

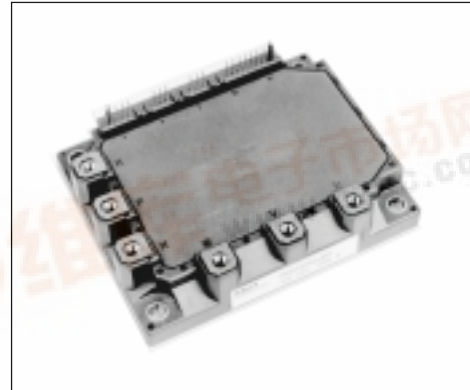
7MBP50RA120

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	V _{DC}	0	900	V		
DC bus voltage (surge)	V _{DC(surge)}	0	1000	V		
DC bus voltage (short operating)	V _{SC}	200	800	V		
Collector-Emitter voltage	V _{CEs}	0	1200	V		
DB Reverse voltage	V _R	-	1200	V		
INV	Collector current	DC	I _c	-	50	A
		1ms	I _{CP}	-	100	A
		DC	-I _c	-	50	A
	Collector power dissipation	One transistor	P _c	-	357	W
DB	Collector current	DC	I _c	-	25	A
		1ms	I _{CP}	-	50	A
		Forward current of Diode	I _F	-	25	A
	Collector power dissipation	One transistor	P _c	-	198	W
Junction temperature	T _j	-	150	°C		
Input voltage of power supply for Pre-Driver	V _{CC} *1	0	20	V		
Input signal voltage	V _{in} *2	0	V _Z	V		
Input signal current	I _{in}	-	1	mA		
Alarm signal voltage	V _{ALM} *3	0	V _{CC}	V		
Alarm signal current	I _{ALM} *4	-	15	mA		
Storage temperature	T _{stg}	-40	125	°C		
Operating case temperature	T _{op}	-20	100	°C		
Isolating voltage (Case-Terminal)	V _{iso} *5	-	AC2.5	kV		
Screw torque	Mounting (M5)	-	3.5 *6	N·m		
	Terminal (M5)	-	3.5 *6	N·m		

*1 Apply V_{CC} between terminal No. 3 and 1, 6 and 4, 9 and 7, 11 and 10.

*2 Apply V_{in} between terminal No. 2 and 1, 5 and 4, 8 and 7, 12,13,14,15 and 10.

*3 Apply V_{ALM} between terminal No. 16 and 10.

*4 Apply I_{ALM} to terminal No. 16.

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

*6 Recommendable Value : 2.5 to 3.0 N·m

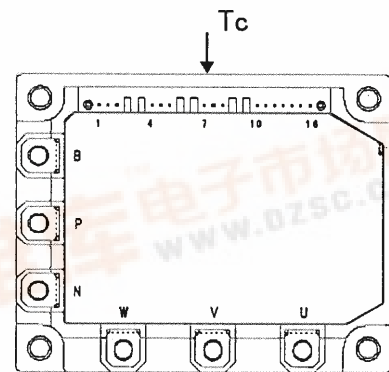


Fig.1 Measurement of case temperature

● Electrical characteristics of power circuit (at T_c=T_j=25°C, V_{CC}=15V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
INV	Collector current at off signal input	I _{CEs}	V _{CE} =1200V input terminal open		1.0	mA
	Collector-Emitter saturation voltage	V _{CE(sat)}	I _c =50A		2.6	V
	Forward voltage of FWD	V _F	-I _c =50A		3.0	V
DB	Collector current at off signal input	I _{CEs}	V _{CE} =1200V input terminal open		1.0	mA
	Collector-Emitter saturation voltage	V _{CE(sat)}	I _c =25A		2.6	V
	Forward voltage of Diode	V _F	-I _c =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}	V _{DC} =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, V _{DC} =600V	0.3	-	-	μs
	t _{off}		-	-	3.6	μs
Switching time (FWD)	t _{rr}	I _F =50A, V _{DC} =600V	-	-	0.4	

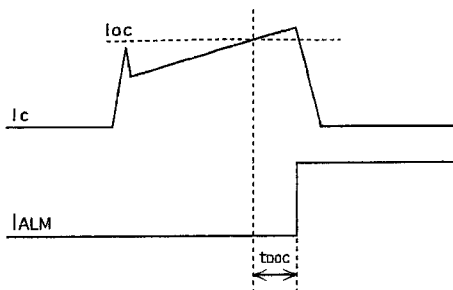


Fig.2 Definition of OC delay time

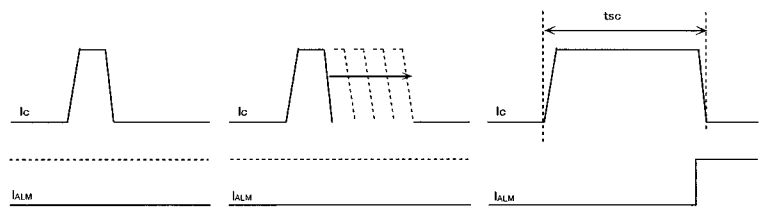


Fig.3 Definition of tsc

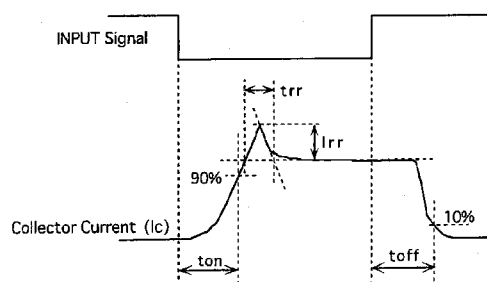


Fig.4 Definition of switching time

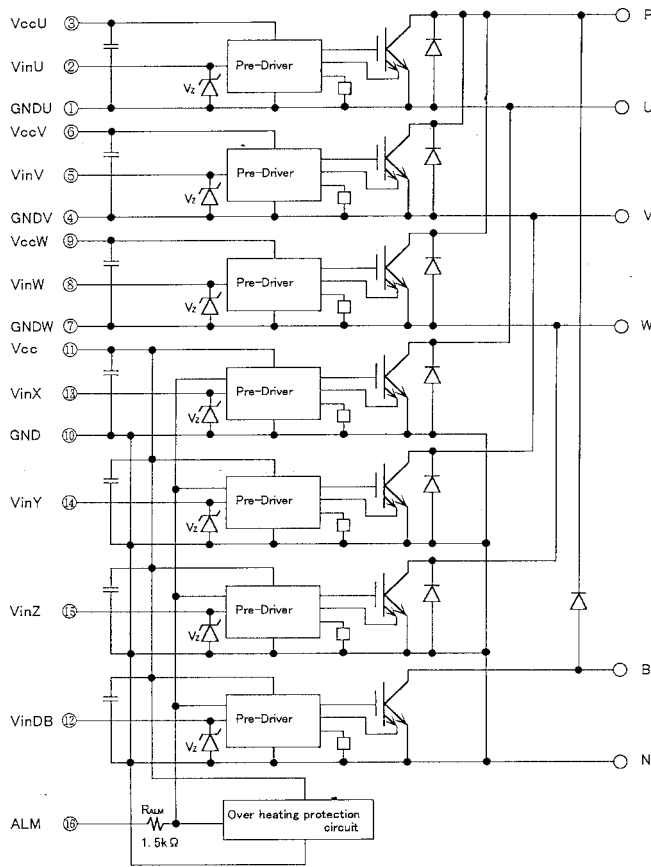
● Thermal characteristics(Tc=25°C)

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

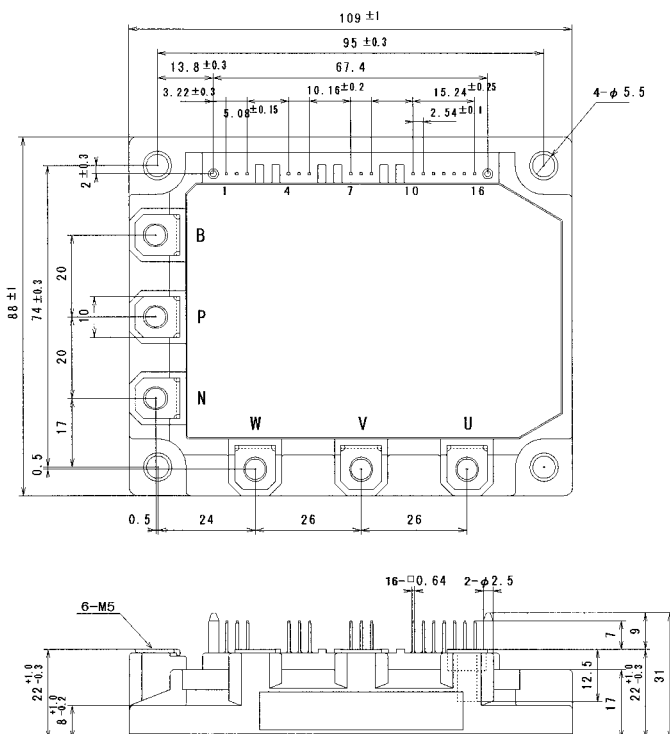
Item	Symbol	Min.	Typ.	Max.	Unit	
DC bus voltage	V _{DC}	200	-	800	V	
Operating power supply voltage range of Pre-driver	V _{CC}	13.5	15	16.5	V	
Switching frequency of IPM	fsw	1	-	20	kHz	
Screw torque	Mounting (M5)	-	2.5	-	3.0	N·m

Block diagram



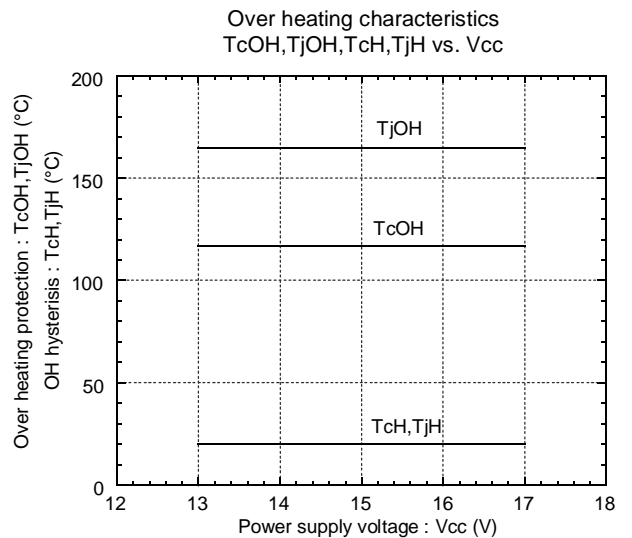
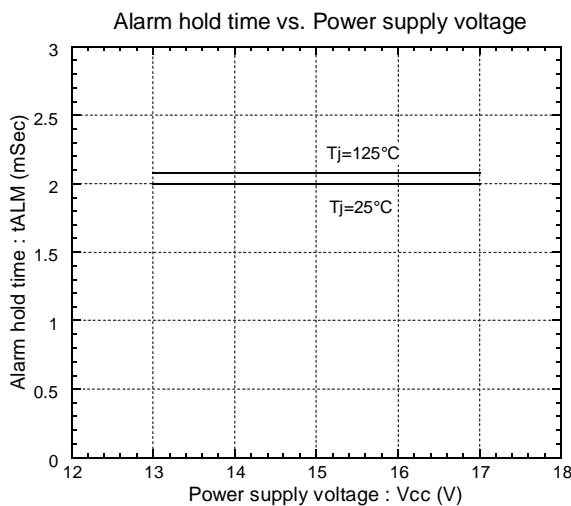
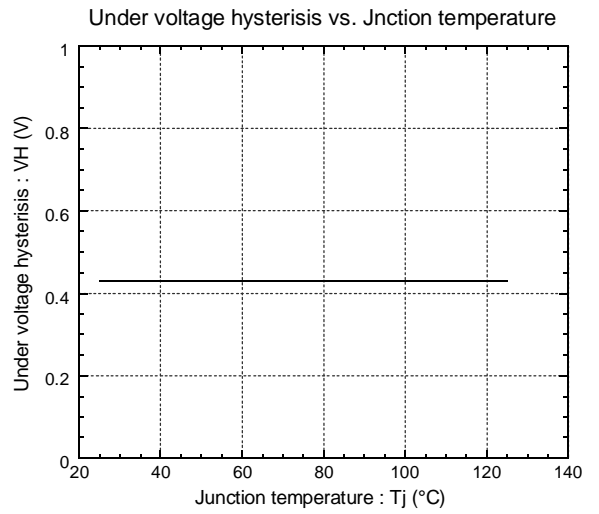
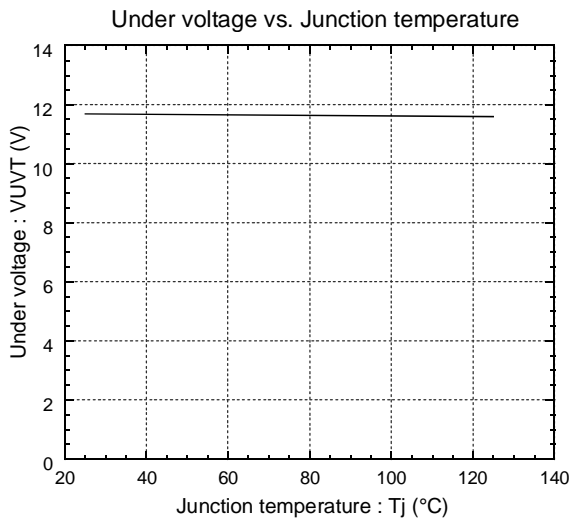
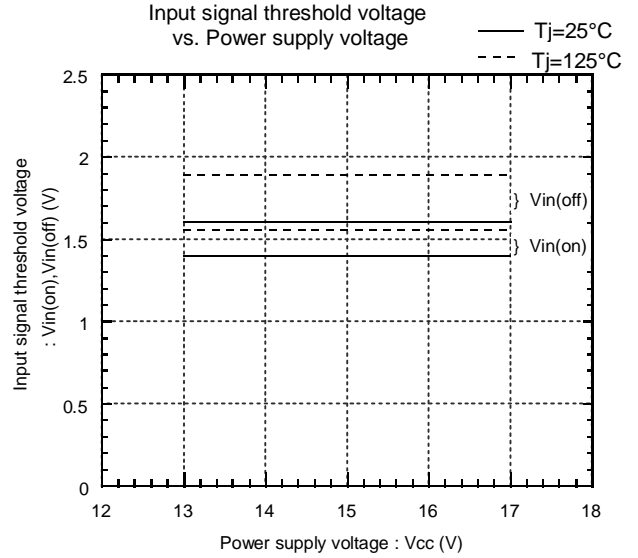
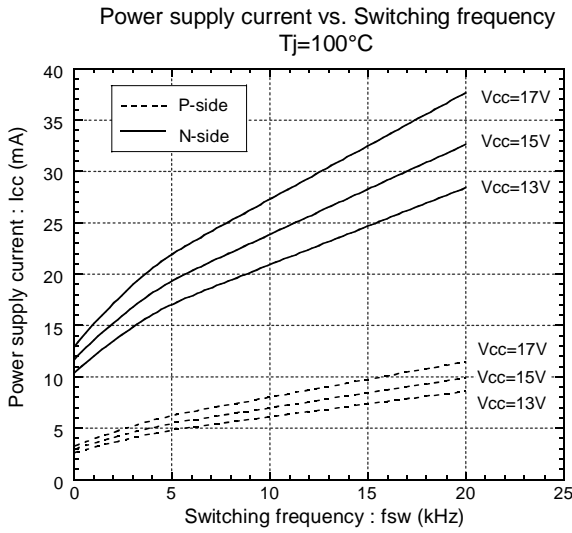
- Pre-drivers include following functions
- a) Amplifier for driver
 - b) Short circuit protection
 - c) Undervoltage lockout circuit
 - d) Over current protection
 - e) IGBT chip over heating protection

Outline drawings, mm



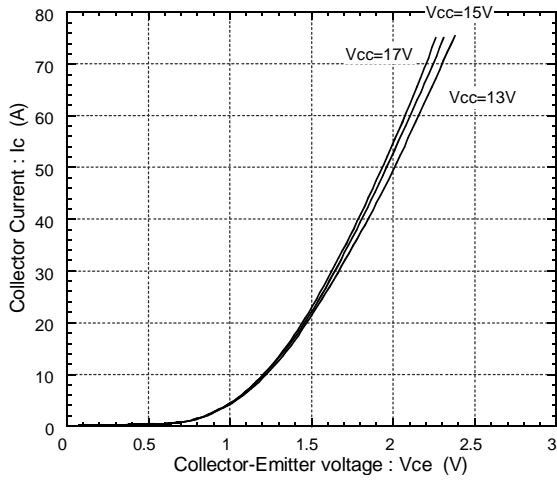
Characteristics (Representative)

Control Circuit

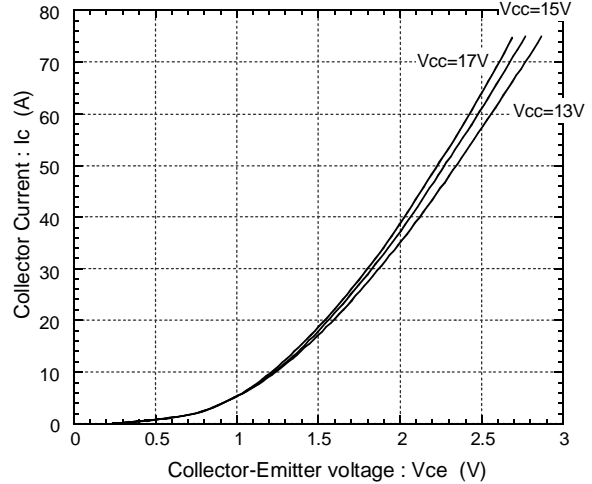


● Inverter

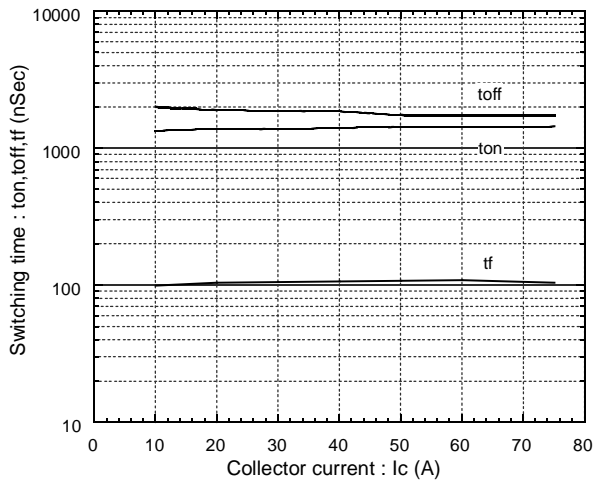
Collector current vs. Collector-Emitter voltage
T_j=25°C



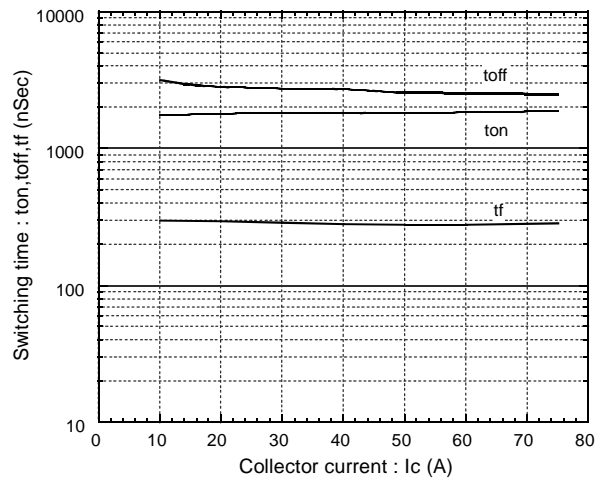
Collector current vs. Collector-Emitter voltage
T_j=125°C



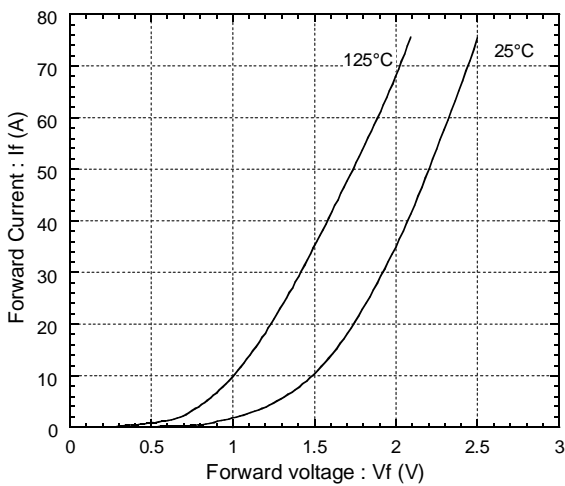
Switching time vs. Collector current
E_{dc}=600V, V_{cc}=15V, T_j=25°C



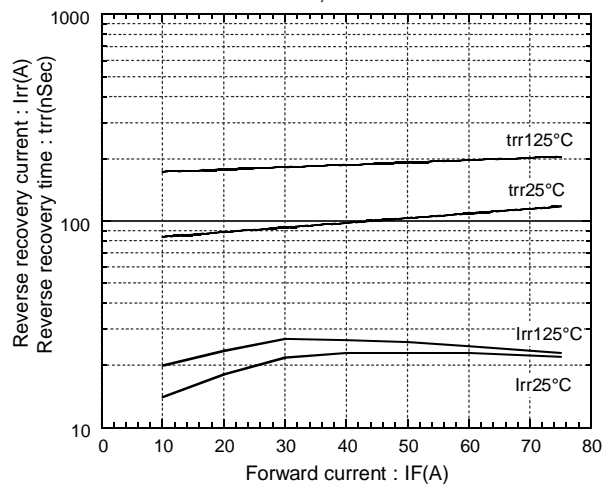
Switching time vs. Collector current
E_{dc}=600V, V_{cc}=15V, T_j=125°C

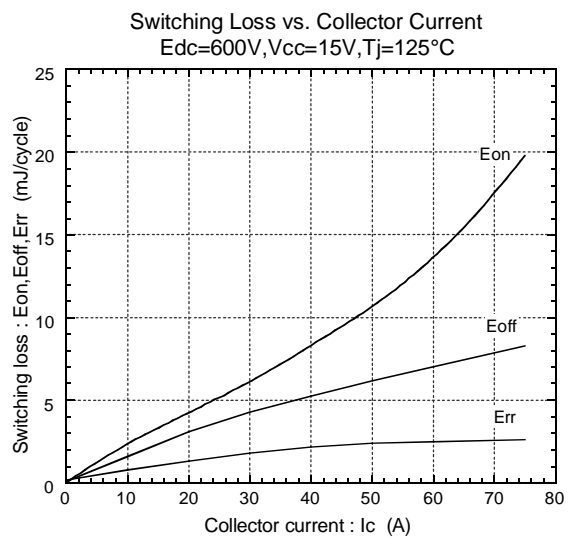
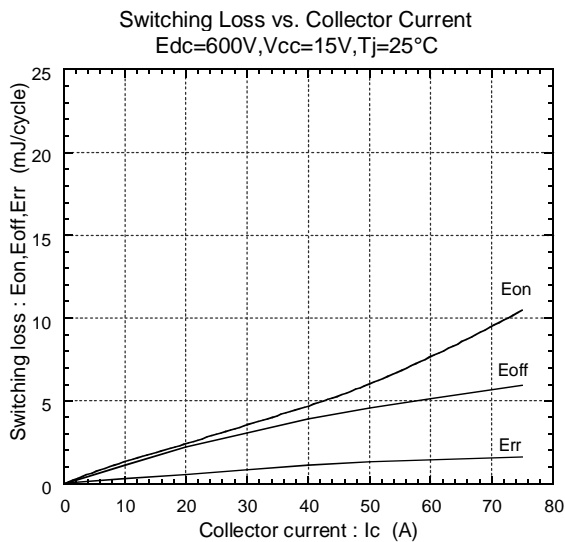
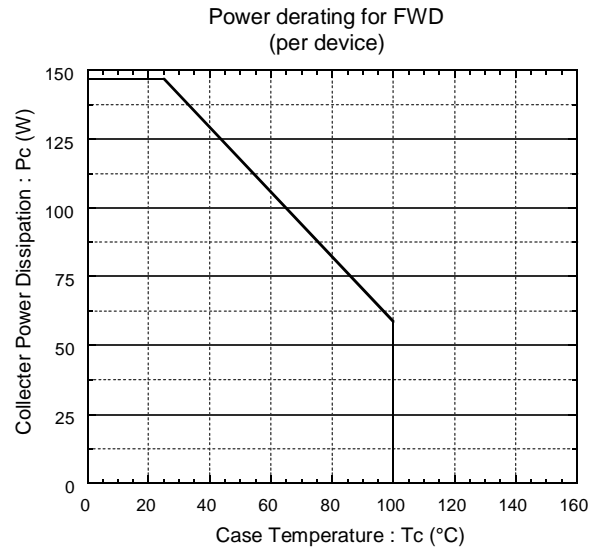
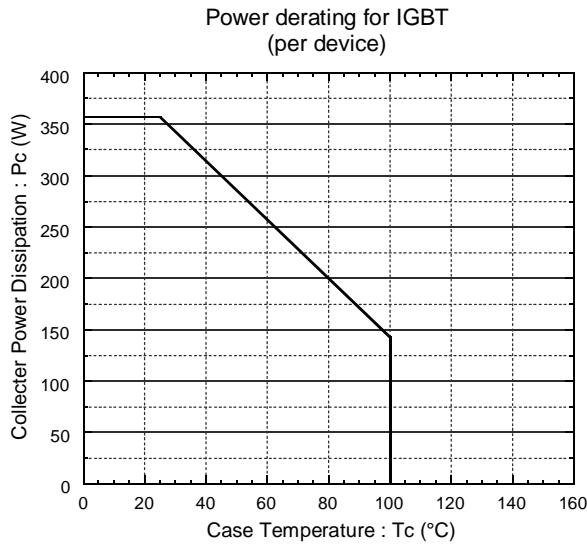
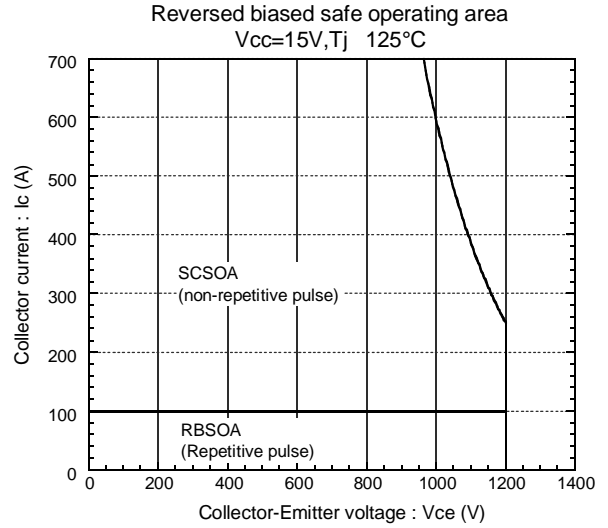
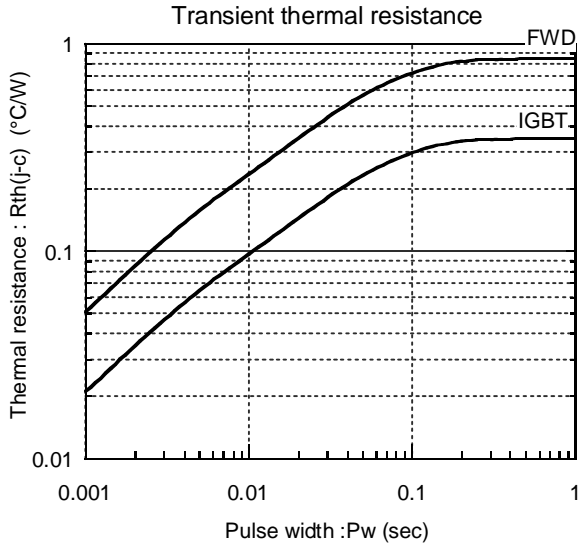


Forward current vs. Forward voltage

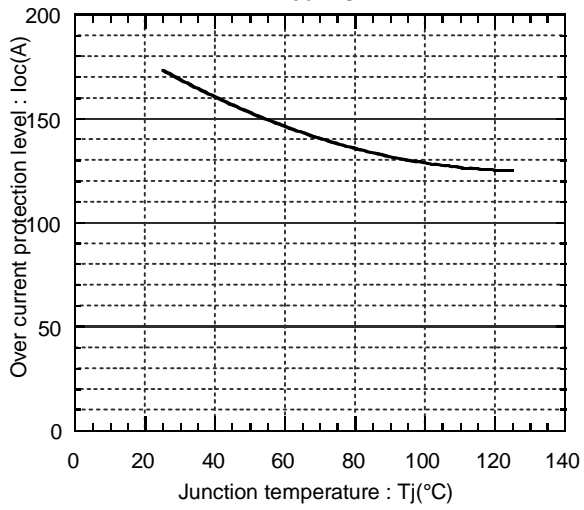


Reverse recovery characteristics
t_{rr}, I_{rr} vs. I_F





Over current protection vs. Junction temperature
V_{cc}=15V



● Brake

