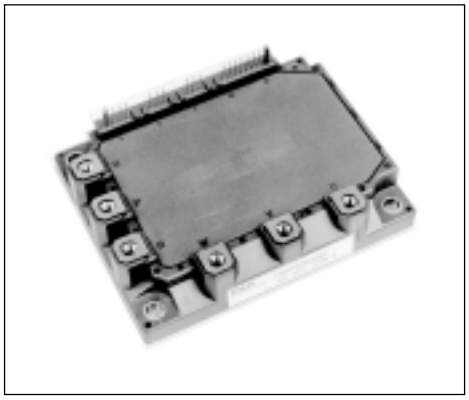
7MBP100RA060

IGBT-IPM R series

600V / 100A 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	450	V
DC bus voltage (surge)			$V_{DC(surge)}$	0	500	V
DC bus voltage (short operating)			V_{SC}	200	400	V
Collector-Emitter voltage			V_{CES}	0	600	V
DB Reverse voltage			V_R	0	600	V
INV	Collector current	DC	I_C	-	100	A
		1ms	I_{CP}	-	200	A
		DC	$-I_C$	-	100	A
	Collector power dissipation	One transistor	P_C	-	400	W
DB	Collector current	DC	I_C	-	50	A
		1ms	I_{CP}	-	100	A
	Forward current of Diode		I_F	-	50	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	Vz	V
Input signal current			I_{in}	-	1	mA
Alarm signal voltage			V_{ALM} *3	0	Vcc	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

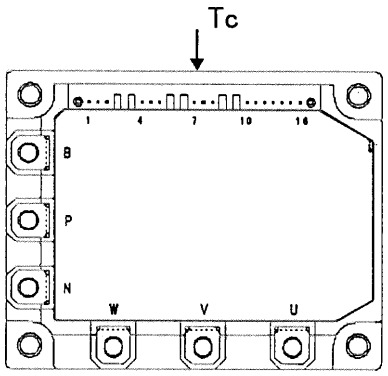


Fig.1 Measurement of case temperature

*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 V_{ALM} between terminal No. 16 and 10.
*4 Apply I_{ALM} to terminal No. 16.
*5 50Hz/60Hz sine wave 1 minute.

● **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	I_{CES}	V_{CE}=600V input terminal open	–	–	1.0	mA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	Ic=100A	–	–	2.8	V
	Forward voltage of FWD	V_F	-Ic=100A	–	–	3.0	V
DB	Collector current at off signal input	I_{CES}	V_{CE}=600V input terminal open	–	–	1.0	mA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	Ic=50A	–	–	2.8	V
	Forward voltage of Diode	V_F	-Ic=50A	–	–	3.3	V

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● 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	Rin=20k ohm	-	8.0	-	V
Over heating protection temperature level		T_{COH}	VDC=0V, Ic=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}	Tj=125°C Collector current	150	-	-	A
	DB	I_{OC}	Tj=125°C Collector current	75	-	-	A
Over current protection delay time		t_{DOC}	Tj=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}	Tj=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)	ton	IC=100A, VDC=300V	0.3	-	-	µs
	toff		-	-	3.6	µs
Switching time (FWD)	trr	IF=100A, VDC=300V	-	-	0.4	µs

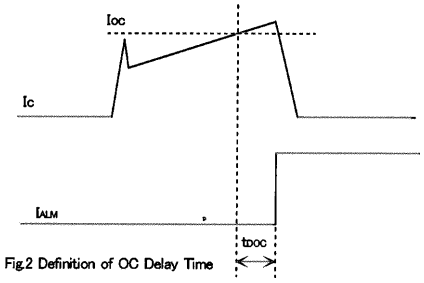

Fig.2 Definition of OC Delay Time

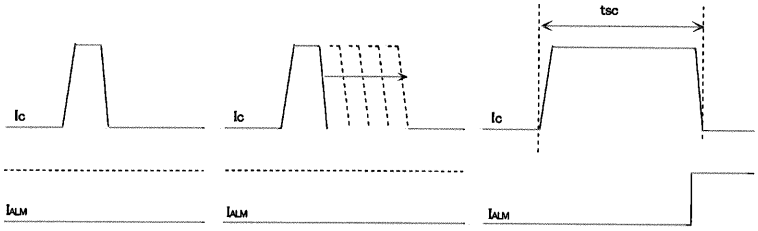

Fig.3 Definition of tsc

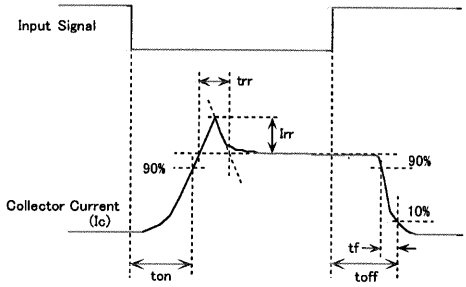

Fig.4 Definition of Switching Time

● Thermal characteristics(Tc=25°C)

Item			Symbol	Typ.	Max.	Unit
Junction to Case thermal resistance	INV	IGBT	Rth(j-c)	-	0.31	°C/W
		FWD	Rth(j-c)	-	0.70	°C/W
	DB	IGBT	Rth(j-c)	-	0.63	°C/W
Case to fin thermal resistance with compound			Rth(c-f)	0.05	-	°C/W

● Recommendable value

Item		Symbol	Min.	Typ.	Max.	Unit
DC bus voltage		V_{DC}	200	-	400	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)					

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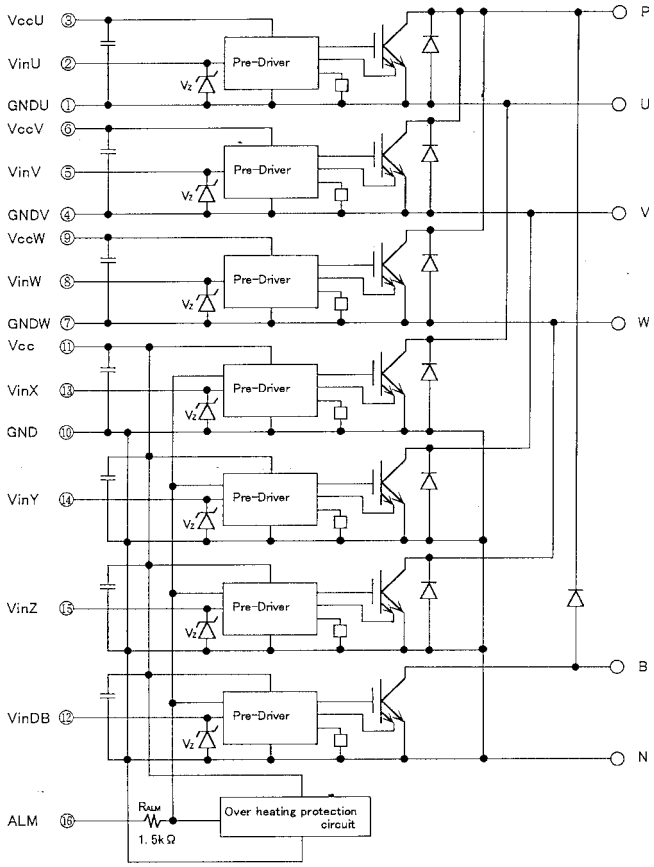
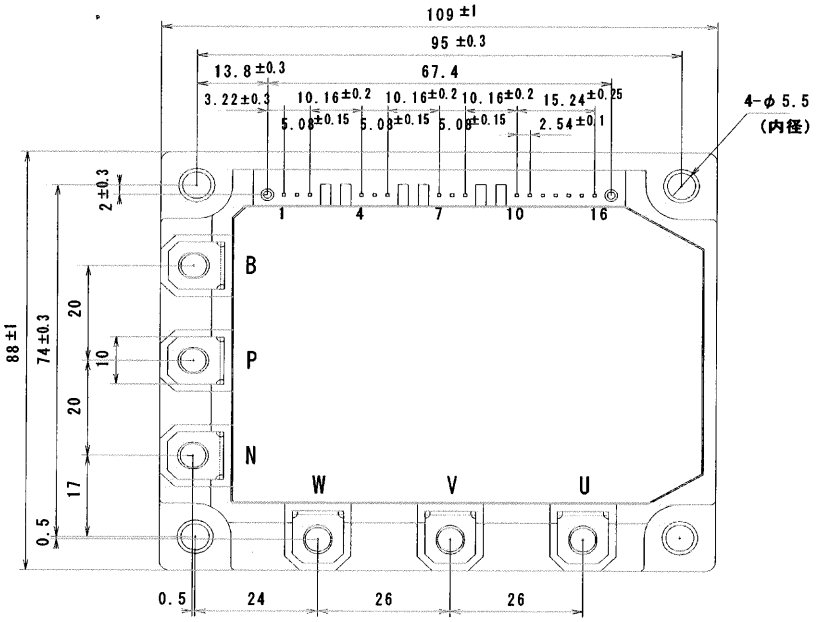
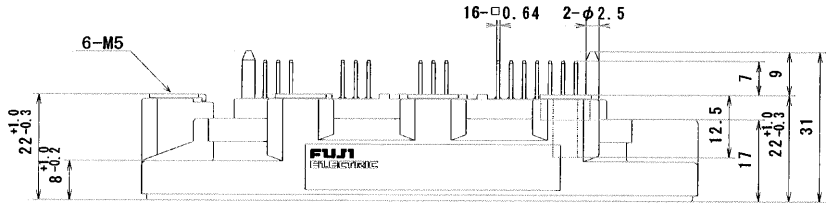
Block diagram



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

Outline drawings, mm





Mass : 440g

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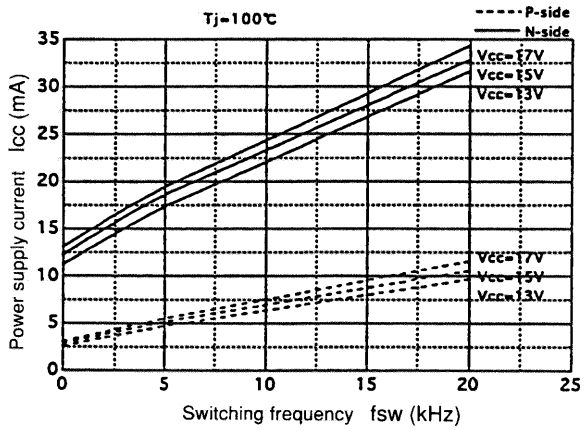
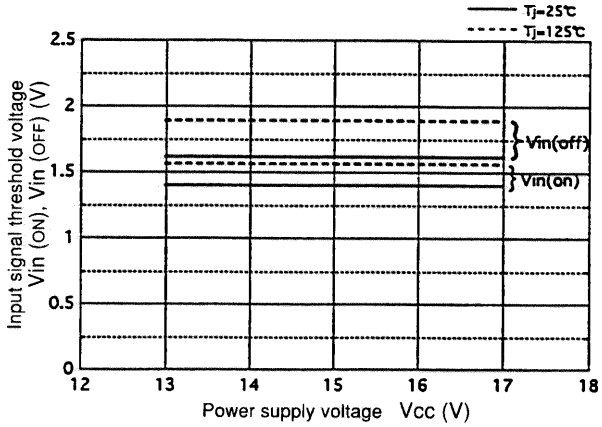
Characteristics (Representative)

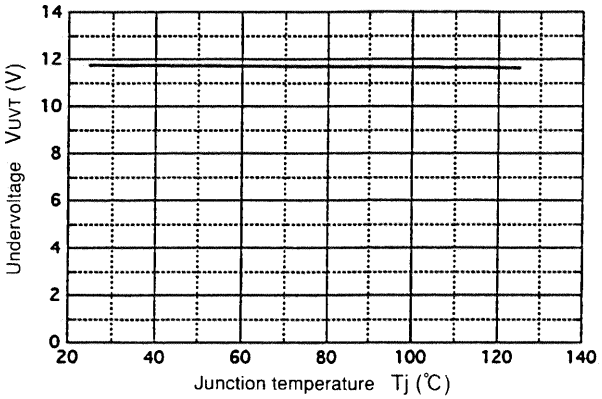
● Control Circuit



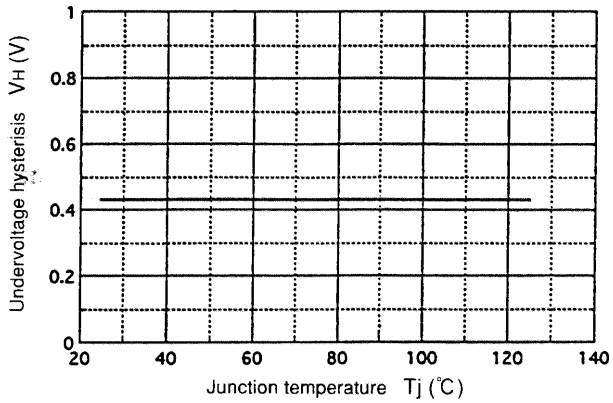
電源電流—スイッチング周波数特性
Power supply current vs. Switching frequency



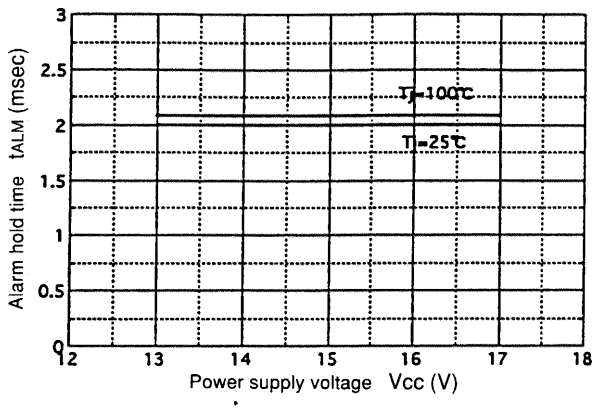
入力しきい値電圧—電源電圧特性
Input signal threshold voltage
vs. Power supply voltage



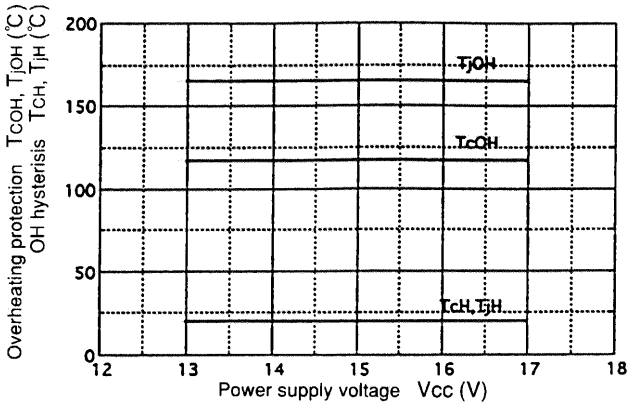
制御電源電圧低下保護レベル—接合部温度特性
Undervoltage vs. Junction temperature



電圧低下保護ヒステリシス—接合部温度特性
Undervoltage hysterisis vs. Junction temperature



アラーム出力保持時間—電源電圧特性
Alarm hold time vs. Power supply voltage



過熱保護動作温度—電源電圧特性
Overheating characteristics TcOH, TjOH,TcH, TjH vs. Vcc

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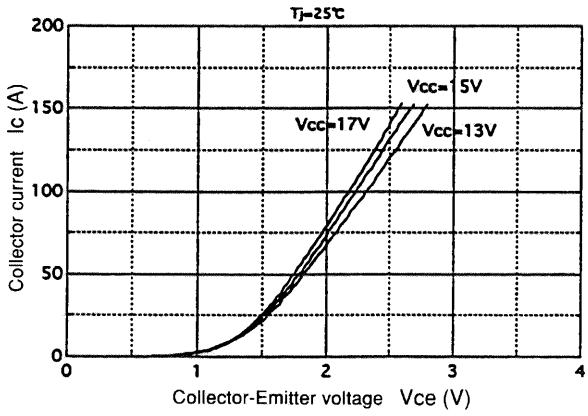
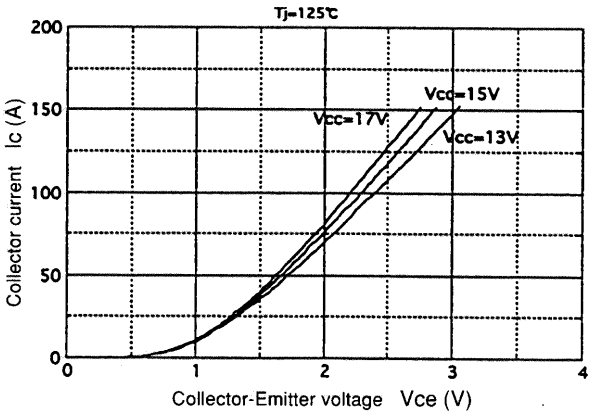
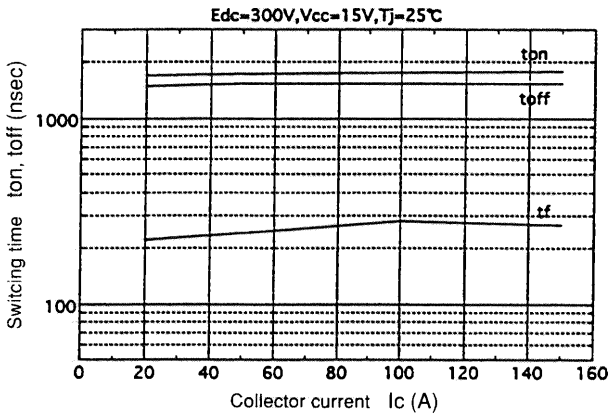
● **Inverter**



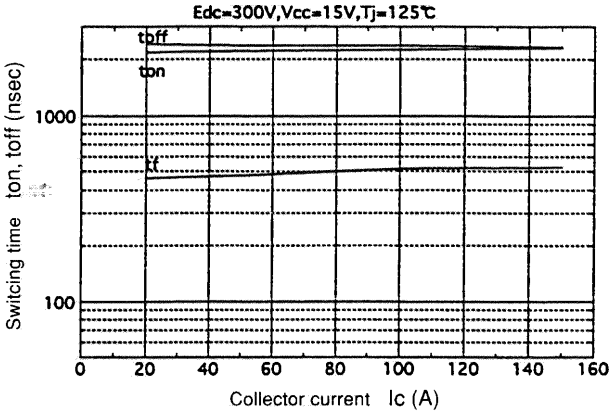
コレクタ電流—コレクタ・エミッタ間電圧特性
Collector current vs. Collector-Emitter voltage



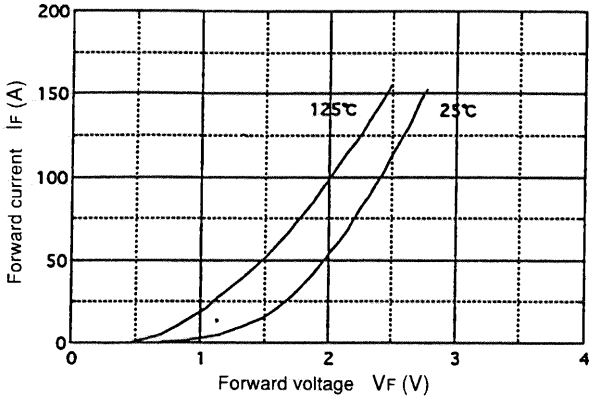
コレクタ電流—コレクタ・エミッタ間電圧特性
Collector current vs. Collector-Emitter voltage



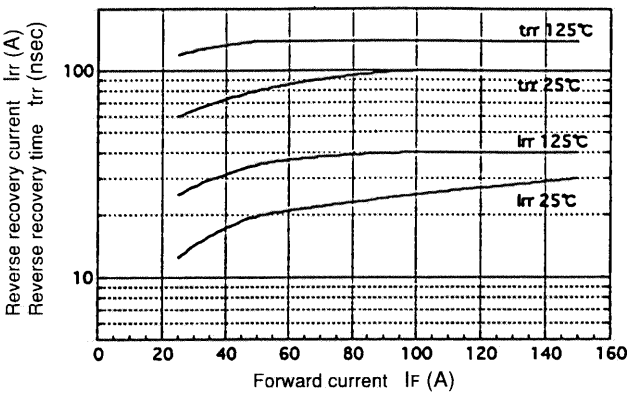
スイッチング時間—コレクタ電流特性
Switching time vs. Collector current



スイッチング時間—コレクタ電流特性
Switching time vs. Collector current



順電流—順電圧特性
Forward current vs. Forward voltage



逆回復時間、逆回復電流—逆回復特性
Reverse recovery characteristics trr, Irr vs. IF

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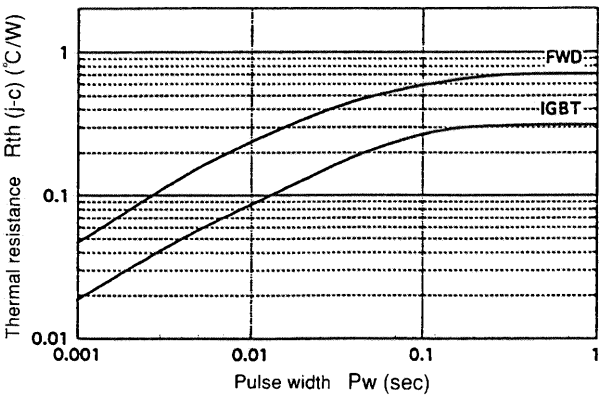
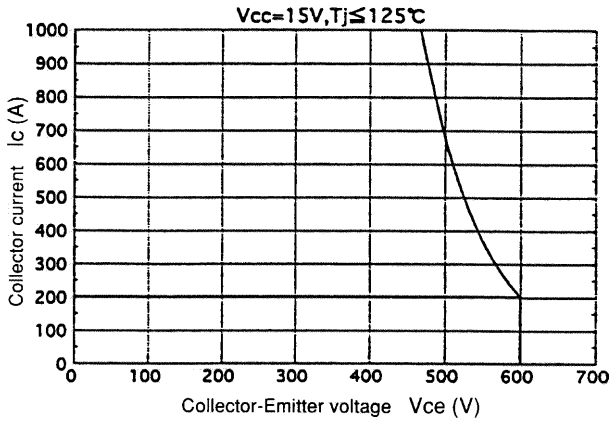
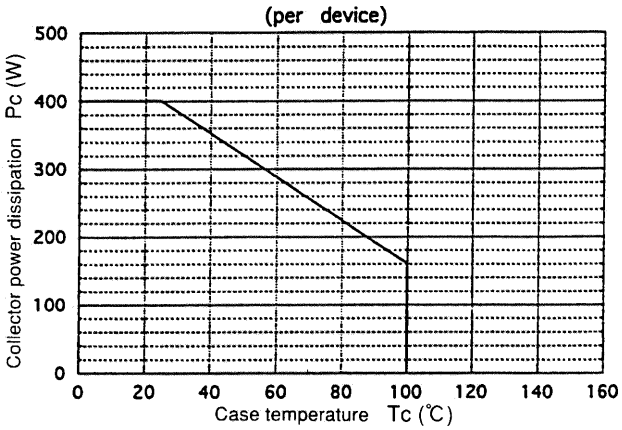


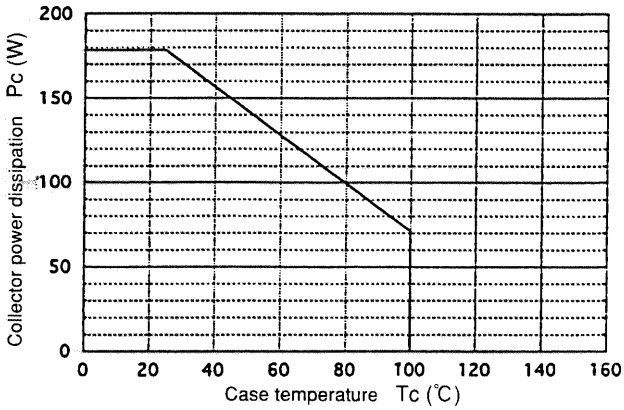
過渡熱抵抗特性
Transient thermal resistance



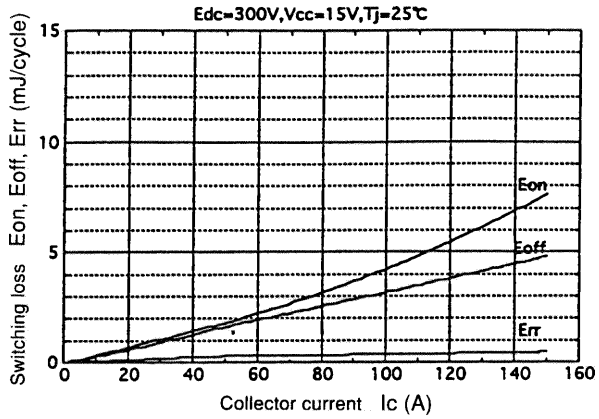
逆バイアス安全動作領域
Reverse biased safe operating area



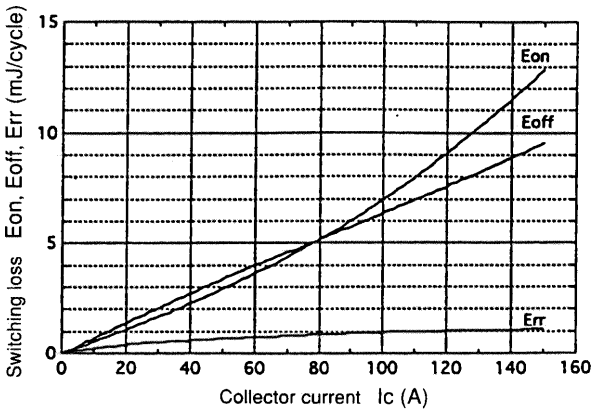
IGBT 電力低減特性（1 チップ）
Power derating for IGBT (per device)



FWD 電力低減特性（1 チップ）
Power derating for FWD (per device)



スイッチング損失—コレクタ電流特性
Switching loss vs. Collector current



スイッチング損失—コレクタ電流特性
Switching loss vs. Collector current

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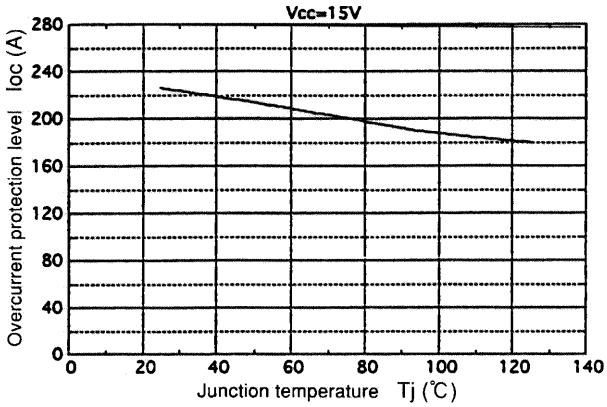

過電流保護—接合部温度特性

Overcurrent protection vs. Junction temperature

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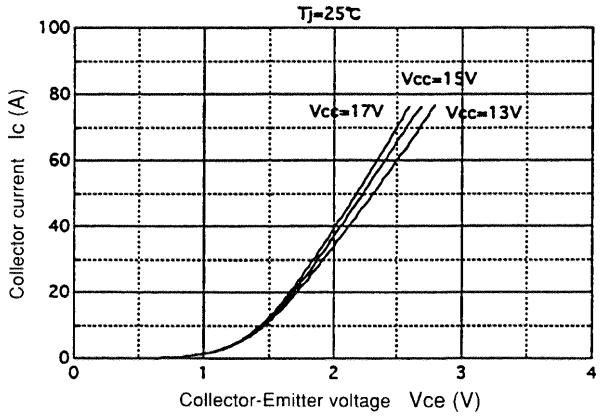
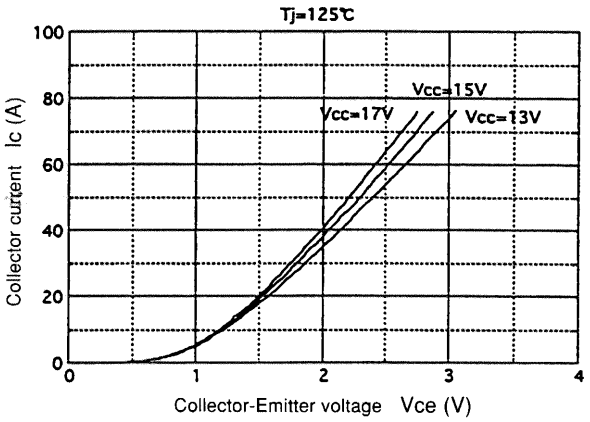
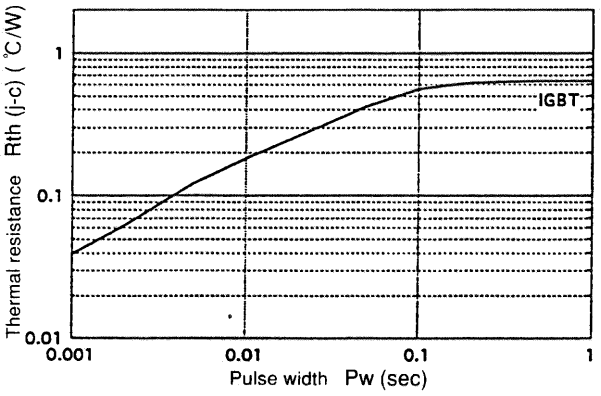
● **Brake**



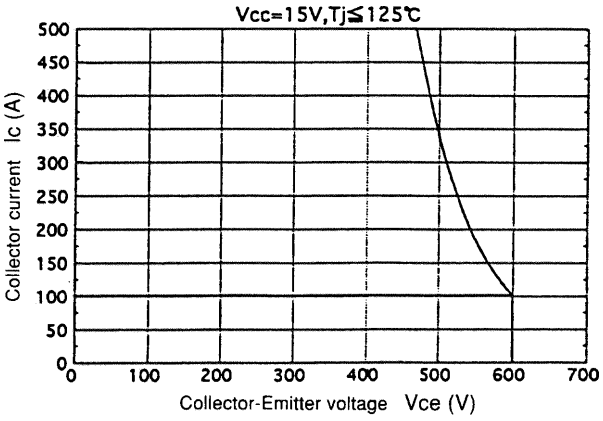
コレクタ電流—コレクタ・エミッタ間電圧特性
Collector current vs. Collector-Emitter voltage



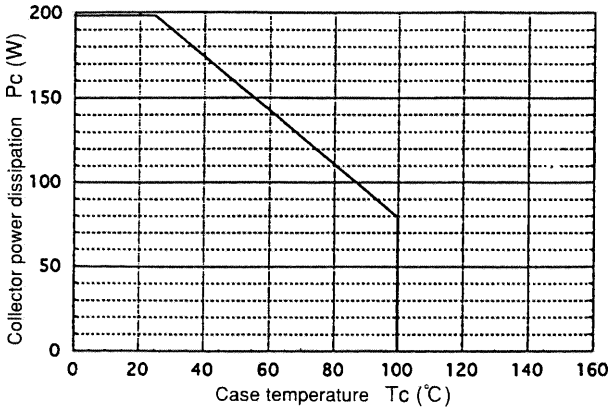
コレクタ電流—コレクタ・エミッタ間電圧特性
Collector current vs. Collector-Emitter voltage



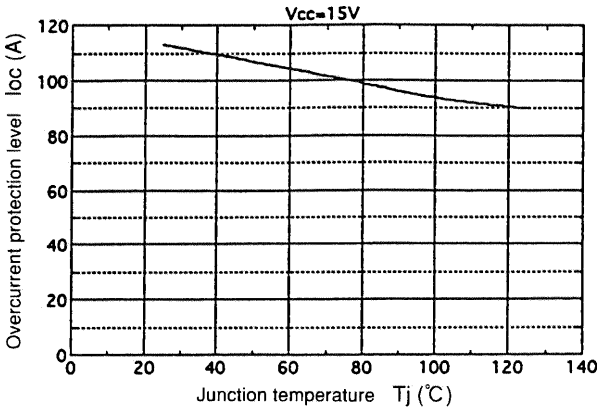
過渡熱抵抗特性
Transient thermal resistance



逆バイアス安全動作領域
Reverse biased safe operating area



IGBT 電力低減特性
Power derating for IGBT(per device)



過電流保護—接合部温度特性
Overcurrent protection vs. Junction temperature

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