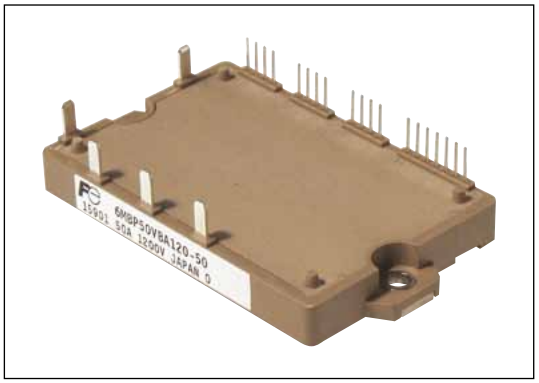
6MBP50VBA060-50

IGBT Modules

IGBT MODULE (V series)
600V / 50A / IPM

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 (T_C=25ºC, V_{CC}=15V unless otherwise specified)

Items		Symbol	Min.	Max.	Units
Collector-Emitter Voltage (*1)		V_{CES}	0	600	V
Short Circuit Voltage		V_{SC}	200	400	V
Collector Current	DC	I_C	-	50	A
	1ms	$I_{C\ pulse}$	-	100	A
	Duty=85.6% (*2)	$-I_C$	-	50	A
Collector Power Dissipation	1 device (*3)	P_C	-	169	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
Alarm Signal Voltage (*6)		V_{ALM}	-0.5	V_{CC}	V
Alarm Signal Current (*7)		I_{ALM}	-	20	mA
Junction Temperature		T_j	-	150	ºC
Operating Case Temperature		T_{opr}	-20	110	ºC
Storage Temperature		T_{stg}	-40	125	ºC
Solder Temperature (*8)		T_{sol}	-	260	ºC
Isolating Voltage (*9)		V_{iso}	-	AC2500	Vrms
Screw Torque	Mounting (M4)	-	-	1.7	Nm

Note *1: V_{CES} shall be applied to the input voltage between terminal P-(U,V, W) and (U,V, W)-N.
Note *2: Duty=125ºC/$R_{th(j-c)D}$ /(I_F×V_F Max.)×100
Note *3: P_C=125ºC/$R_{th(j-c)Q}$
Note *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.
Note *5: V_{in} shall be applied to the input voltage between terminal No.3 and 1, 7 and 5, 11 and 9, 16~18 and 13.
Note *6: V_{ALM} shall be applied to the voltage between terminal No.2 and 1, 6 and 5, 10 and 9, 19 and 13.
Note *7: I_{ALM} shall be applied to the input current to terminal No.2,6,10 and 19.
Note *8: Immersion time 10±1sec. 1time.
Note *9: Terminal to base, 50/60Hz sine wave 1minute.

● Electrical Characteristics (T_j=25ºC, V_{CC}=15V unless otherwise specified)

Items		Symbol	Conditions		Min.	Typ.	Max.	Units
Inverter	Collector Current at off signal input	I_{CES}	V_{CE}=600V		-	-	1.0	mA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	I_C=50A	Terminal	-	-	2.00	V
				Chip	-	1.40	-	V
	Forward voltage of FWD	V_F	I_F=50A	Terminal	-	-	2.30	V
				Chip	-	1.80	-	V
Switching time		t_{on}	V_{DC}=300V, T_j=125ºC I_c=50A		1.1	-	-	µs
		t_{off}			-	-	2.1	µs
		t_{rr}	V_{DC}=300V I_F=50A		-	-	0.3	µs
Supply current of P-side pre-driver (per one unit)		I_{ccp}	Switching Frequency= 0-15kHz T_C=-20~110ºC		-	-	11	mA
Supply current of N-side pre-driver		I_{ccn}			-	-	34	mA
Input signal threshold voltage		$V_{inth(on)}$	V_{in}-GND	ON	1.2	1.4	1.6	V
		$V_{inth(off)}$		OFF	1.5	1.7	1.9	V
Over Current Protection Level		I_{OC}	T_j=125ºC		75	-	-	A
Over Current Protection Delay time		t_{dOC}	T_j=125ºC		-	5	-	µs
Short Circuit Protection Delay time		t_{SC}	T_j=125ºC		-	2	3	µs
IGBT Chips Over Heating Protection Temperature Level		T_{jOH}	Surface of IGBT Chips		150	-	-	ºC
Over Heating Protection Hysteresis		T_{jH}			-	20	-	ºC
Under Voltage Protection Level		V_{UV}			11.0	-	12.5	V
Under Voltage Protection Hysteresis		V_H			0.2	0.5	-	V
Alarm Signal Hold Time		$t_{ALM(OC)}$	ALM-GND T_C=-20~110ºC	V_{CC} ≧10V	1.0	2.0	2.4	ms
		$t_{ALM(UV)}$			2.5	4.0	4.9	ms
		$t_{ALM(TjOH)}$			5.0	8.0	11.0	ms
Resistance for current limit		R_{ALM}			960	1265	1570	Ω

● Thermal Characteristics (T_c = 25ºC)

Items			Symbol	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance (*10)	Inverter	IGBT	$R_{th(j-c)Q}$	-	-	0.74	°C/W
		FWD	$R_{th(j-c)D}$	-	-	1.27	°C/W
Case to Fin Thermal Resistance with Compound			$R_{th(c-f)}$	-	0.05	-	°C/W

Note *10: For 1device, the measurement point of the case is just under the chip.

● Noise Immunity (V_{DC}=300V, V_{CC}=15V)

Items	Conditions	Min.	Typ.	Max.	Units
Common mode rectangular noise	Pulse width 1µs, polarity ±, 10 minute Judge : no over-current, no miss operating	±2.0	-	-	kV

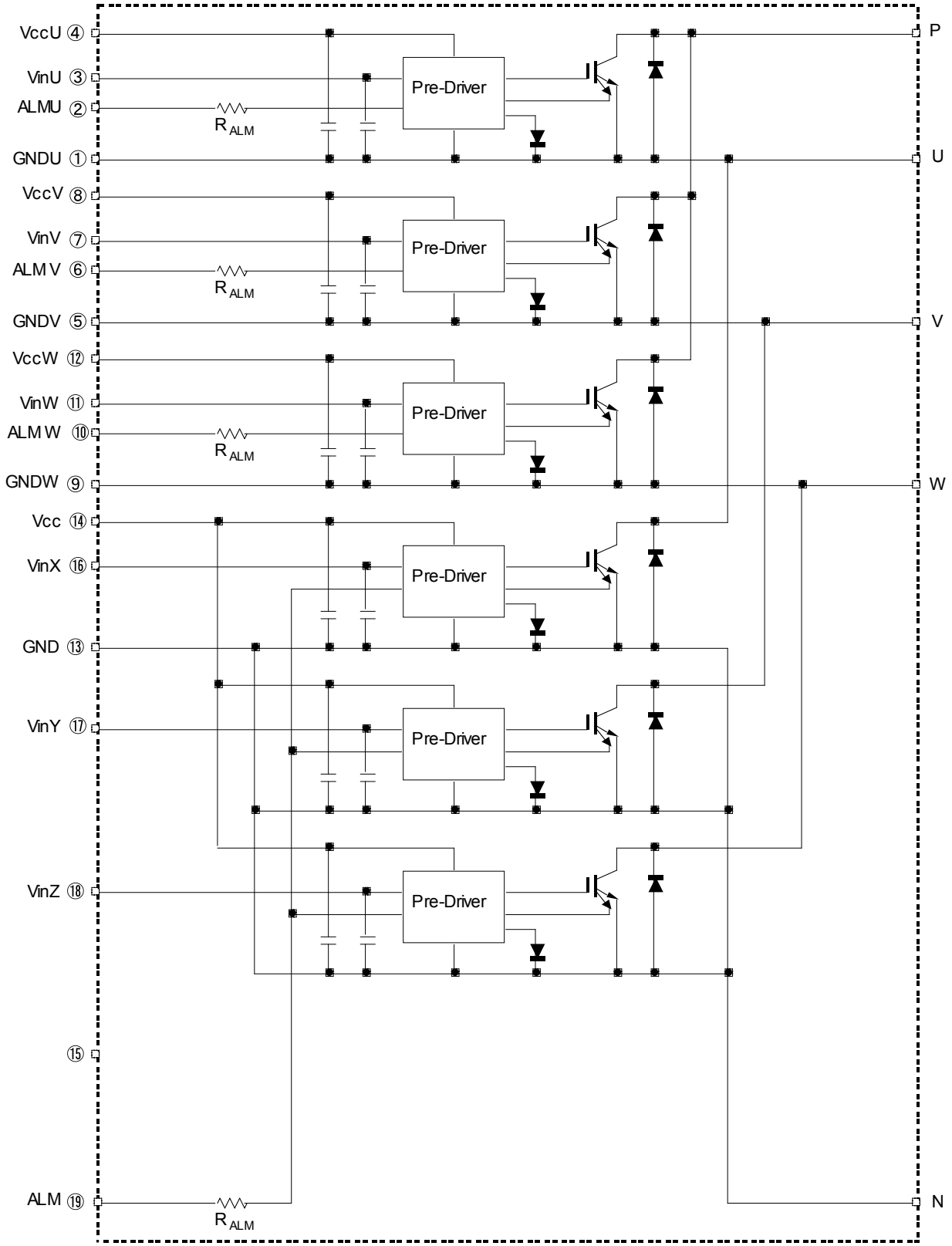
● Recommended Operating Conditions

Items	Symbol	Min.	Typ.	Max.	Units
DC Bus Voltage	V_{DC}	-	-	400	V
Power Supply Voltage of Pre-Driver	V_{CC}	13.5	15.0	16.5	V
Switching frequency of IPM	f_{SW}	-	-	20	kHz
Arm shoot through blocking time for IPM's input signal	t_{dead}	1.0	-	-	µs
Screw Torque (M4)	-	1.3	-	1.7	Nm

● Weight

Items	Symbol	Min.	Typ.	Max.	Units
Weight	W_t	-	100	-	g

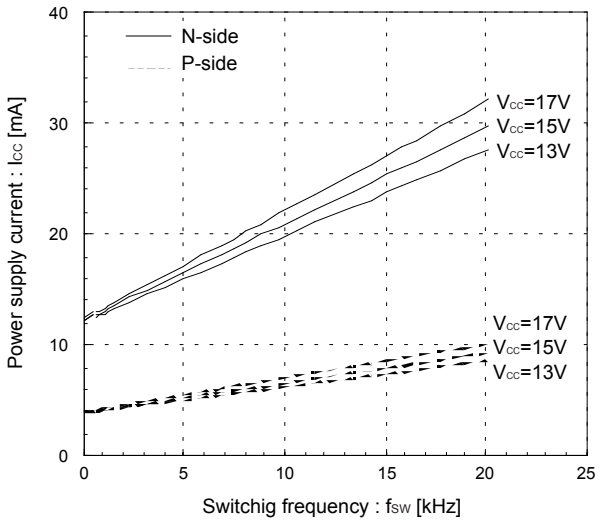
■Block Diagram



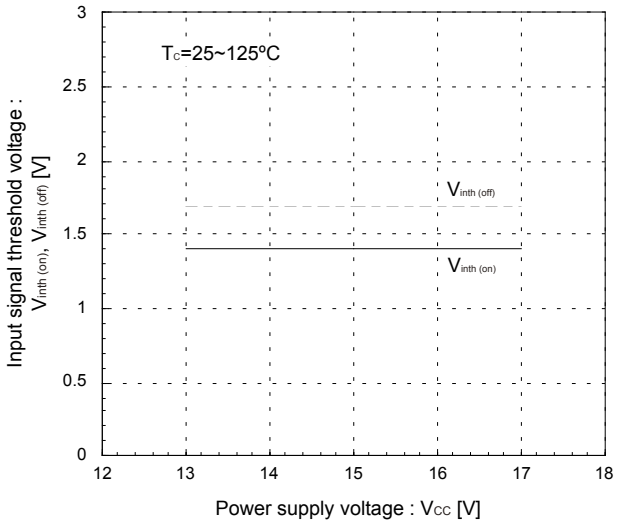
Pre-drivers include following functions
1. Amplifier for driver
2. Short circuit protection
3. Under voltage lockout circuit
4. Over current protection
5. IGBT chip over heating protection

■ Characteristics (Representative)

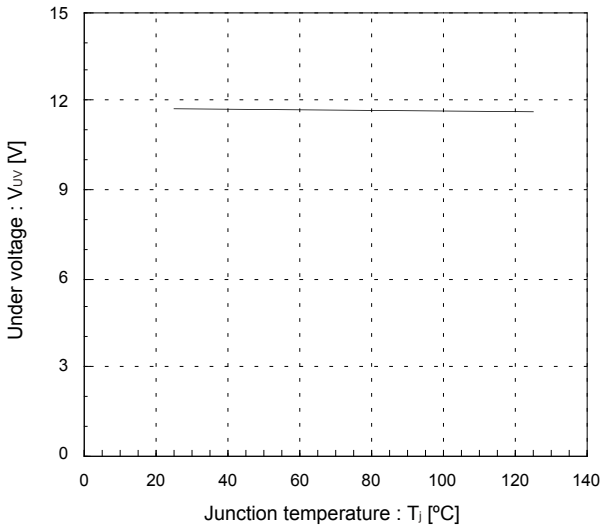
Power supply current vs. Switching frequency
T_j=25ºC (typ.)



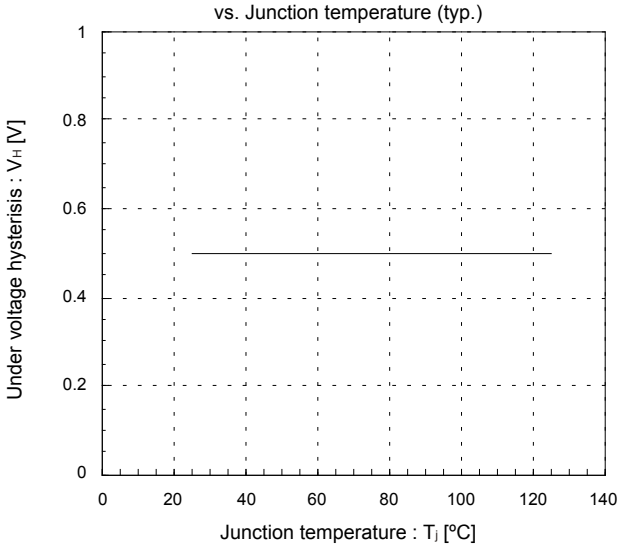
Input signal threshold voltage
vs. Power supply boltage (typ.)



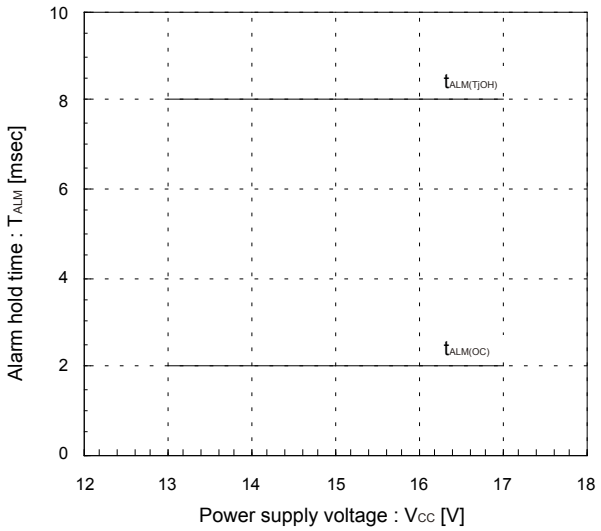
Under voltage vs. Junction temperature (typ.)



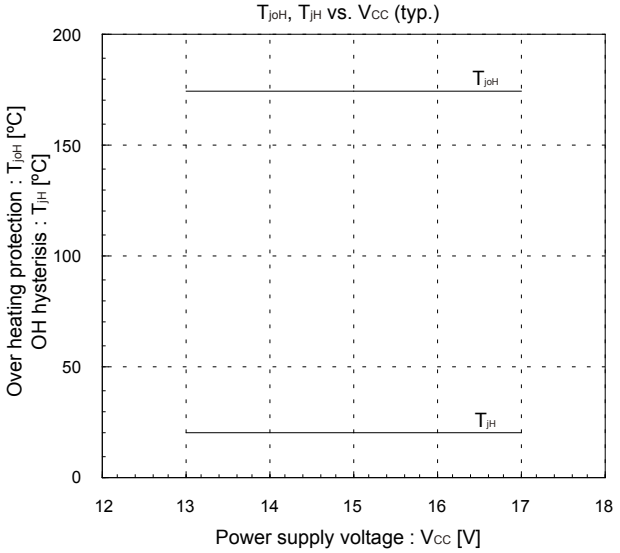
Under voltage hysterisis
vs. Junction temperature (typ.)



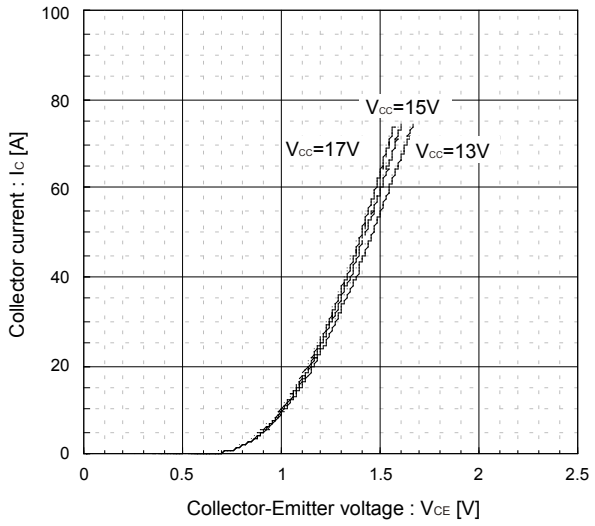
Alarm hold time vs. Power supply voltage (typ.)



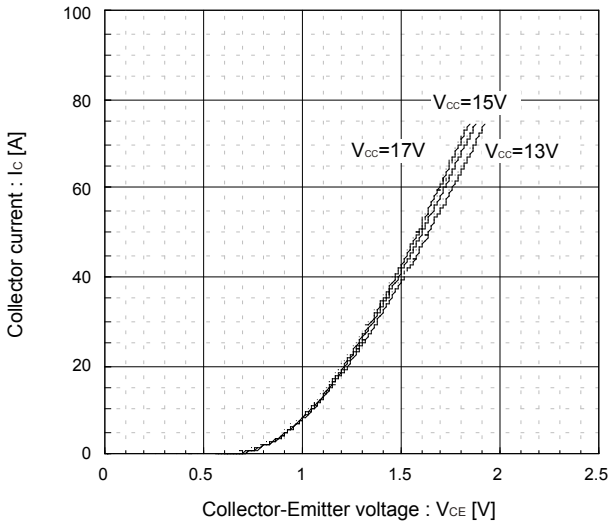
Over heating characteristics
T_{joH}, T_{jH} vs. V_{CC} (typ.)



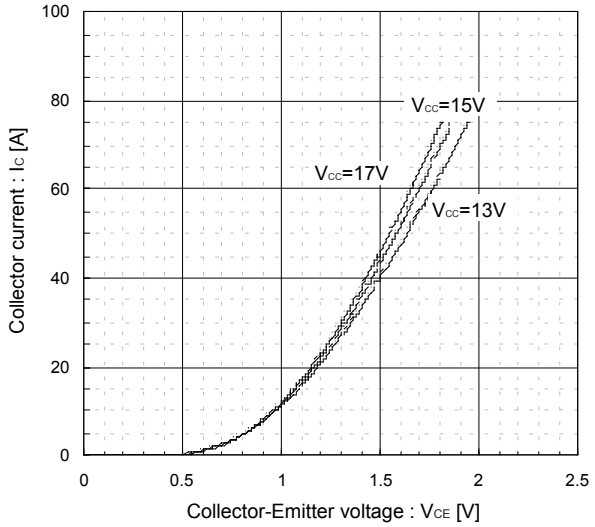
Collector current vs. collector-Emitter voltage
T_j=25ºC [Chip] (typ.)



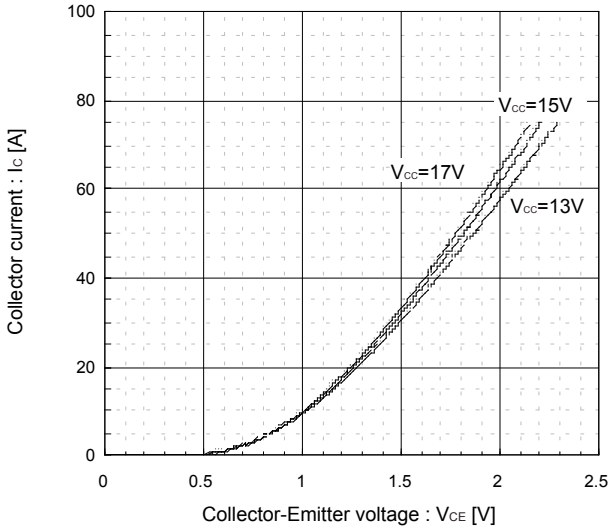
Collector current vs. collector-Emitter voltage
T_j=25ºC [Terminal] (typ.)



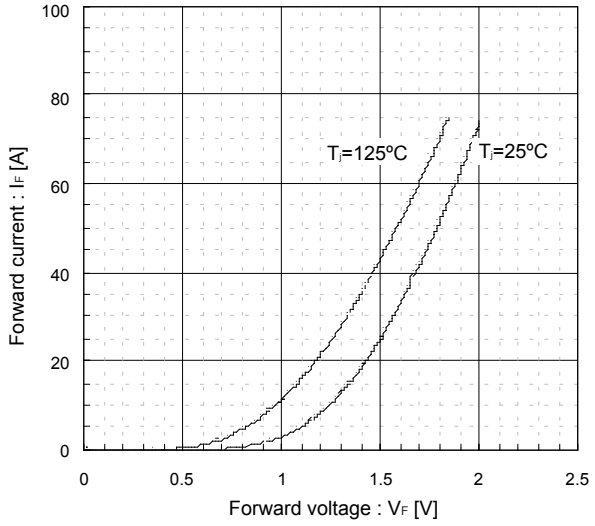
Collector current vs. collector-Emitter voltage
T_j=125ºC [Chip] (typ.)



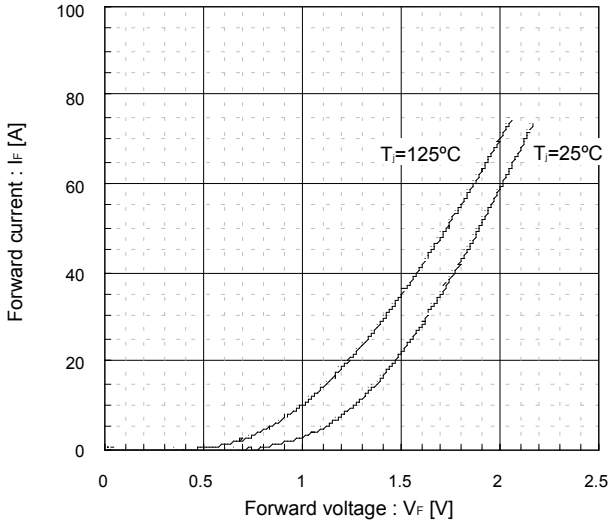
Collector current vs. collector-Emitter voltage
T_j=125ºC [Terminal] (typ.)



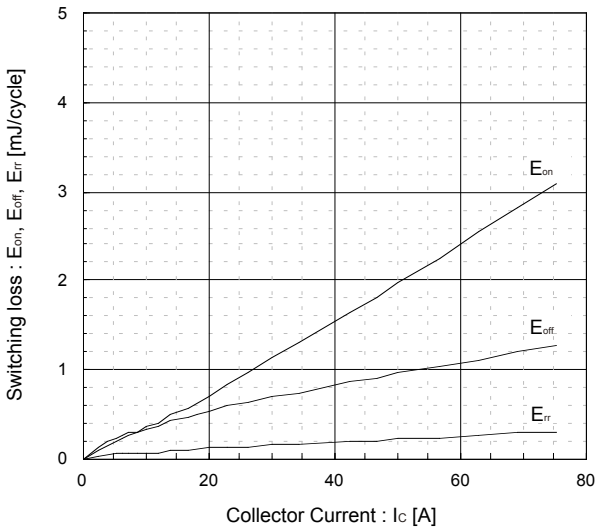
Forward current vs. Forward voltage
[Chip] (typ.)



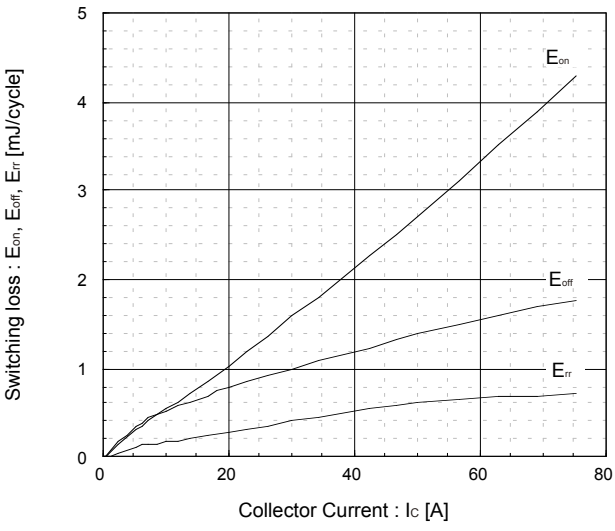
Forward current vs. Forward voltage
[Terminal] (typ.)



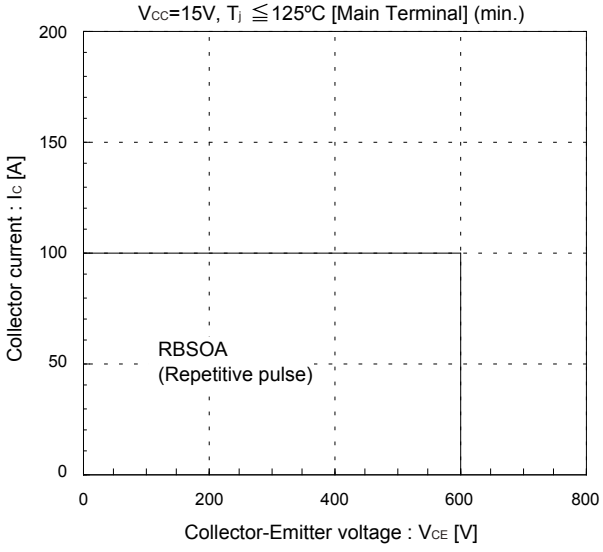
Switching Loss vs. Collector Current (typ.)
V_{DC}=300V, V_{CC}=15V, T_j=25ºC



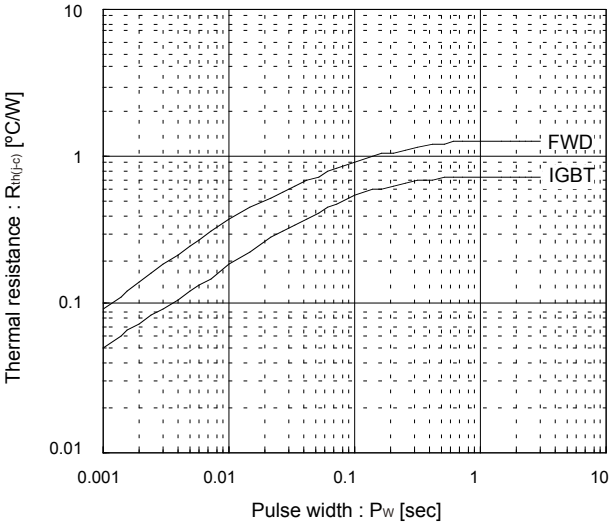
Switching Loss vs. Collector Current (typ.)
V_{DC}=300V, V_{CC}=15V, T_j=125ºC



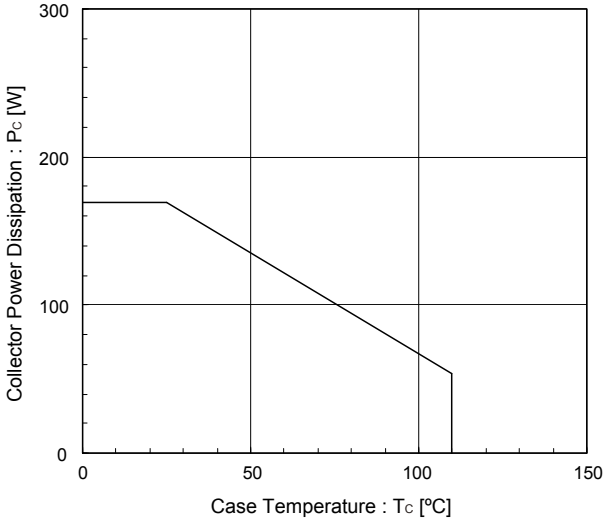
Reversed biased safe operating area
V_{CC}=15V, T_j ≦125ºC [Main Terminal] (min.)



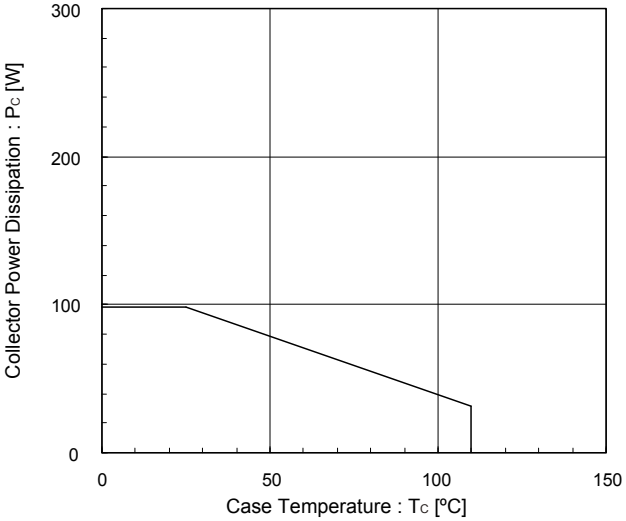
Transient thermal resistance (max.)

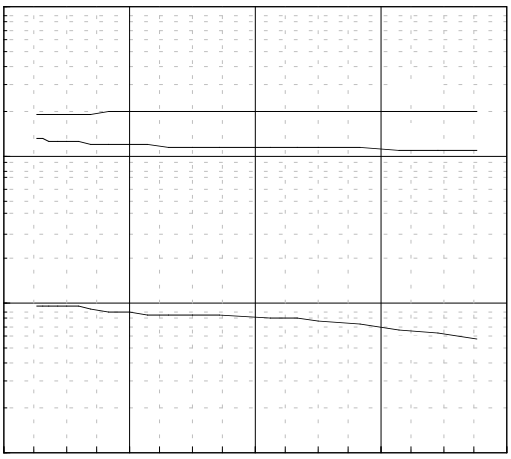


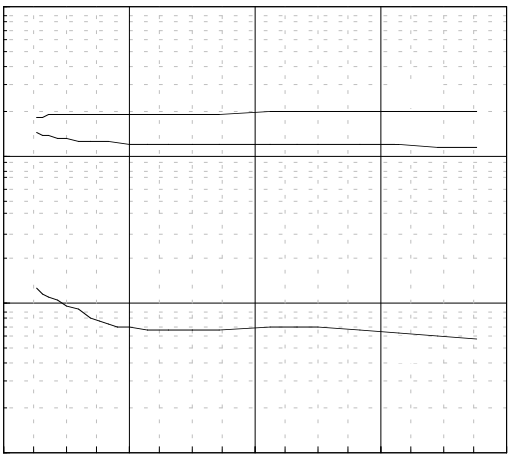
Power derating for IGBT (max.)
[per device]



Power derating for FWD(max.)
[per device]







富士電機

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Technical Information

IGBT Modules

- Please refer to URLs below for futher information about products, application manuals and technical documents.
- 关于本规格书中没有记载的产品信息，应用手册，技术资料等，请参考以下链接。
- 本データシートに記載されていない製品情報，アプリケーションマニュアル，技術資料は以下の URL をご参照下さい。

FUJI ELECTRIC Power Semiconductor WEB site

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