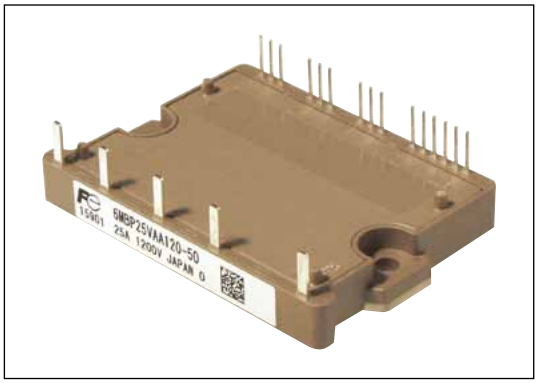
6MBP50VAA060-50

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	Ic	-	50	A
	1ms	Ic pulse	-	100	A
	Duty=100% (*2)	-Ic	-	50	A
Collector Power Dissipation	1 device (*3)	Pc	-	192	W
Supply Voltage of Pre-Driver (*4)		V_{CC}	-0.5	20	V
Input Signal Voltage (*5)		Vin	-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		Tj	-	150	ºC
Operating Case Temperature		Topr	-20	110	ºC
Storage Temperature		Tstg	-40	125	ºC
Solder Temperature (*8)		Tsol	-	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/Rth(j-c)D/(I_F×V_F Max.)×100
Note *3: P_C=125ºC/Rth(j-c)Q
Note *4: V_{CC} shall be applied to the input voltage between terminal No.3 and 1, 6 and 4, 9 and 7, 11 and 10.
Note *5: Vin shall be applied to the input voltage between terminal No.2 and 1, 5 and 4, 8 and 7, 12~14 and 10.
Note *6: V_{ALM} shall be applied to the voltage between terminal No.15 and 10.
Note *7: I_{ALM} shall be applied to the input current to terminal No.15.
Note *8: Immersion time 10±1sec. 1time.
Note *9: Terminal to base, 50/60Hz sine wave 1minute.

● Electrical Characteristics (Tj=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	-	-	2.0	V
				Chip	-	1.4	-	V
	Forward voltage of FWD	V_F	I_F=50A	Terminal	-	-	2.3	V
				Chip	-	1.8	-	V
Switching time		ton	V_{DC}=300V, Tj=125ºC Ic=50A		1.1	-	-	µs
		toff			-	-	2.1	µs
		trr	V_{DC}=300V I_F=50A		-	-	0.3	µs
Supply current of P-side pre-driver (per one unit)		Iccp	Switching Frequency= 0-15kHz Tc=-20~110ºC		-	-	10	mA
Supply current of N-side pre-driver		Iccn			-	-	25	mA
Input signal threshold voltage		Vinth(on)	Vin-GND	ON	1.2	1.4	1.6	V
		Vinth(off)		OFF	1.5	1.7	1.9	V
Over Current Protection Level		I_{OC}	Tj=125ºC		75	-	-	A
Over Current Protection Delay time		t_{dOC}	Tj=125ºC		-	5	-	µs
Short Circuit Protection Delay time		t_{SC}	Tj=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 Tc=-20~110ºC	$V_{CC} \geqq$ 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	Rth(j-c)Q	-	-	0.65	°C/W
		FWD	Rth(j-c)D	-	-	1.30	°C/W
Case to Fin Thermal Resistance with Compound			Rth(c-f)	-	0.05	-	°C/W

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

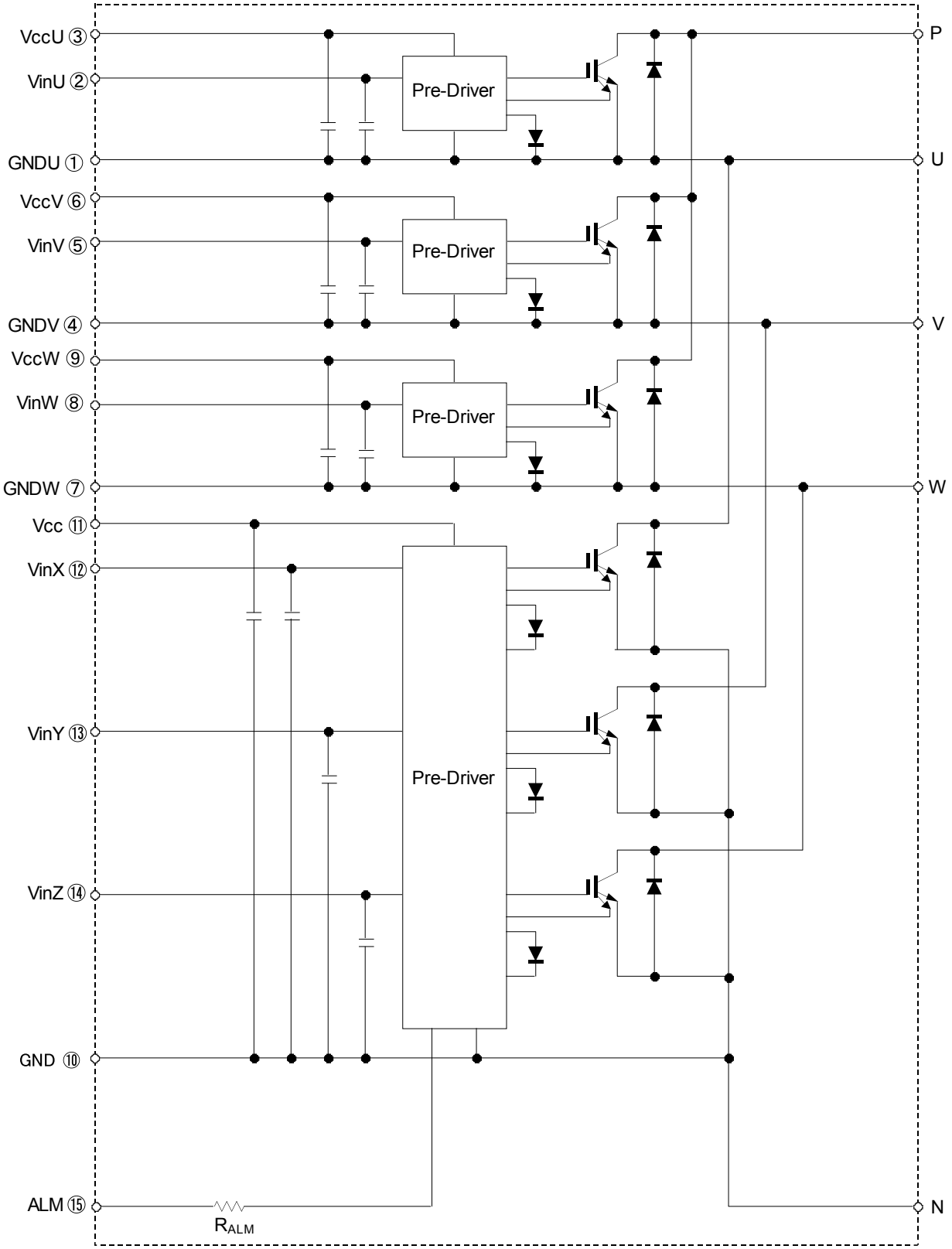
● Noise Immunity (V_{DC}=300V, V_{CC}=15V)

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
Arm shoot through blocking time for IPM's input signal	tdead	1.0	-	-	µs
Screw Torque (M4)	-	1.3	-	1.7	Nm

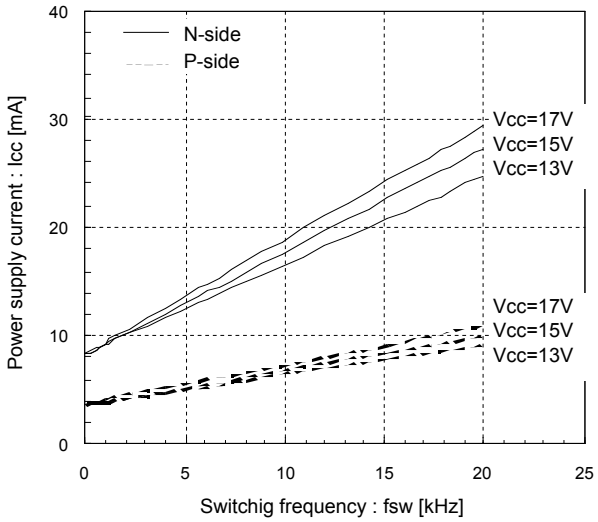
■Block Diagram



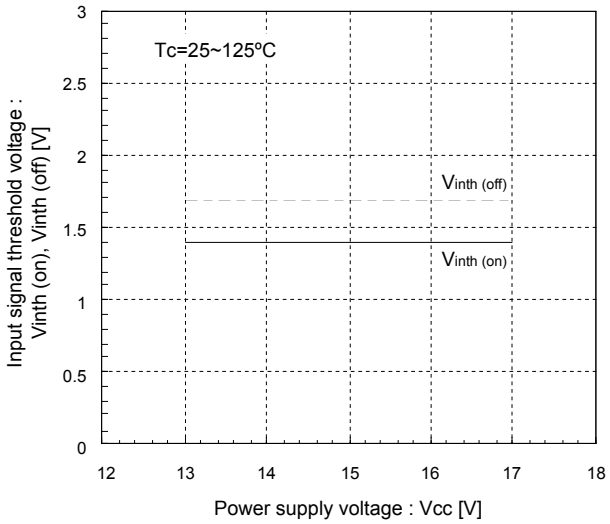
Pre-drivers include following functions
1. Amplifier for driver
2. Short circuit protection
3. Under voltage lockout circuit
4. Over current protection
5. IGBT chip over heating protection

■ Characteristics (Representative)

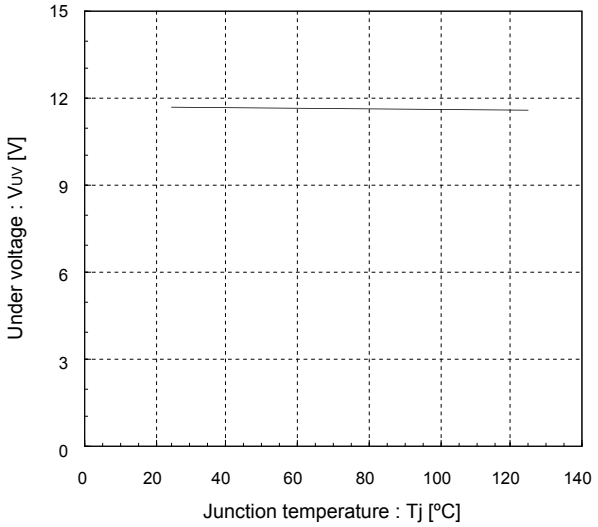
Power supply current vs. Switching frequency
Tj=25ºC (typ.)



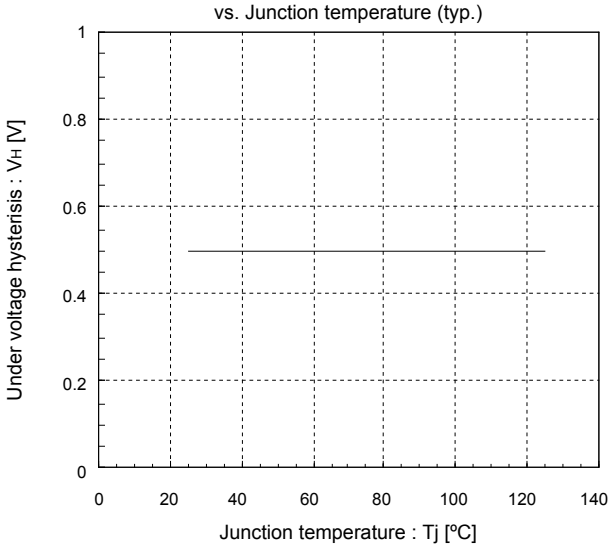
Input signal threshold voltage
vs. Power supply boltage (typ.)



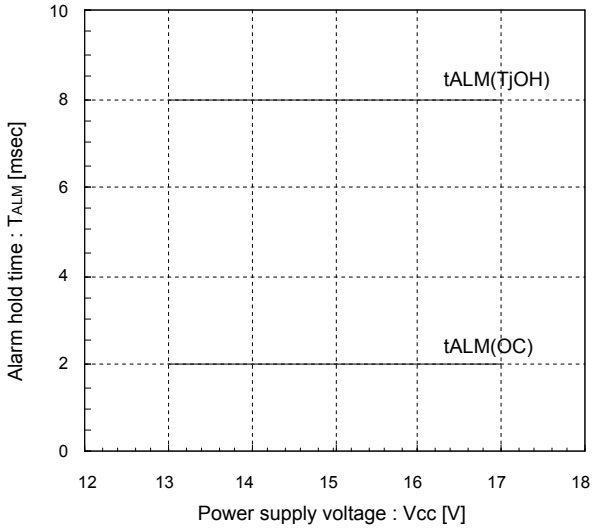
Under voltage vs. Junction temperature (typ.)



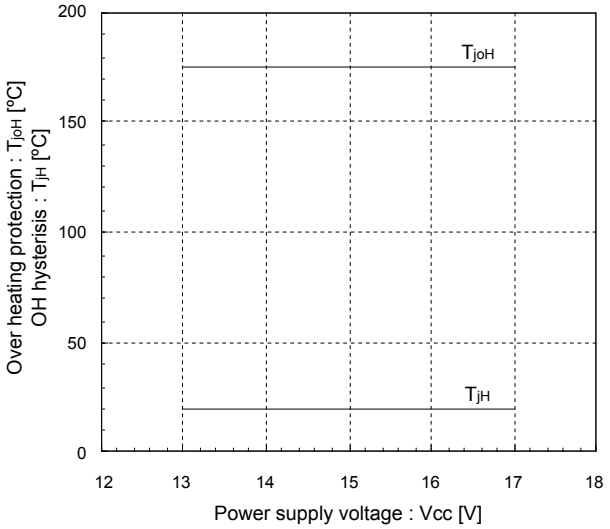
Under voltage hysterisis
vs. Junction temperature (typ.)



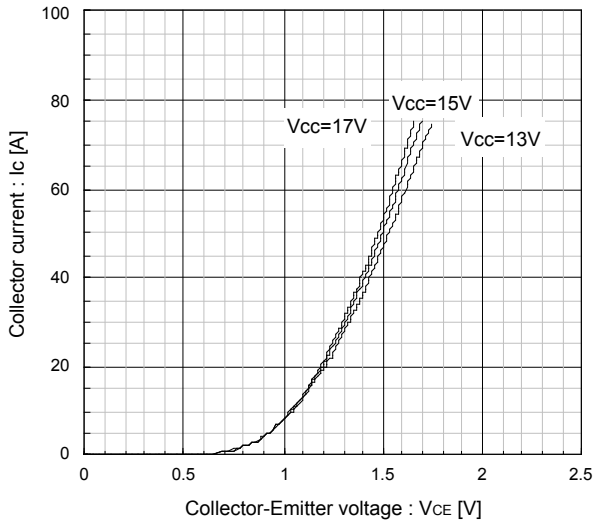
Alarm hold time vs. Power supply voltage (typ.)



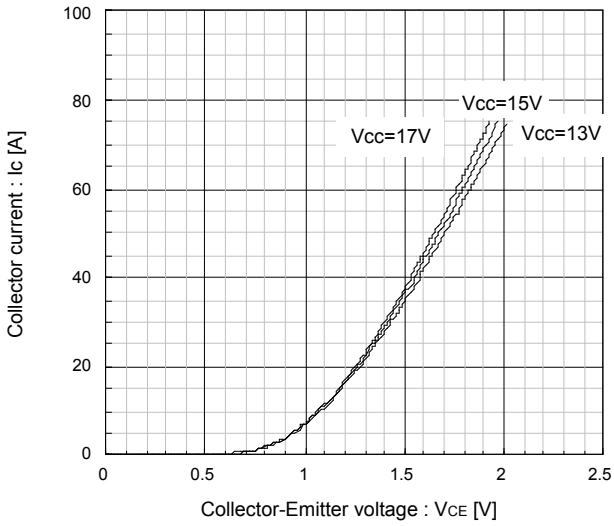
Over heating characteristics
TjoH, TjH vs. Vcc (typ.)



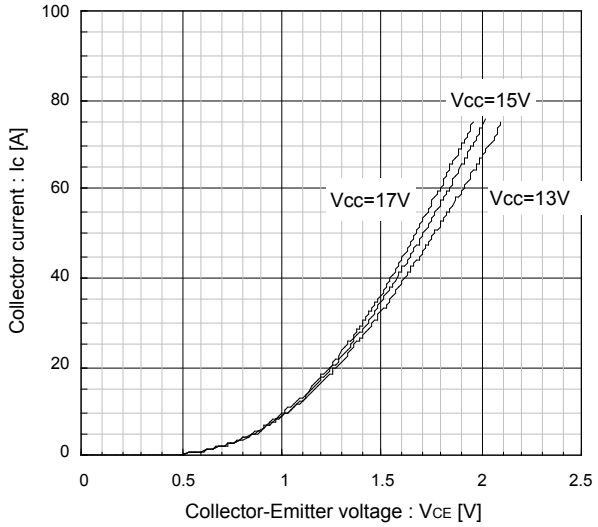
Collector current vs. collector-Emitter voltage
Tj=25ºC [Chip] (typ.)



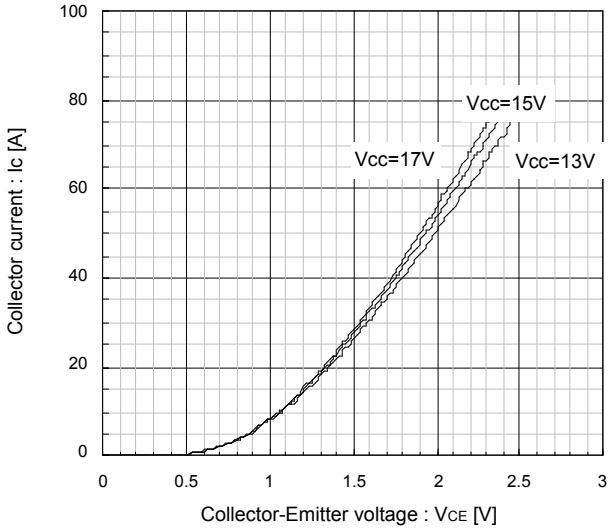
Collector current vs. collector-Emitter voltage
Tj=25ºC [Terminal] (typ.)



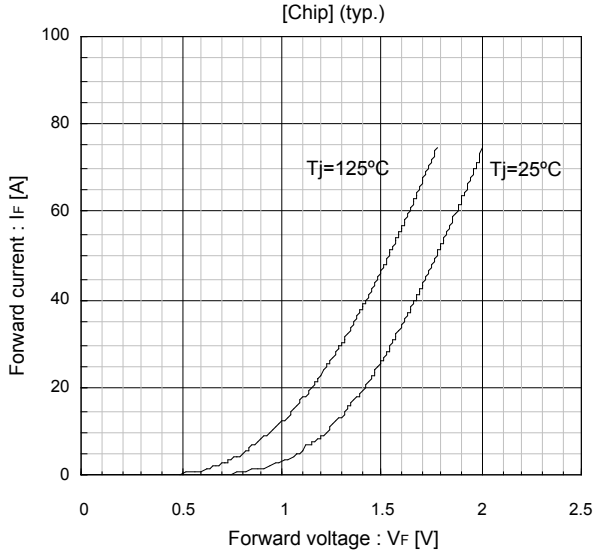
Collector current vs. collector-Emitter voltage
Tj=125ºC [Chip] (typ.)



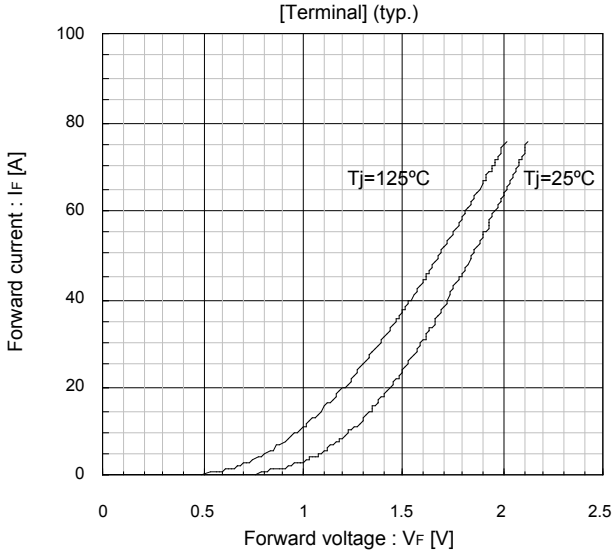
Collector current vs. collector-Emitter voltage
Tj=125ºC [Terminal] (typ.)



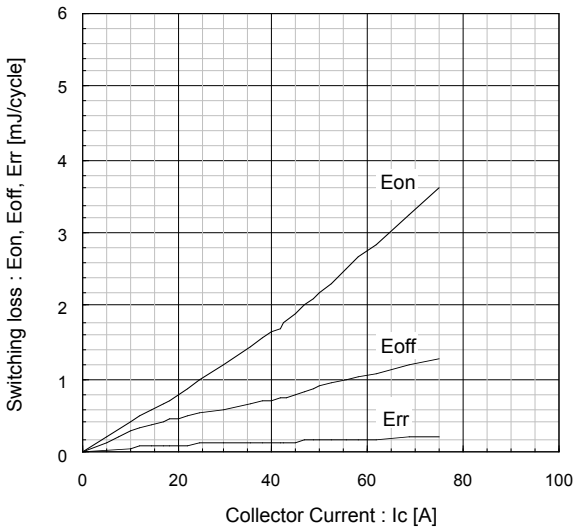
Forward current vs. Forward voltage
[Chip] (typ.)



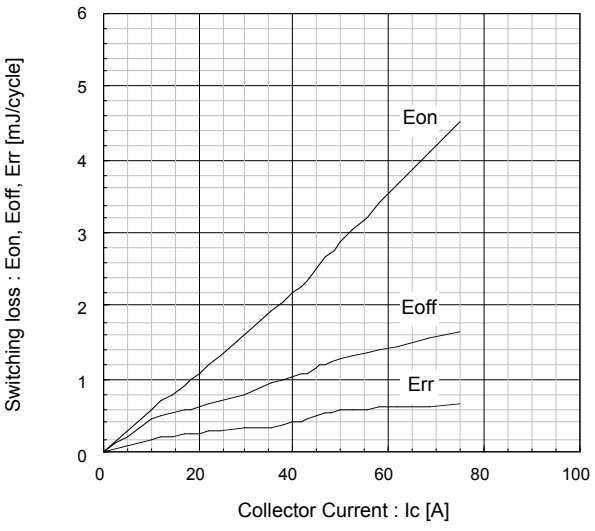
Forward current vs. Forward voltage
[Terminal] (typ.)



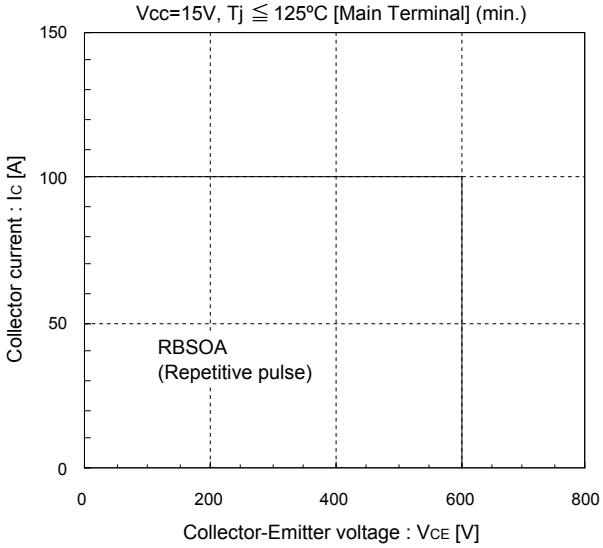
Switching Loss vs. Collector Current (typ.)
V_{DC}=300V, Vcc=15V, Tj=25ºC



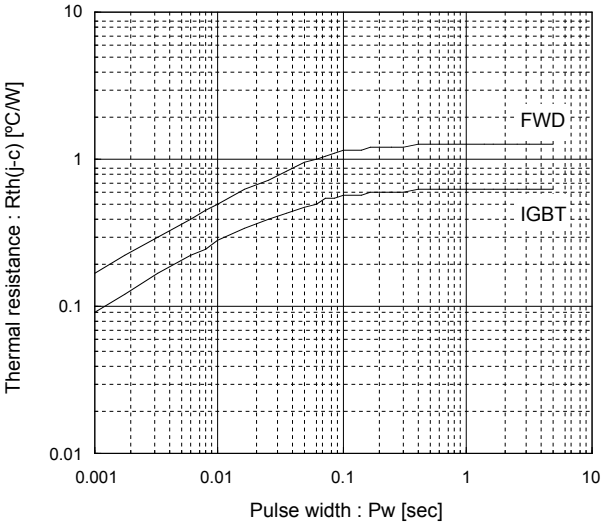
Switching Loss vs. Collector Current (typ.)
V_{DC}=300V, Vcc=15V, Tj=125ºC



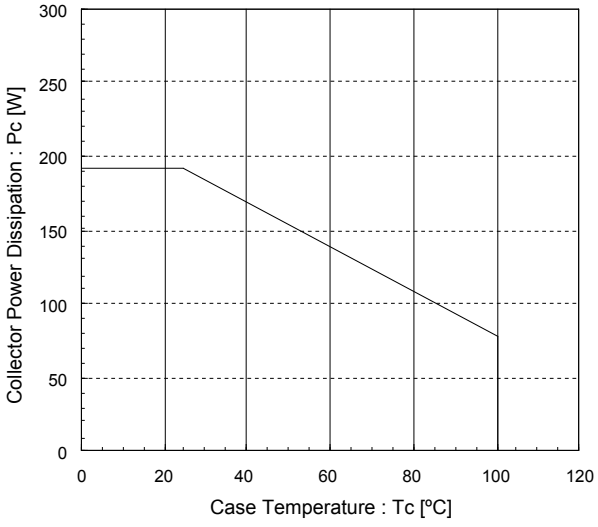
Reversed biased safe operating area
Vcc=15V, Tj ≦ 125ºC [Main Terminal] (min.)



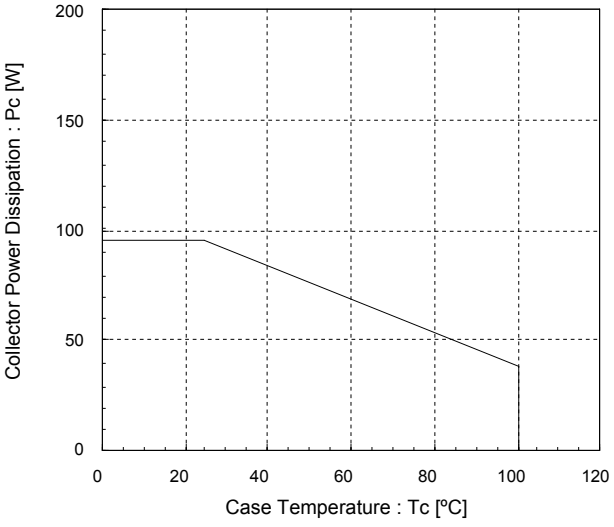
Transient thermal resistance (max.)



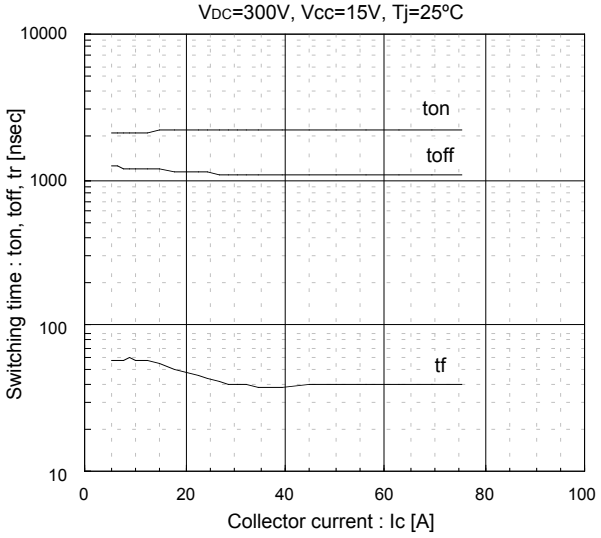
Power derating for IGBT (max.)
[per device]



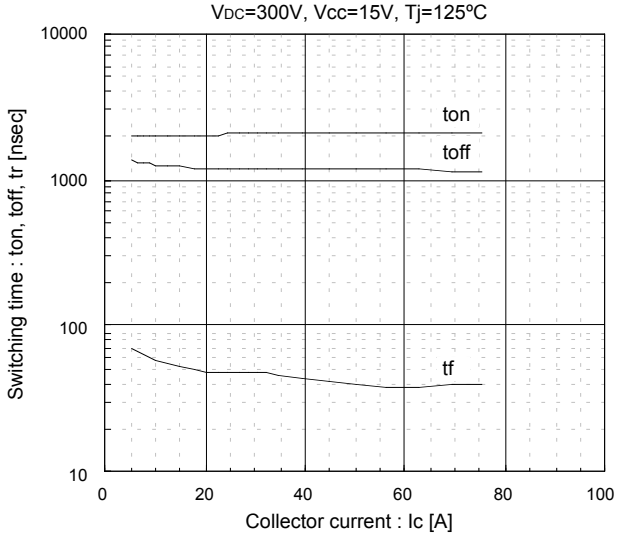
Power derating for FWD(max.)
[per device]



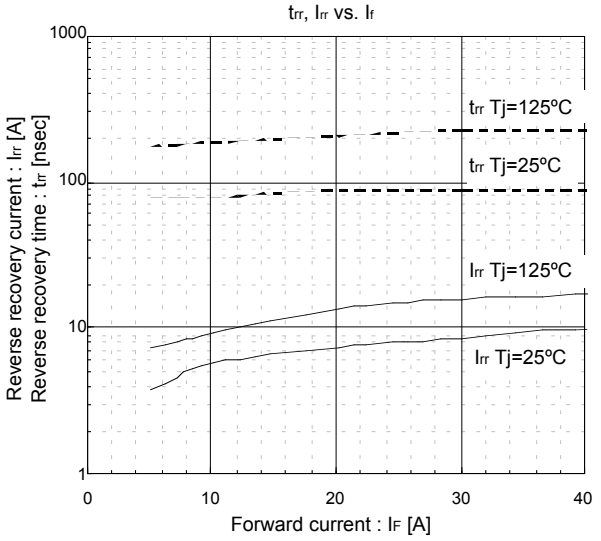
Switching time vs. Collector current (typ.)
V_{DC}=300V, Vcc=15V, Tj=25ºC



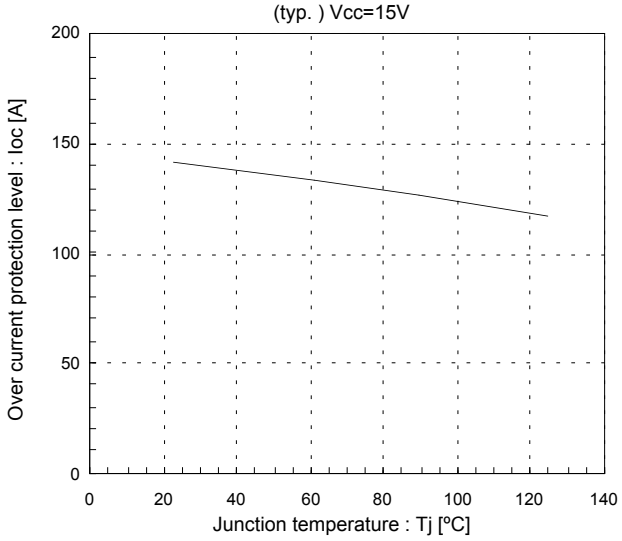
Switching time vs. Collector current (typ.)
V_{DC}=300V, Vcc=15V, Tj=125ºC



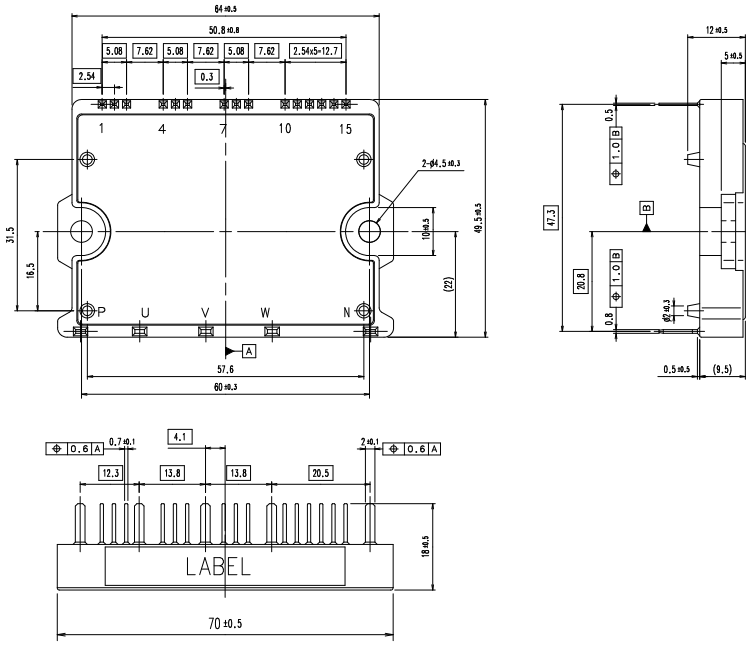
Reverse recovery characteristics (typ.)
t_{rr}, I_{rr} vs. I_F



Over current protection vs. Junction temperature
(typ.) Vcc=15V



■ Outline Drawings, mm



WARNING

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of May 2011.
The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sur to obtain the latest specifications.

2. All applications described in this Catalog exemplify the use of Fuji's products for your reference only. No right or license, either express or implied, under any patent, copyright, trade secret or other intellectual property right owned by Fuji Electric Co., Ltd. is (or shall be deemed) granted. Fuji Electric Co., Ltd. makes no representation or warranty, whether express or implied, relating to the infringement or alleged infringement of other's intellectual property rights which may arise from the use of the applications described herein.

3. Although Fuji Electric Co., Ltd. is enhancing product quality and reliability, a small percentage of semiconductor products may become faulty. When using Fuji Electric semiconductor products in your equipment, you are requested to take adequate safety measures to prevent the equipment from causing a physical injury, fire, or other problem if any of the products become faulty. It is recommended to make your design failsafe, flame retardant, and free of malfunction.

4. The products introduced in this Catalog are intended for use in the following electronic and electrical equipment which has normal reliability requirements.
- Computers
- OA equipment
- Communications equipment (terminal devices)
- Measurement equipment
- Machine tools
- Audiovisual equipment
- Electrical home appliances
- Personal equipment
- Industrial robots etc.

5. If you need to use a product in this Catalog for equipment requiring higher reliability than normal, such as for the equipment listed below, it is imperative to contact Fuji Electric Co., Ltd. to obtain prior approval. When using these products for such equipment, take adequate measures such as a backup system to prevent the equipment from malfunctioning even if a Fuji's product incorporated in the equipment becomes faulty.
- Transportation equipment (mounted on cars and ships)
- Trunk communications equipment
- Traffic-signal control equipment
- Gas leakage detectors with an auto-shut-off feature
- Emergency equipment for responding to disasters and anti-burglary devices
- Safety devices
- Medical equipment

6. Do not use products in this Catalog for the equipment requiring strict reliability such as the following and equivalents to strategic equipment (without limitation).
- Space equipment
- Aeronautic equipment
- Nuclear control equipment
- Submarine repeater equipment

8. If you have any question about any portion in this Catalog, ask Fuji Electric Co., Ltd. or its sales agents before using the product.
Neither Fuji Electric Co., Ltd. nor its agents shall be liable for any injury caused by any use of the products not in accordance with instructions set forth herein.