

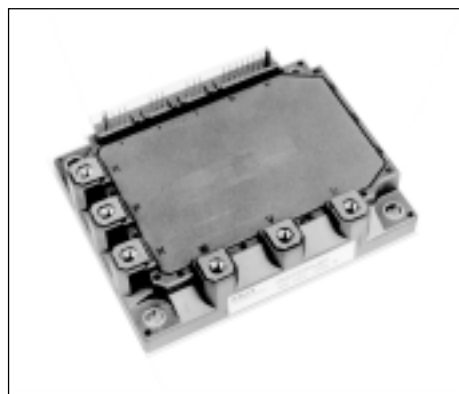
7MBP50RA120

IGBT-IPM R series

1200V / 50A 7 in one-package

Features

- Temperature protection provided by directly detecting the junction temperature of the IGBTs
- Low power loss and soft switching
- Compatible with existing IPM-N series packages
- 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.		
DC bus voltage		Vbc	0	900	V	
DC bus voltage (surge)		Vbc(surge)	0	1000	V	
DC bus voltage (short operating)		Vsc	200	800	V	
Collector-Emitter voltage		Vces	0	1200	V	
DB Reverse voltage		VR	-	1200	V	
INV	Collector current	DC	Ic	-	50	A
		1ms	IcP	-	100	A
		DC	-Ic	-	50	A
	Collector power dissipation	One transistor	PC	-	357	W
DB	Collector current	DC	Ic	-	25	A
		1ms	IcP	-	50	A
	Forward current of Diode		IF	-	25	A
	Collector power dissipation	One transistor	PC	-	198	W
Junction temperature		Tj	-	150	°C	
Input voltage of power supply for Pre-Driver		Vcc *1	0	20	V	
Input signal voltage		Vin *2	0	Vz	V	
Input signal current		Iin	-	1	mA	
Alarm signal voltage		VALM *3	0	Vcc	V	
Alarm signal current		IALM *4	-	15	mA	
Storage temperature		Tstg	-40	125	°C	
Operating case temperature		Top	-20	100	°C	
Isolating voltage (Case-Terminal)		Viso *5	-	AC2.5	kV	
Screw torque	Mounting (M5)		-	3.5 *6	N·m	
	Terminal (M5)		-	3.5 *6	N·m	

*1 Apply Vcc between terminal No. 3 and 1, 6 and 4, 9 and 7, 11 and 10.

*2 Apply Vin between terminal No. 2 and 1, 5 and 4, 8 and 7, 12,13,14,15 and 10.

*3 Apply VALM between terminal No. 16 and 10.

*4 Apply IALM to terminal No. 16.

*5 50Hz/60Hz sine wave 1 minute.

*6 Recommendable Value : 2.5 to 3.0 N·m

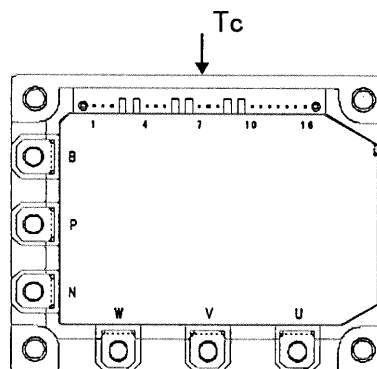


Fig.1 Measurement of case temperature

- Electrical characteristics of power circuit (at Tc=Tj=25°C, Vcc=15V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
INV	Collector current at off signal input	ICES	VCE=1200V input terminal open		1.0	mA
	Collector-Emitter saturation voltage	VCE(sat)	Ic=50A		2.6	V
	Forward voltage of FWD	VF	-Ic=50A		3.0	V
DB	Collector current at off signal input	ICES	VCE=1200V input terminal open		1.0	mA
	Collector-Emitter saturation voltage	VCE(sat)	Ic=25A		2.6	V
	Forward voltage of Diode	VF	-Ic=25A		3.3	V

● Electrical characteristics of control circuit(at Tc=Tj=25°C, Vcc=15V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Power supply current of P-line side Pre-driver(one unit)	I _{ccp}	fsw=0 to 15kHz Tc=-20 to 100°C *7	3	-	18	mA	
Power supply current of N-line side three Pre-driver	I _{ccn}	fsw=0 to 15kHz Tc=-20 to 100°C *7	10	-	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	
Over heating protection temperature level	T _{COH}	VDC=0V, I _c =0A, Case temperature Fig.1	110	-	125	°C	
Hysteresis	T _{CH}		-	20	-	°C	
IGBT chips over heating protection temperature level	T _{JOH}	surface of IGBT chips	150	-	-	°C	
Hysteresis	T _{JH}		-	20	-	°C	
Collector current protection level	INV	I _{oc}	T _j =125°C	75	-	-	A
	DB	I _{oc}	T _j =125°C	38	-	-	A
Over current protection delay time	t _{DOC}	T _j =25°C Fig.2	-	10	-	μs	
Under voltage protection level	V _{UV}		11.0	-	12.5	V	
Hysteresis	V _H		0.2	-	-	V	
Alarm signal hold time	t _{ALM}		1.5	2	-	ms	
SC protection delay time	t _{SC}	T _j =25°C Fig.3	-	-	12	μs	
Limiting resistor for alarm	R _{ALM}		1425	1500	1575	ohm	

*7 Switching frequency of IPM

● Dynamic characteristics(at Tc=Tj=125°C, Vcc=15V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Switching time (IGBT)	t _{on}	I _C =50A, VDC=600V	0.3	-	-	μs
	t _{off}		-	-	3.6	μs
Switching time (FWD)	t _{rr}	I _F =50A, VDC=600V	-	-	0.4	

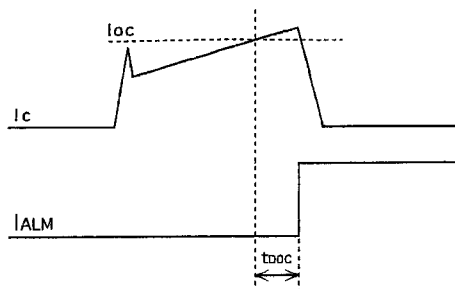


Fig.2 Definition of OC delay time

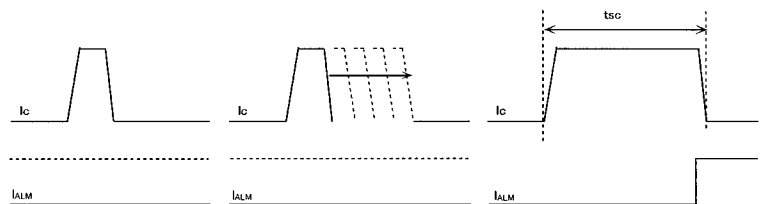


Fig.3 Definition of tsc

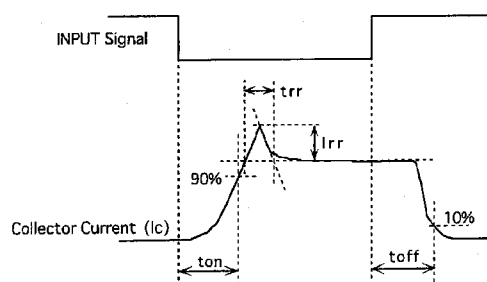


Fig.4 Definition of switching time

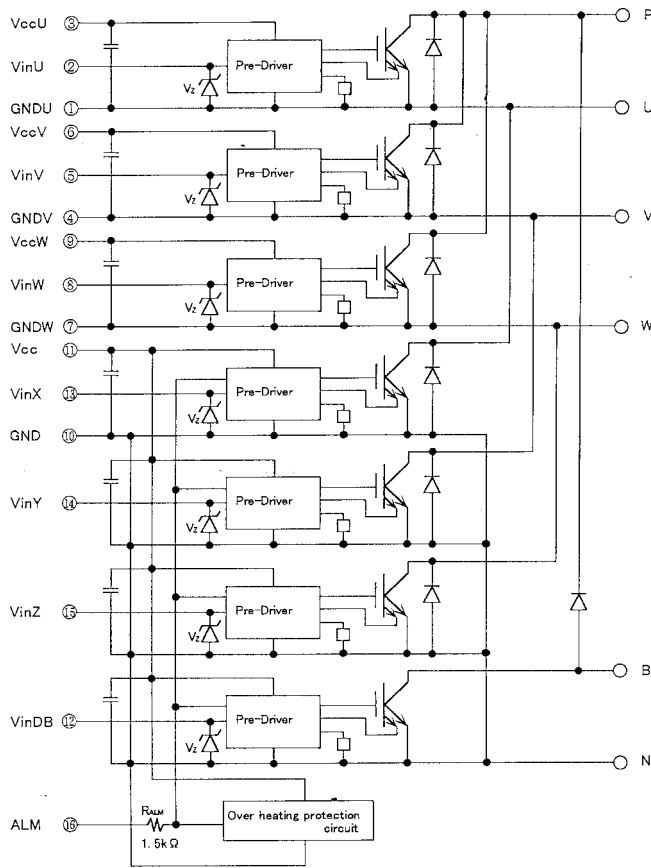
● Thermal characteristics(Tc=25°C)

Item	Symbol	Typ.	Max.	Unit		
Junction to Case thermal resistance	INV	IGBT	R _{th(j-c)}	-	0.35	°C/W
		FWD	R _{th(j-c)}	-	0.85	°C/W
	DB	IGBT	R _{th(j-c)}	-	0.63	°C/W
Case to fin thermal resistance with compound	R _{th(c-f)}	0.05	-	°C/W		

● Recommendable value

Item	Symbol	Min.	Typ.	Max.	Unit	
DC bus voltage	V _{DC}	200	-	800	V	
Operating power supply voltage range of Pre-driver	V _{CC}	13.5	15	16.5	V	
Switching frequency of IPM	fsw	1	-	20	kHz	
Screw torque	Mounting (M5)	-	2.5	-	3.0	N·m
	Terminal (M5)	-	2.5	-	3.0	N·m

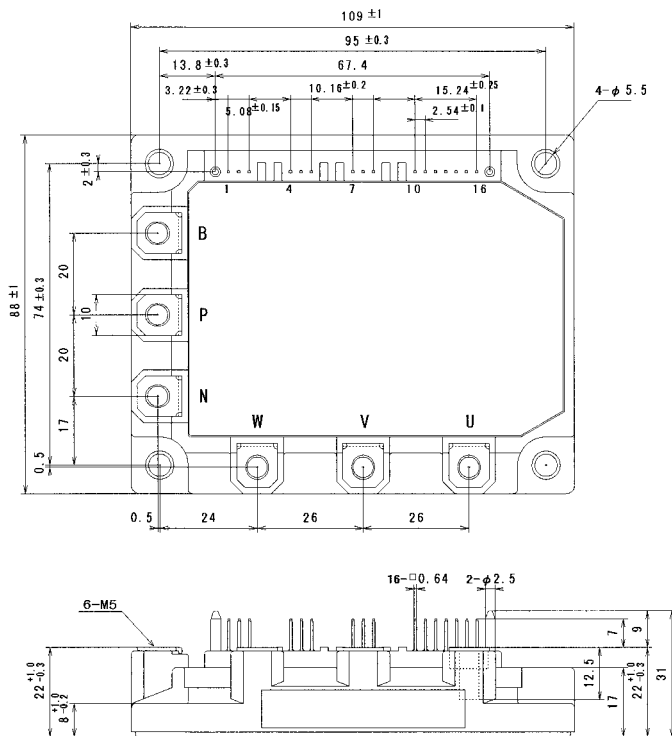
Block diagram



Pre-drivers include following functions

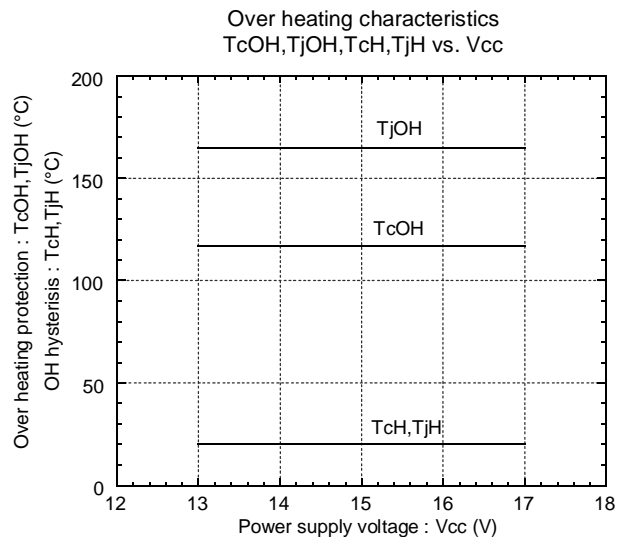
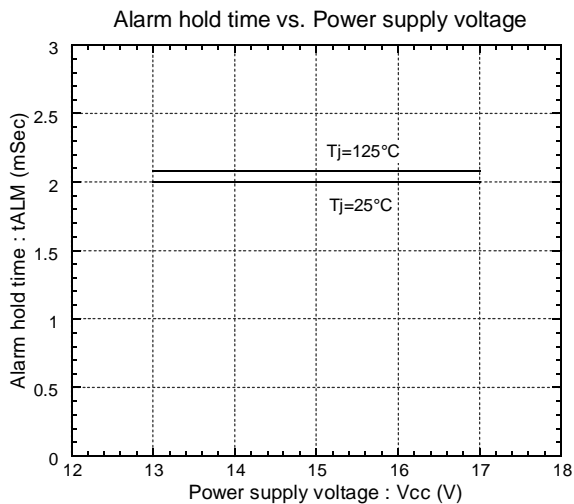
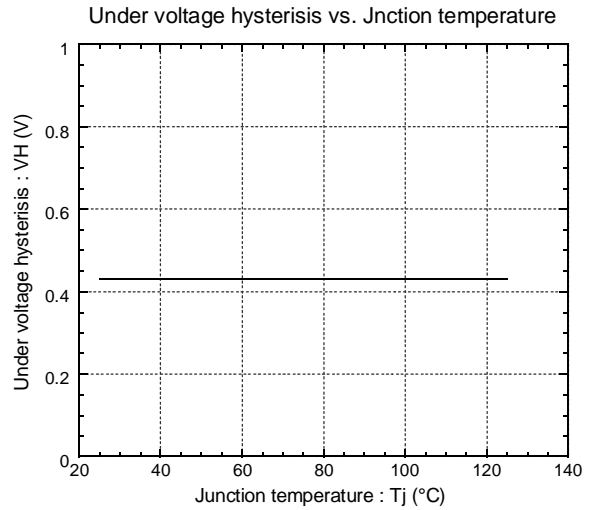
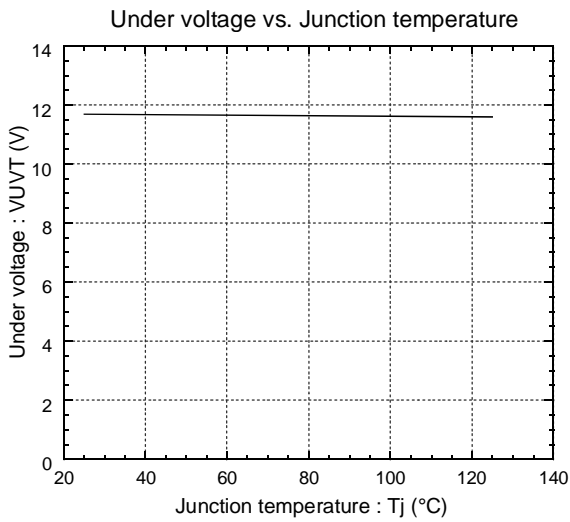
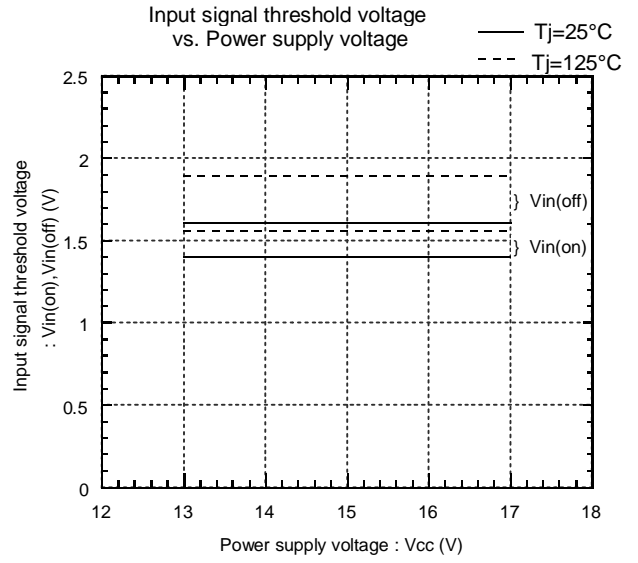
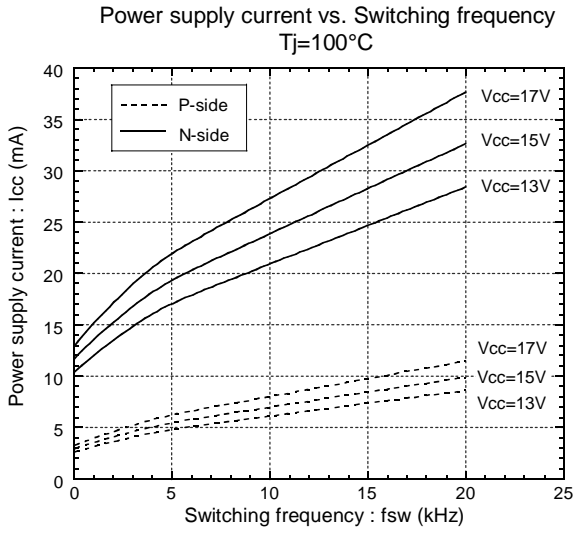
- a) Amplifier for driver
- b) Short circuit protection
- c) Undervoltage lockout circuit
- d) Over current protection
- e) IGBT chip over heating protection

Outline drawings, mm



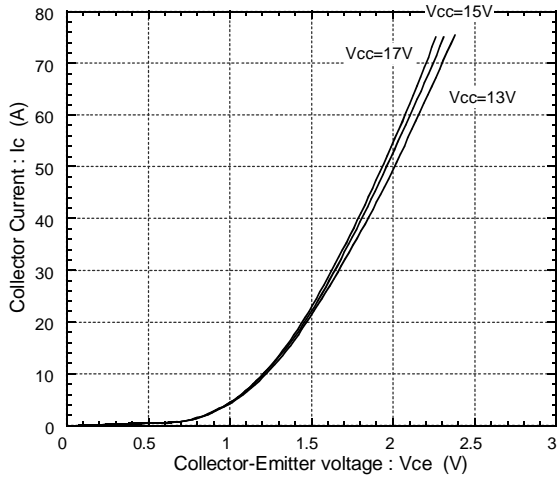
Characteristics (Representative)

Control Circuit

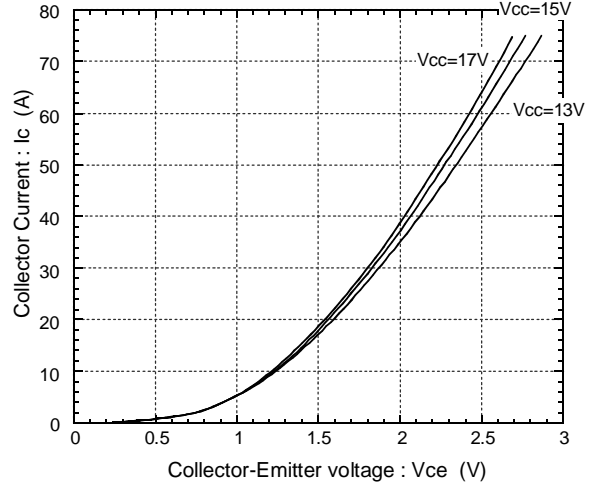


● Inverter

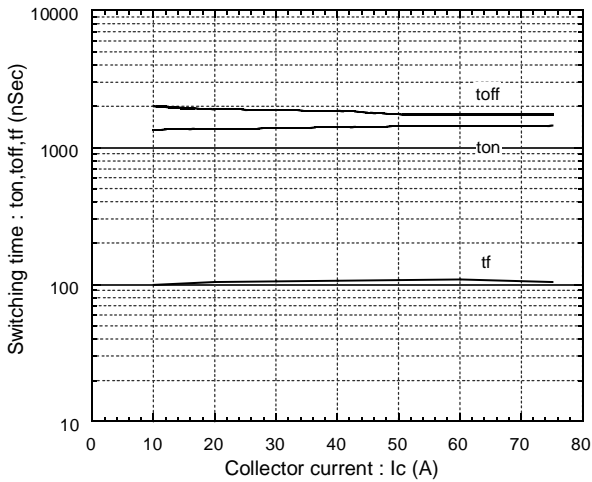
Collector current vs. Collector-Emitter voltage
Tj=25°C



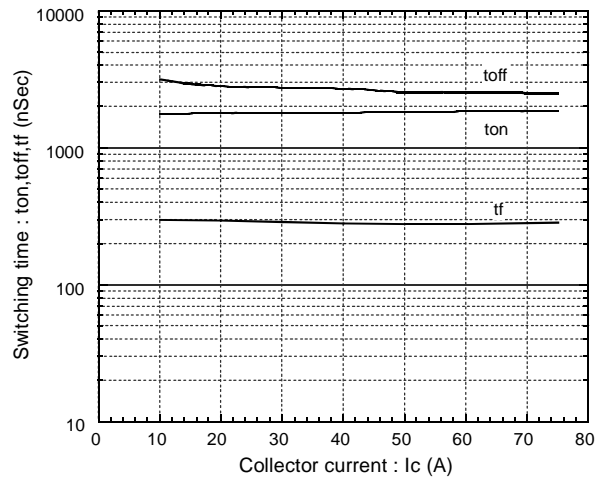
Collector current vs. Collector-Emitter voltage
Tj=125°C



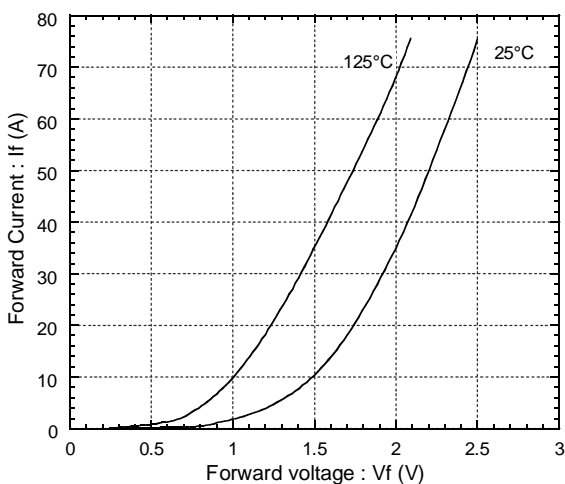
Switching time vs. Collector current
Edc=600V, Vcc=15V, Tj=25°C



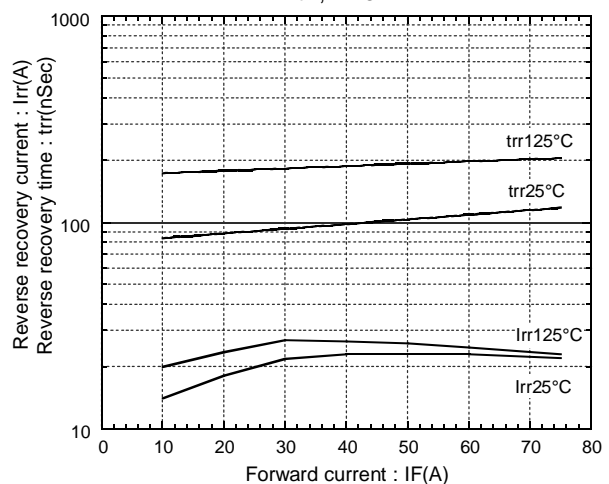
Switching time vs. Collector current
Edc=600V, Vcc=15V, Tj=125°C

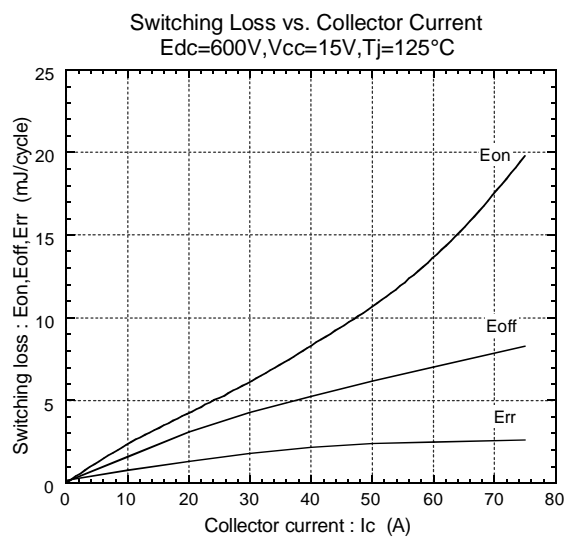
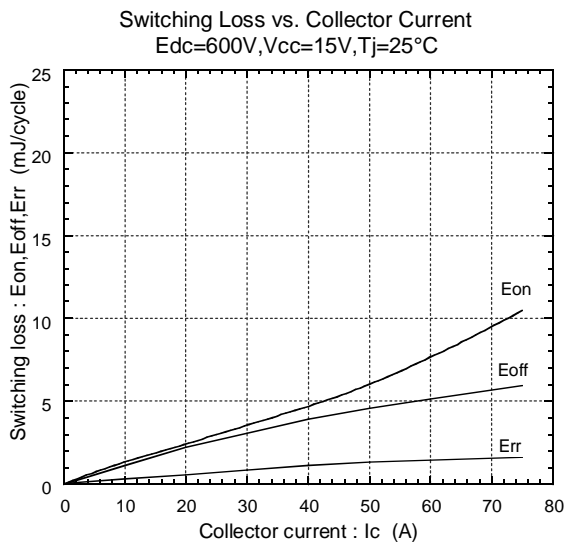
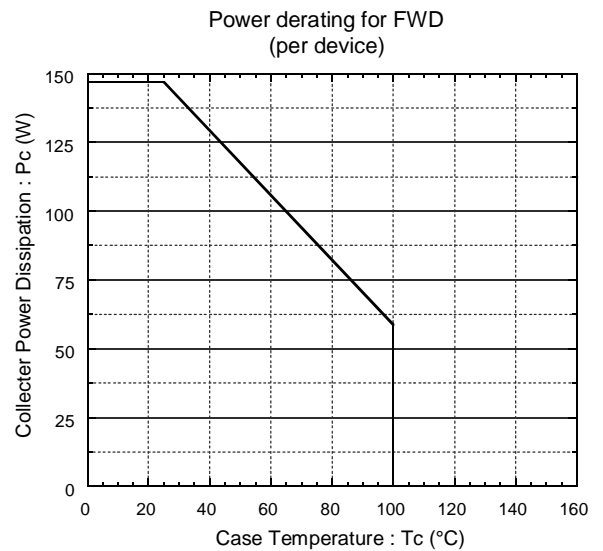
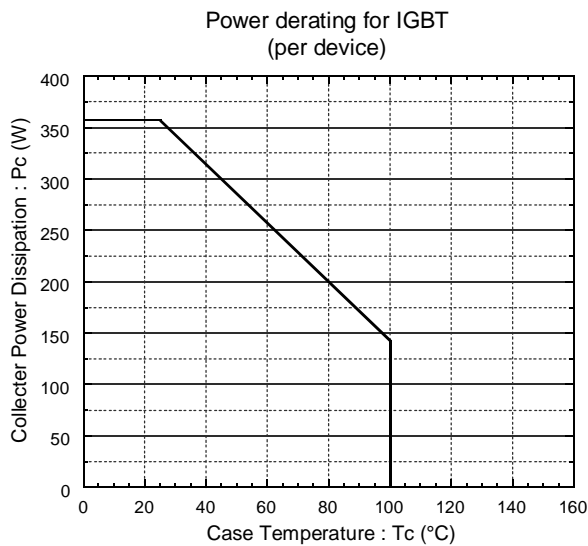
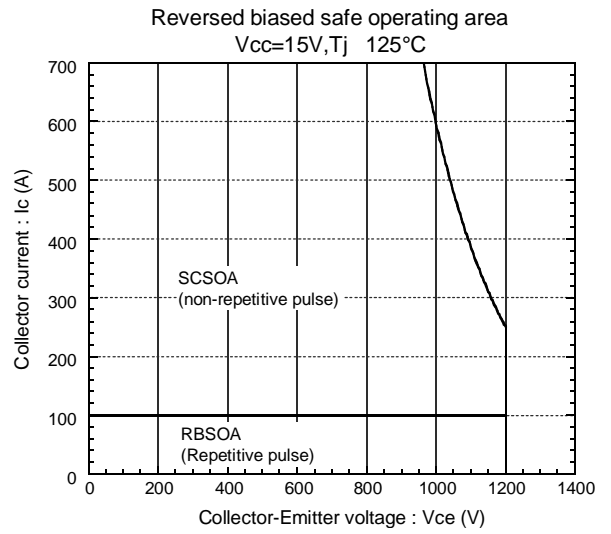
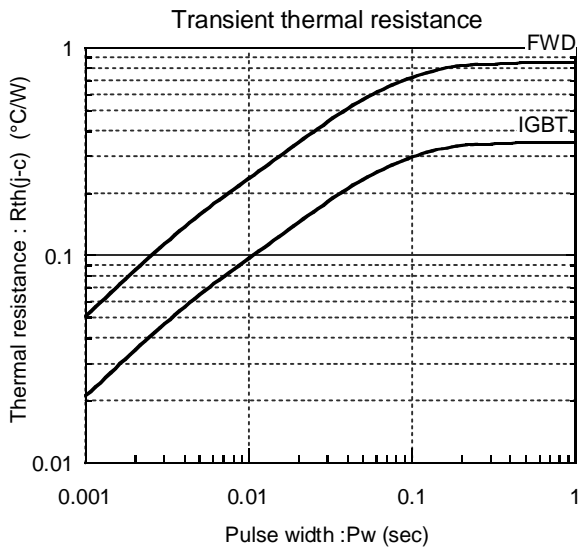


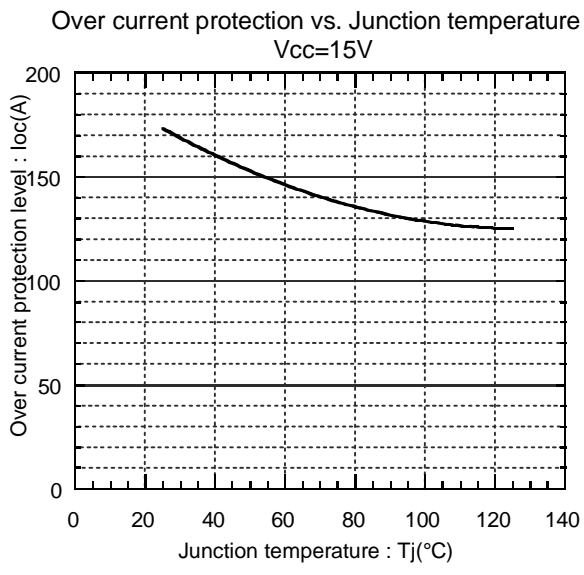
Forward current vs. Forward voltage



Reverse recovery characteristics
trr, Irr vs. IF







● Brake

