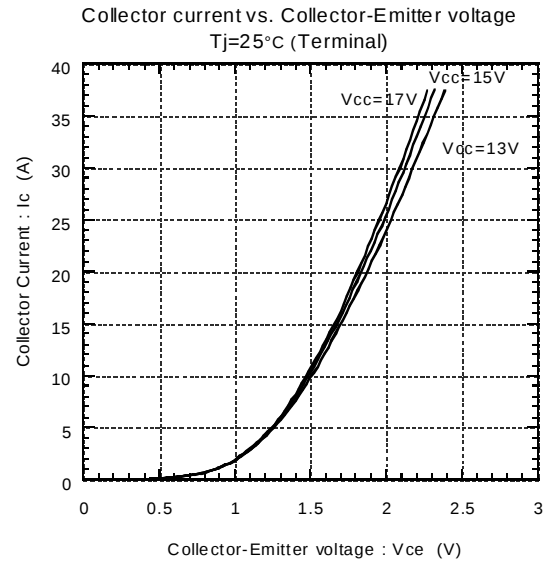
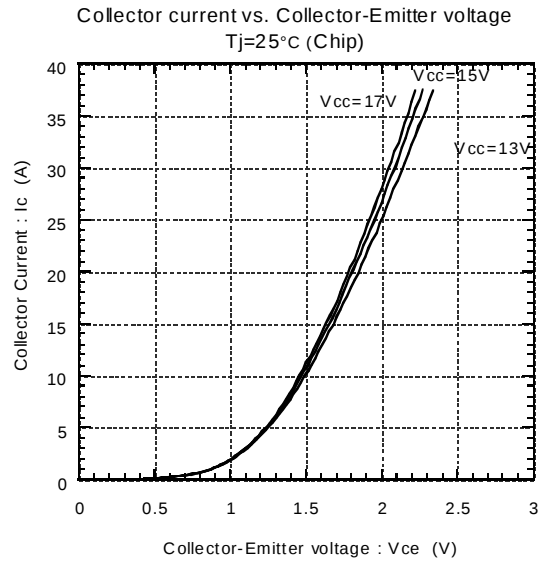
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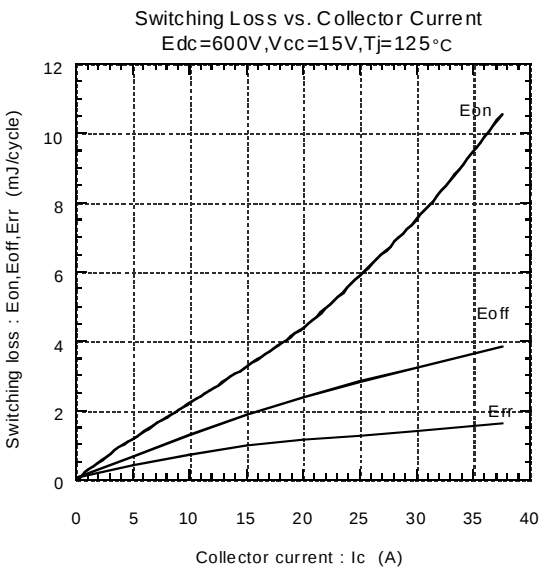
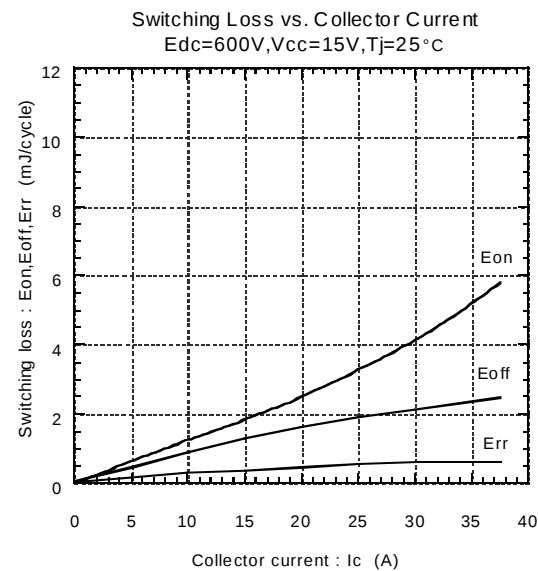
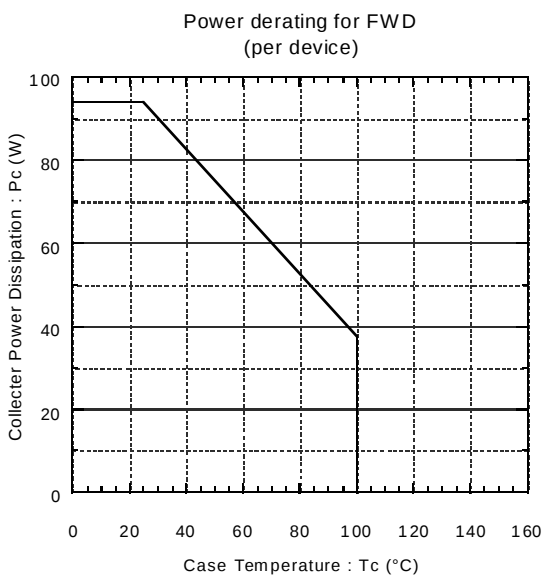
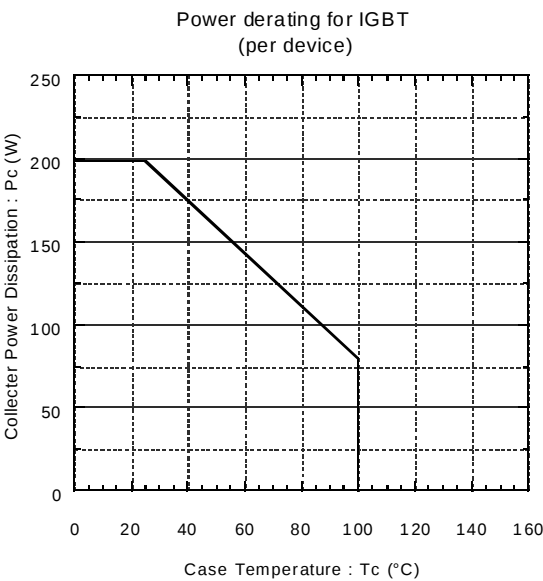
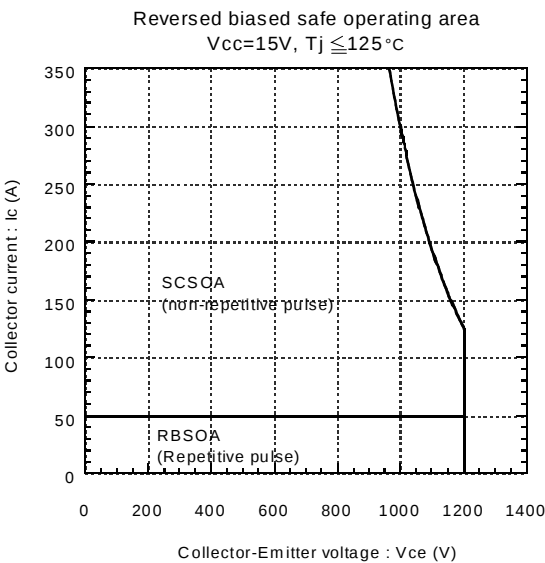
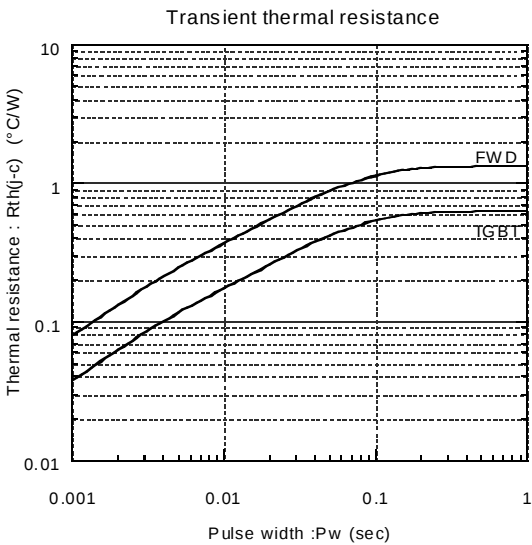
Characteristics

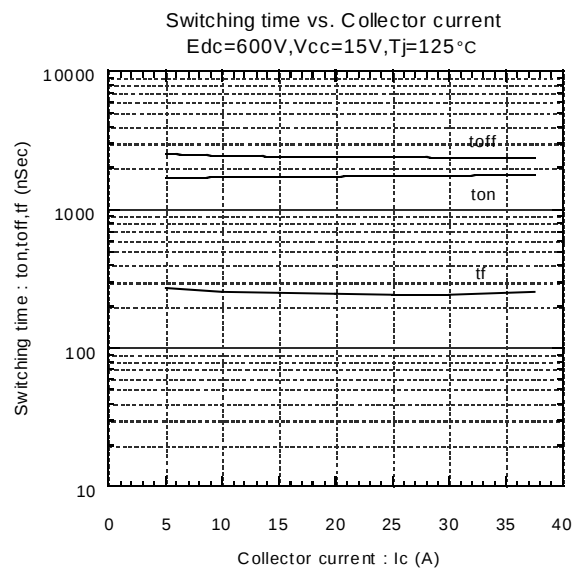
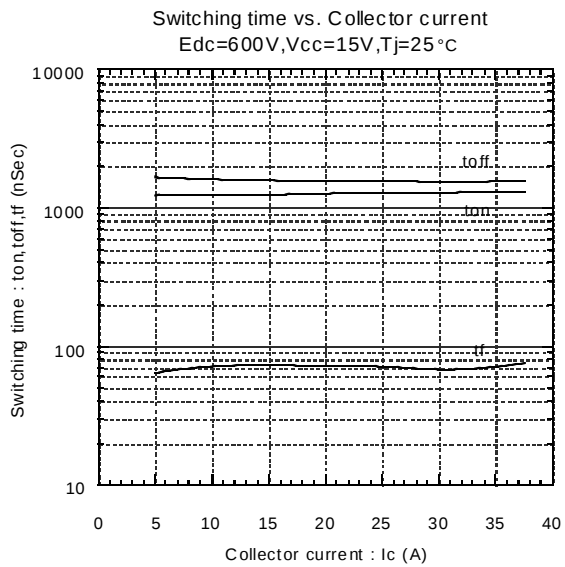
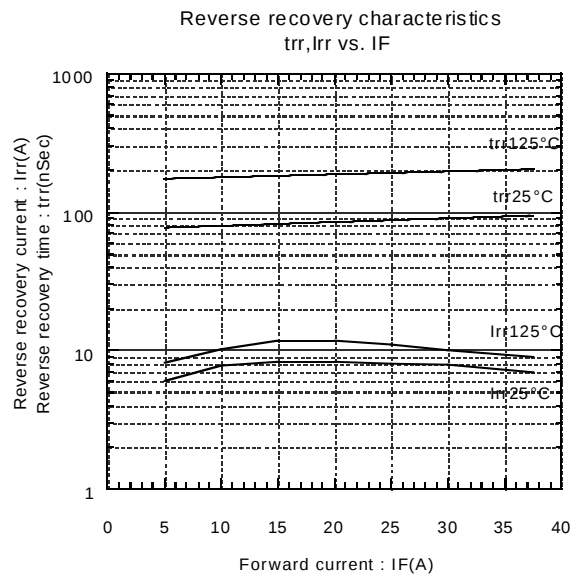
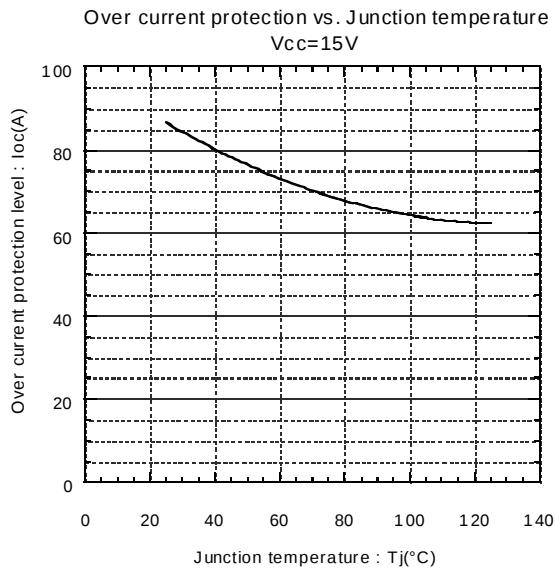
Control circuit characteristics (Representative)



● Main circuit characteristics (Representative)







● Dynamic Brake Characteristics (Representative)

