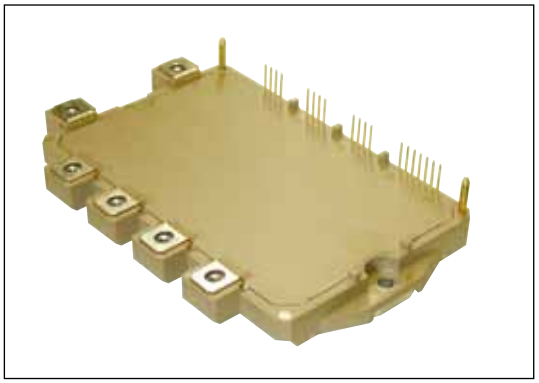
7MBP50VDA120-50

IGBT Modules

IGBT MODULE (V series)
1200V / 50A / IPM

Features

- **Temperature protection provided by directly detecting the junction temperature of the IGBTs**
- Low power loss and soft switching
- 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	1200	V
Short Circuit Voltage			V_{SC}	400	800	V
Inverter	Collector Current	DC	I_C	-	50	A
		1ms	I_{cp}	-	100	A
		Duty=100% (*2)	$-I_C$	-	50	A
	Collector Power Dissipation	1 device (*3)	P_C	-	250	W
Brake	Collector Current	DC	I_C	-	25	A
		1ms	I_{cp}	-	50	A
	Forward Current of Diode		I_F	-	25	A
	Collector Power Dissipation	1 device (*3)	P_C	-	187	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		Terminal (M4)	-	-	1.7	Nm
		Mounting (M4)				

Note *1: V_{CES} shall be applied to the input voltage between terminal P-(U,V, W) and (U,V, W, B)-N.
Note *2: Duty=125ºC/Rth(j-c)D /(I_F×V_F Max.)×100
Note *3: P_C=125ºC/Rth(j-c)Q (Inverter & Brake)
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: Vin shall be applied to the input voltage between terminal No.3 and 1, 7 and 5, 11 and 9, 15~18 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 1min. All terminals should be connected together during the test.

● 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}=1200V		-	-	1.0	mA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	I_C=50A	Terminal	-	-	2.25	V
				Chip	-	1.70	-	V
	Forward voltage of FWD	V_F	I_F=50A	Terminal	-	-	2.80	V
				Chip	-	2.10	-	V
Brake	Collector Current at off signal input	I_{CES}	V_{CE}=1200V		-	-	1.0	mA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	I_C=25A	Terminal	-	-	2.10	V
				Chip	-	1.70	-	V
	Forward voltage of FWD	V_F	I_C=25A	Terminal	-	-	2.55	V
				Chip	-	2.10	-	V
Switching time		t_{on}	V_{DC}=600V, T_j=125ºC, I_C=50A		1.1	-	-	µs
		t_{off}			-	-	2.1	µs
		t_{rr}	V_{DC}=600V, I_C=50A		-	-	0.3	µs
Supply current of P-side pre-driver (per one unit)		I_{ccp}	Switching Frequency= 0-15kHz T_C=-20~110ºC		-	-	14	mA
Supply current of N-side pre-driver		I_{ccn}			-	-	58	mA
Input signal threshold voltage		$V_{inth(on)}$	Vin-GND	ON	1.2	1.4	1.6	V
		$V_{inth(off)}$		OFF	1.5	1.7	1.9	V
Over Current Protection Level	Inverter	I_{OC}	T_j=125ºC		75	-	-	A
	Brake				38	-	-	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	$V_{CC} \geqq$ 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	$R_{th(j-c)Q}$	-	-	0.50	°C/W
		FWD	$R_{th(j-c)D}$	-	-	0.74	°C/W
	Brake	IGBT	$R_{th(j-c)Q}$	-	-	0.67	°C/W
		FWD	$R_{th(j-c)D}$	-	-	1.2	°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.

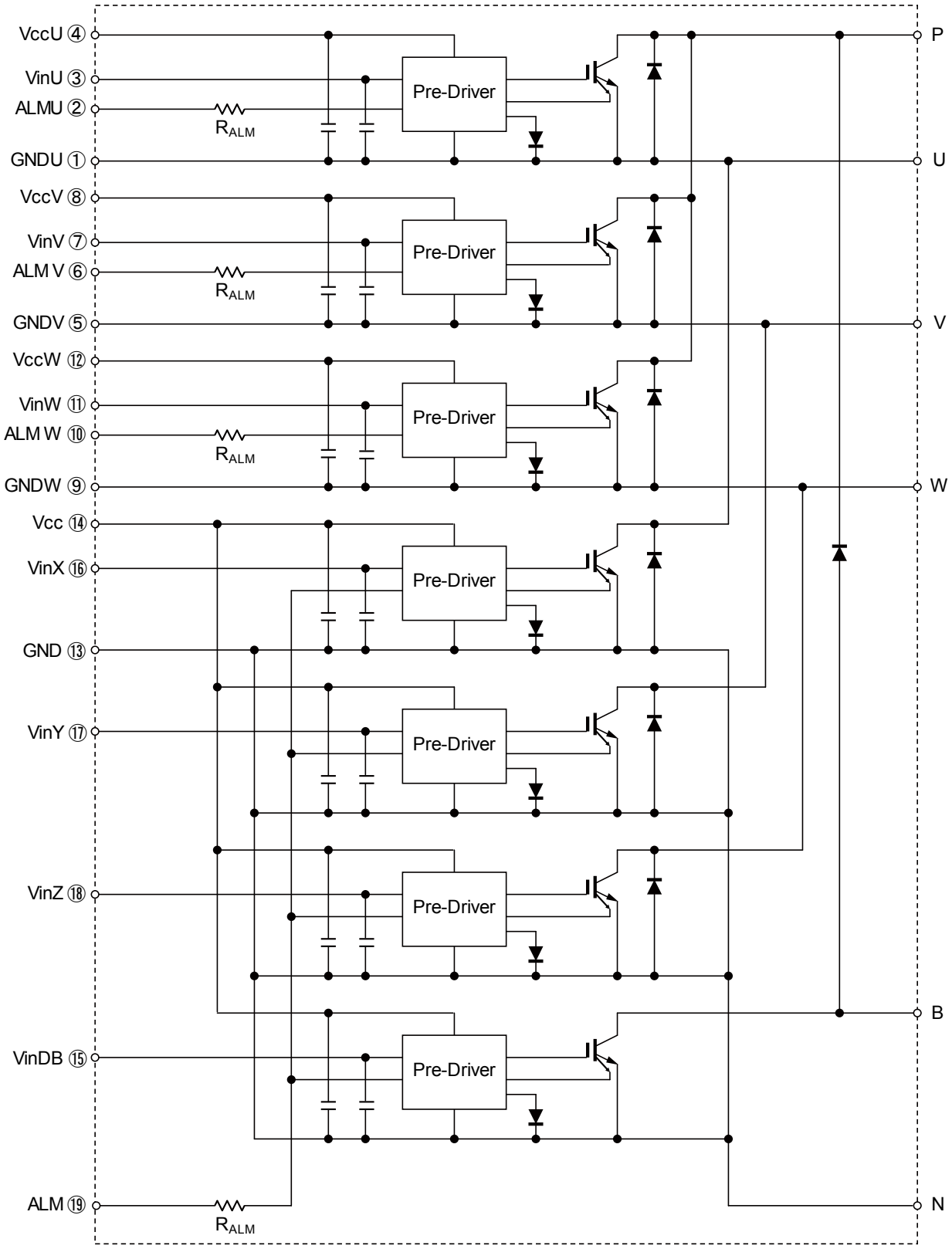
● Noise Immunity (V_{DC}=600V, V_{cc}=15V)

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

● Recommended Operating Conditions

Items	Symbol	Min.	Typ.	Max.	Units
DC Bus Voltage	V_{DC}	-	-	800	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

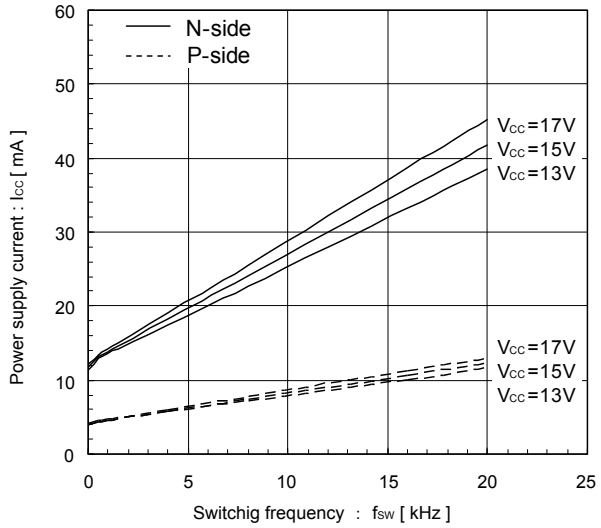
■ Block Diagram



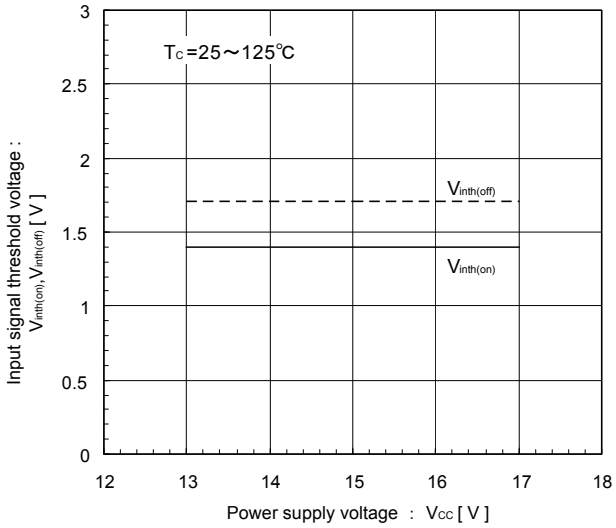
Pre-drivers include following functions
1. Amplifier for driver
2. Short circuit protection
3. Under voltage lockout circuit
4. Over current protection
5. IGBT chip over heating protection

■ Characteristics (Representative)

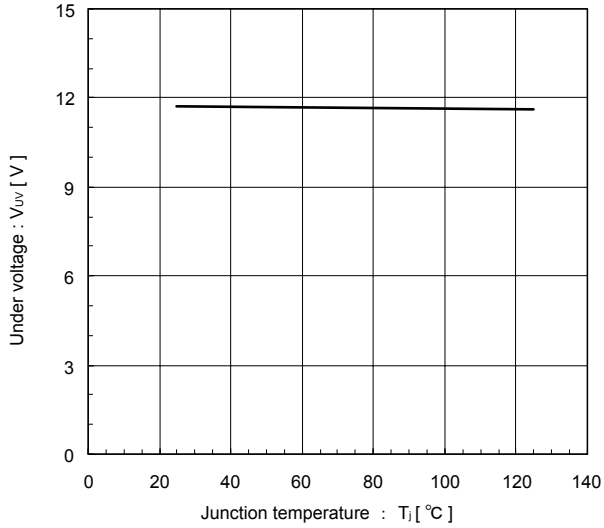
Power supply current vs. Switching frequency
T_j= 25℃(typ.)



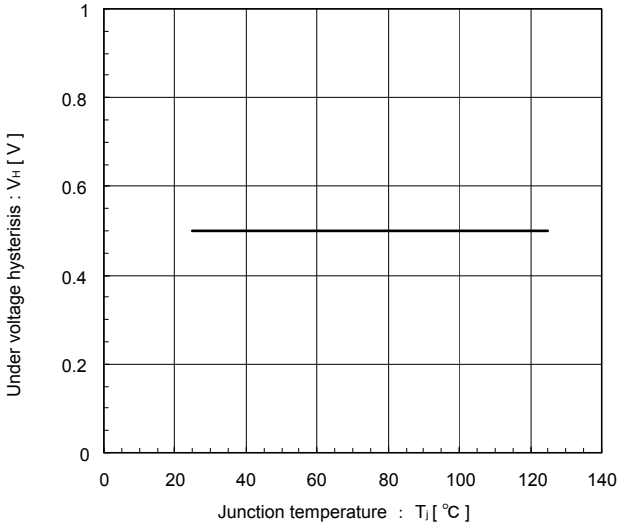
Input signal threshold voltage
vs. Power supply voltage (typ.)



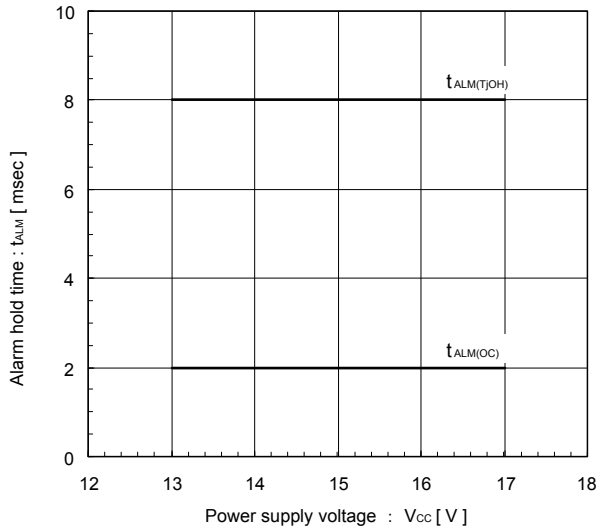
Under voltage vs. Junction temperature (typ.)



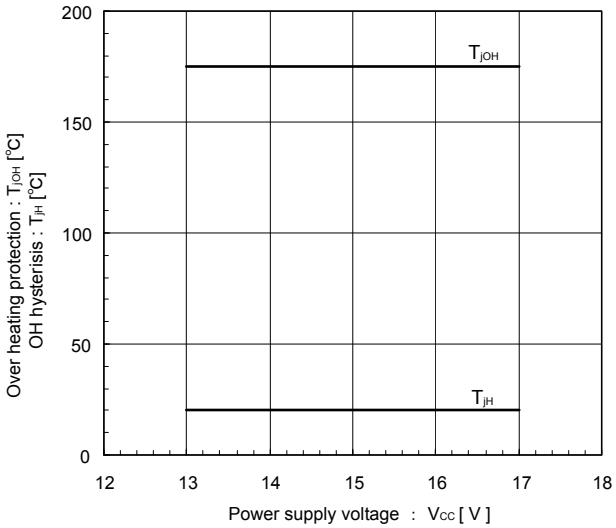
Under voltage hysterisis
vs. Junction temperature (typ.)



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

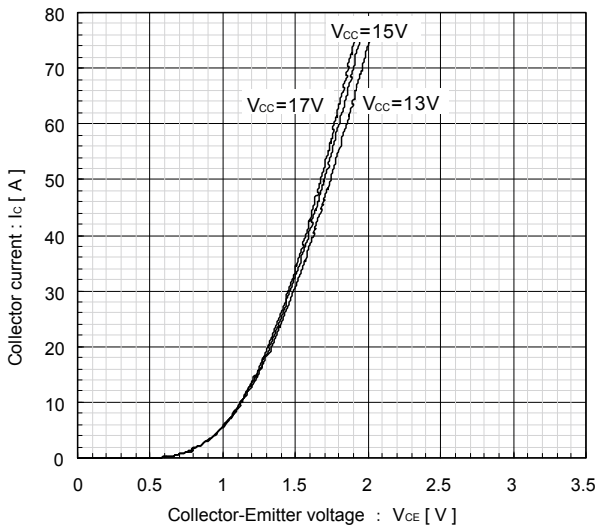


Over heating characteristics
T_{jOH}, T_{jH} vs. V_{CC} (typ.)

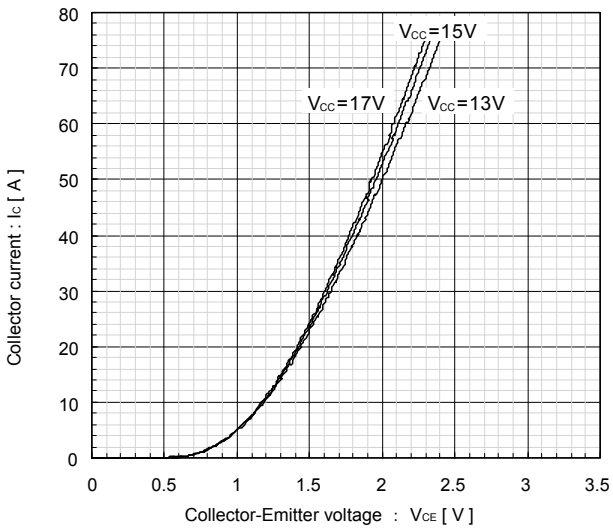


Inverter

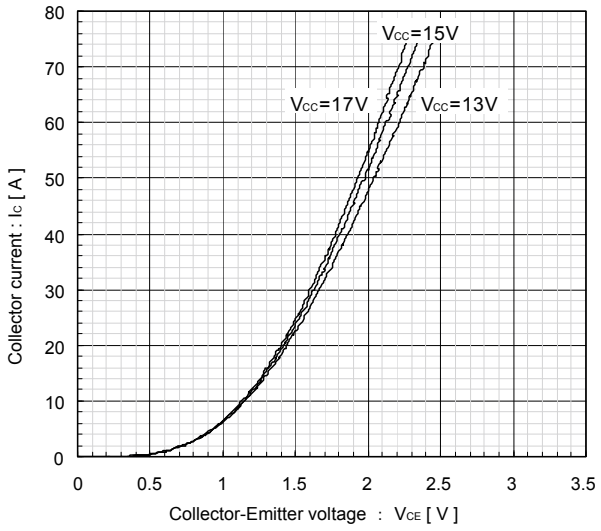
Collector current vs. Collector-Emitter voltage
T_j=25℃[Chip] (typ.)



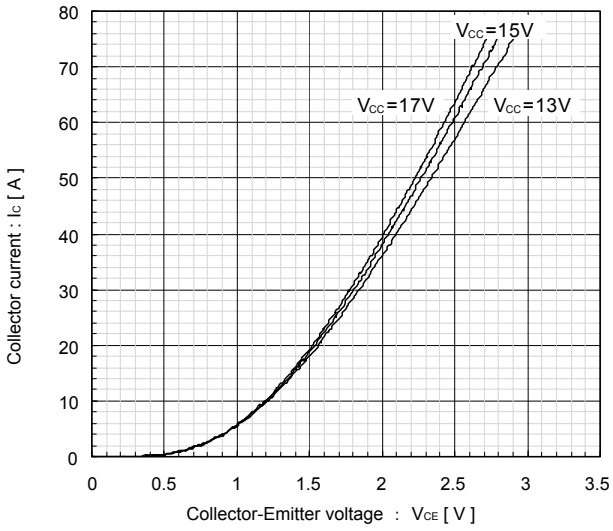
Collector current vs. Collector-Emitter voltage
T_j=25℃[Terminal] (typ.)



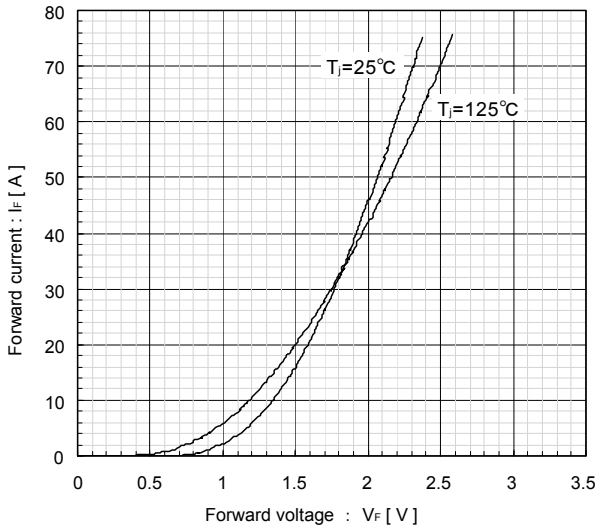
Collector current vs. Collector-Emitter voltage
T_j=125℃[Chip] (typ.)



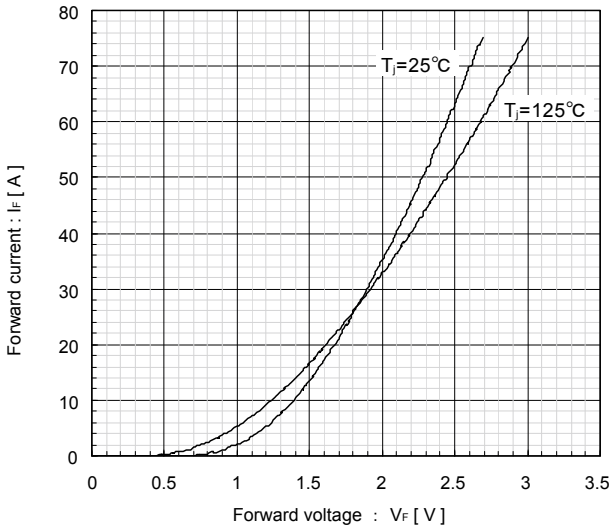
Collector current vs. Collector-Emitter voltage
T_j=125℃[Terminal] (typ.)



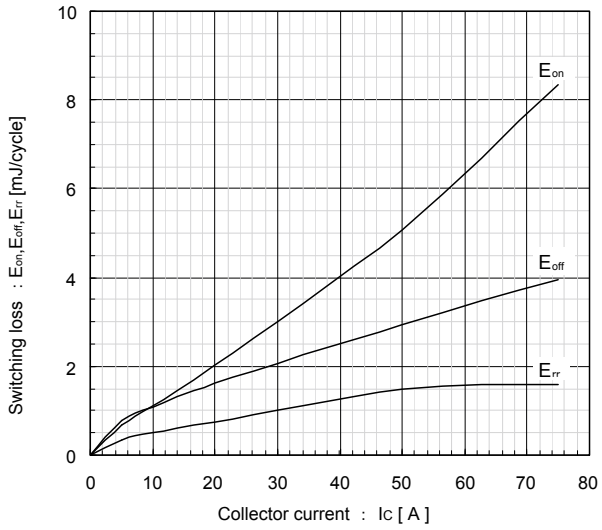
Forward current vs. Forward voltage
[Chip] (typ.)



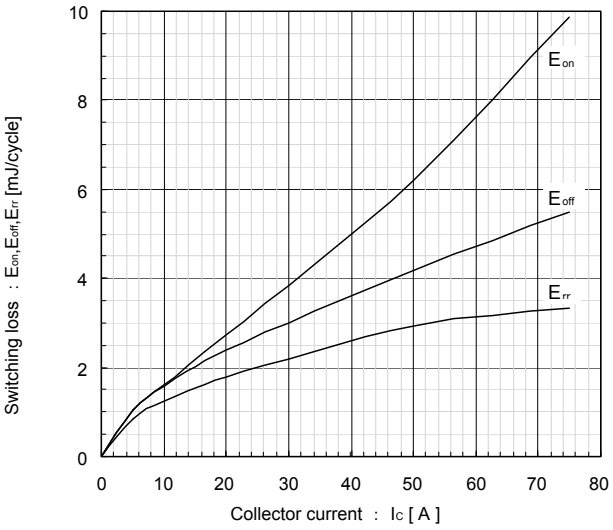
Forward current vs. Forward voltage
[Terminal] (typ.)



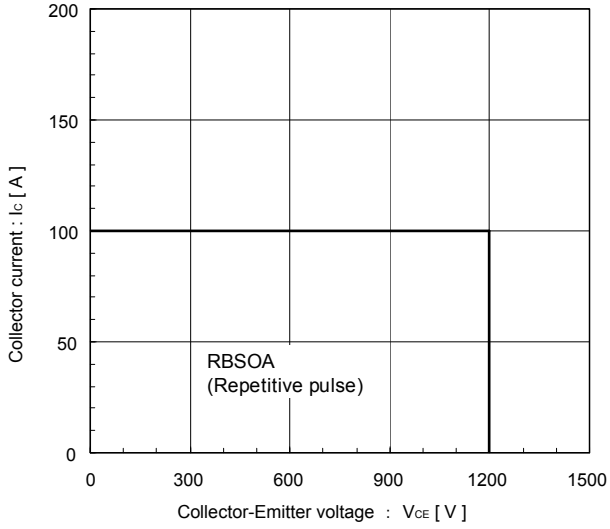
Switching Loss vs. Collector Current (typ.)
V_{DC}=600V,V_{CC}=15V,T_j=25℃



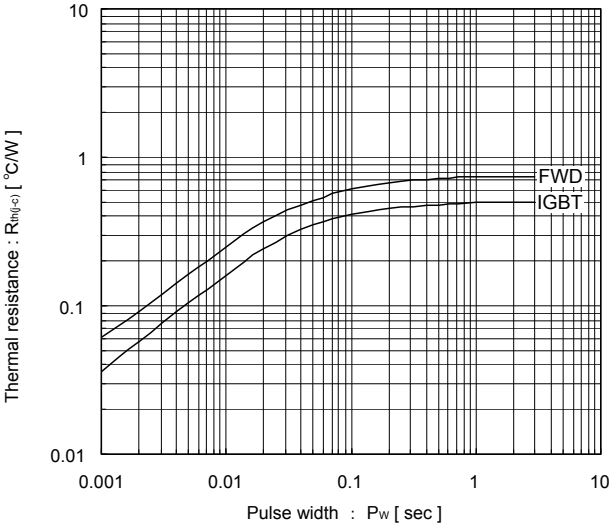
Switching Loss vs. Collector Current (typ.)
V_{DC}=600V,V_{CC}=15V,T_j=125℃



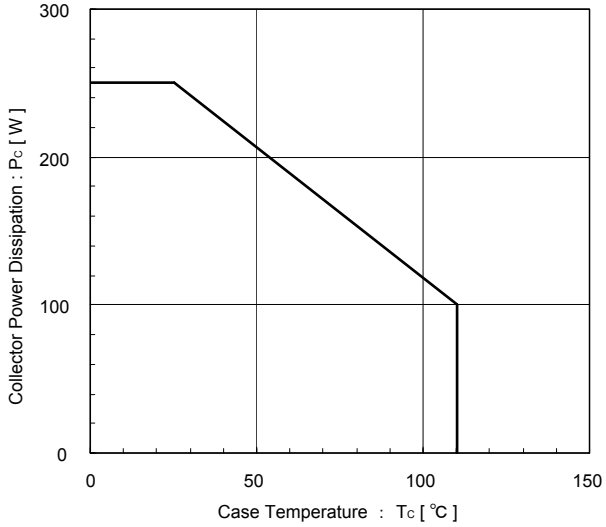
Reversed biased safe operating area
V_{CC}=15V,T_j≦125℃[Main Terminal] (min.)



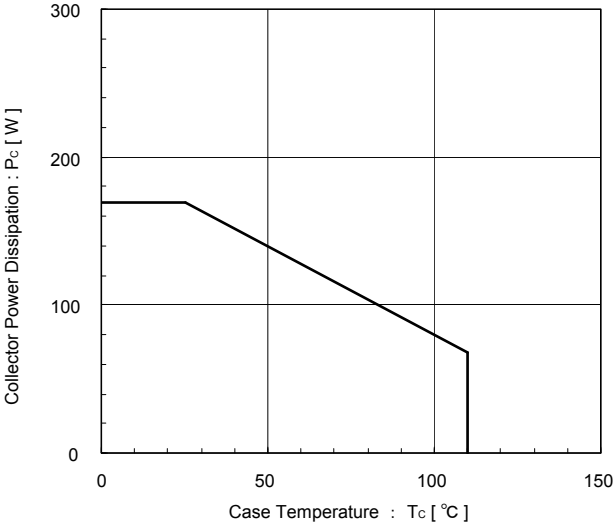
Transient thermal resistance (max.)



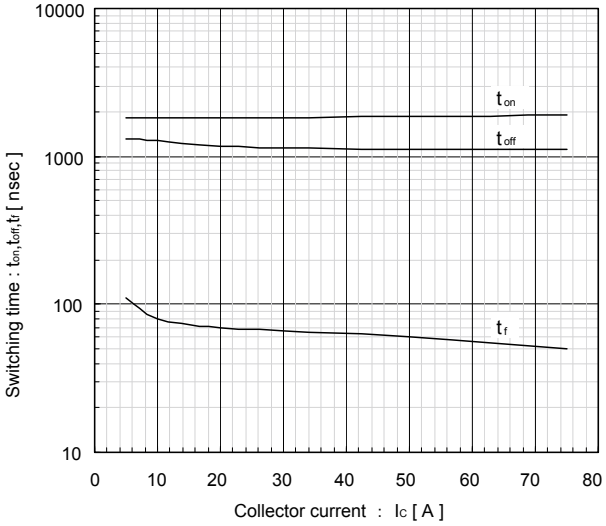
Power derating for IGBT (max.)
[per device]



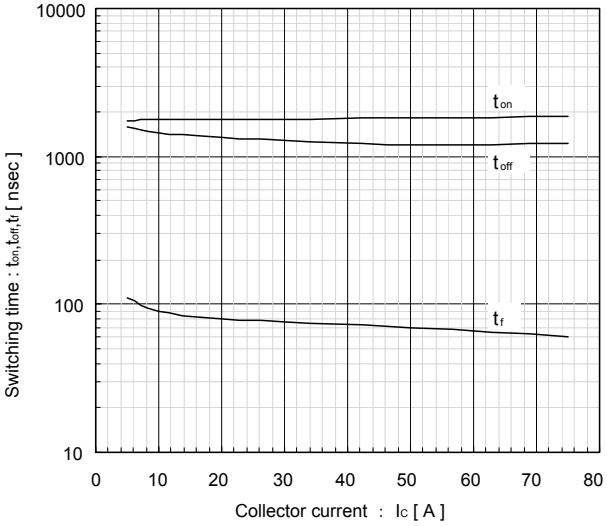
Power derating for FWD (max.)
[per device]



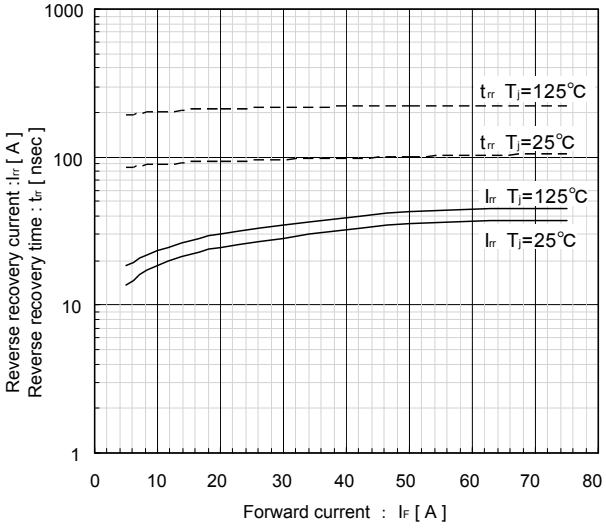
Switching time vs. Collector current (typ.)
V_{DC}=600V, V_{CC}=15V, T_j=25℃



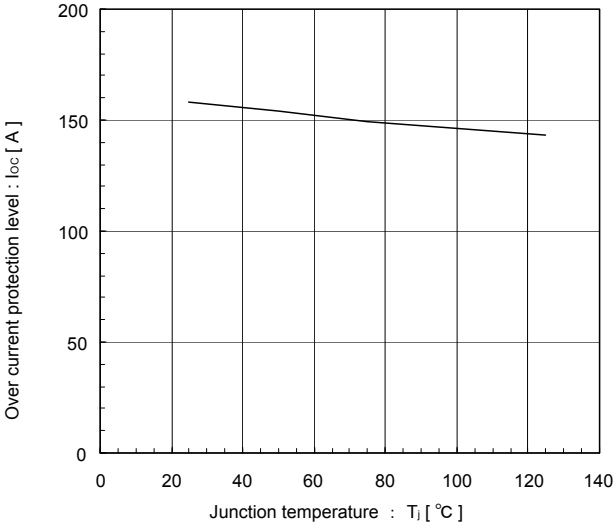
Switching time vs. Collector current (typ.)
V_{DC}=600V, V_{CC}=15V, T_j=125℃



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

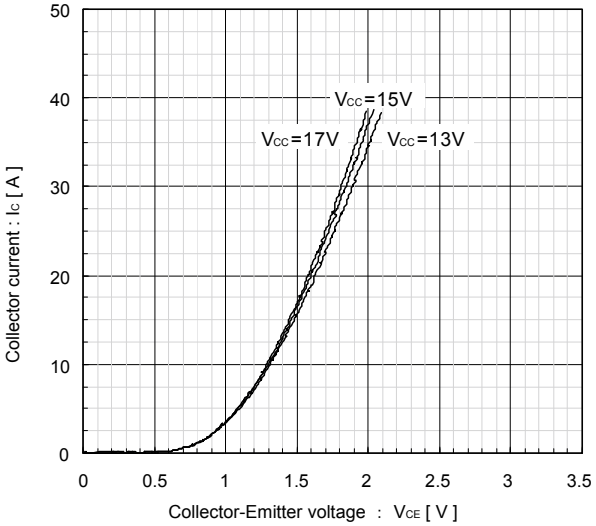


Over current protection vs. Junction temperature (typ.)
V_{CC}=15V

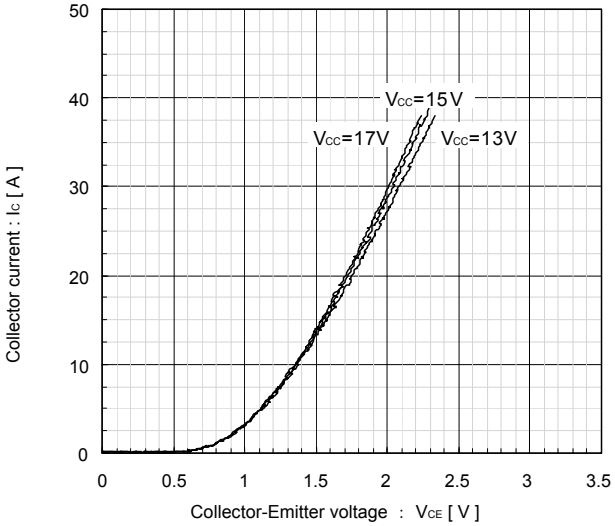


Brake

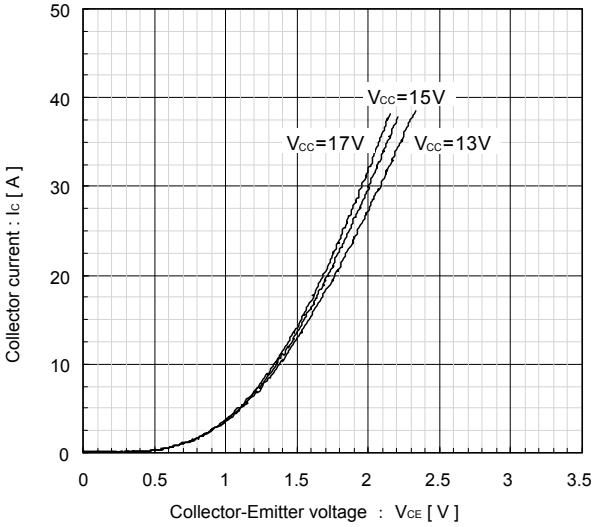
Collector current vs. Collector-Emitter voltage
T_j=25℃[Chip] (typ.)



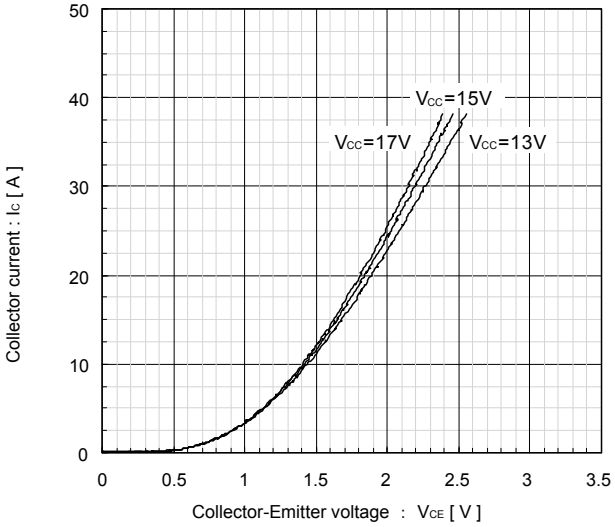
Collector current vs. Collector-Emitter voltage
T_j=25℃[Terminal] (typ.)



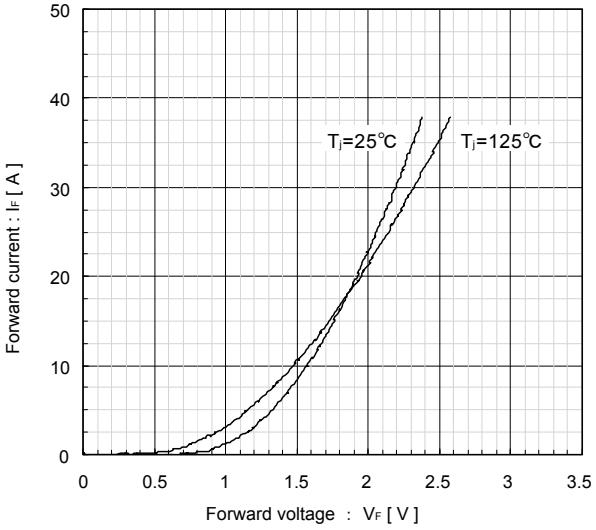
Collector current vs. Collector-Emitter voltage
T_j=125℃[Chip] (typ.)



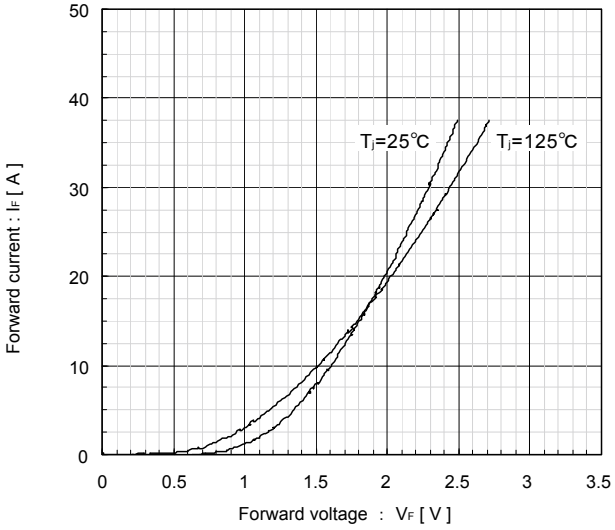
Collector current vs. Collector-Emitter voltage
T_j=125℃[Terminal] (typ.)



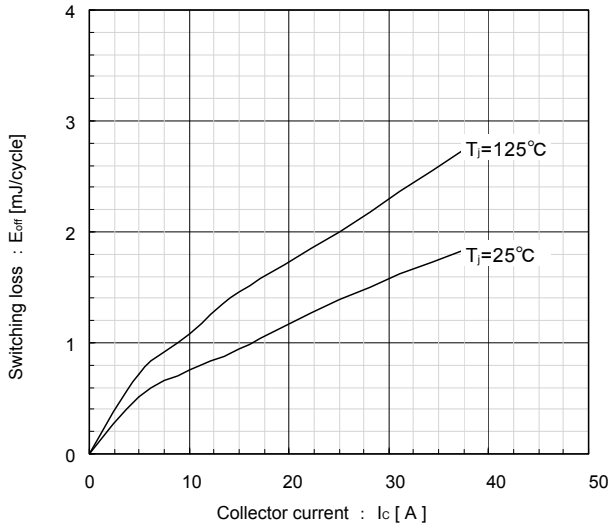
Forward current vs. Forward voltage
[Chip] (typ.)



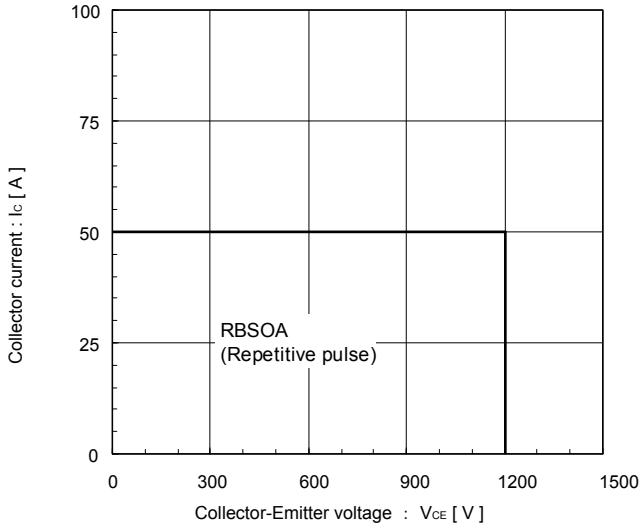
Forward current vs. Forward voltage
[Terminal] (typ.)



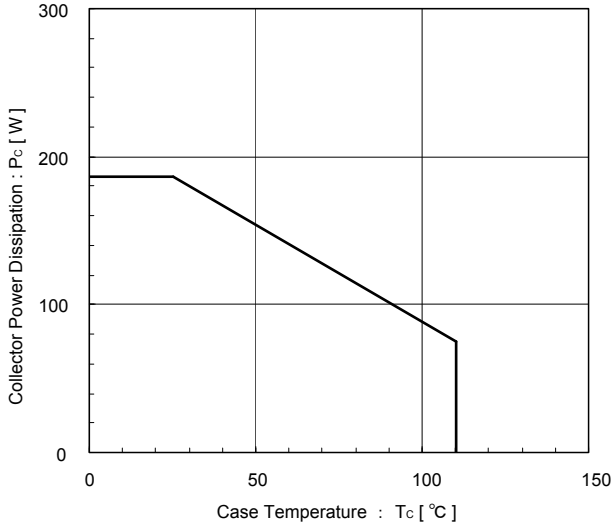
Switching Loss vs. Collector Current (typ.)
V_{DC}=600V,V_{CC}=15V



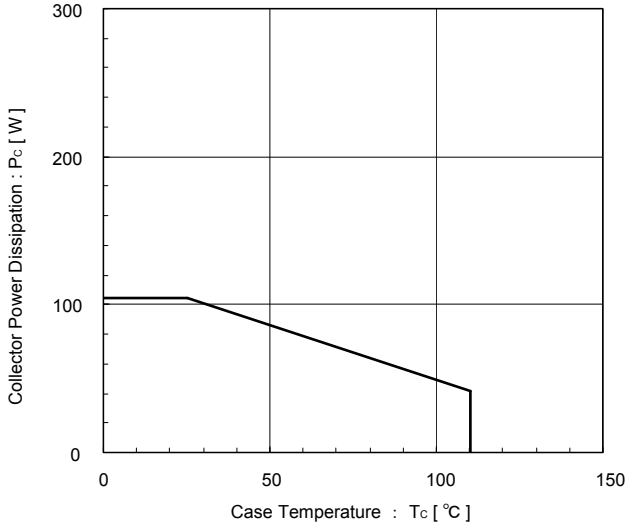
Reversed biased safe operating area
V_{CC}=15V,T_j≦125℃[Main Terminal] (min.)



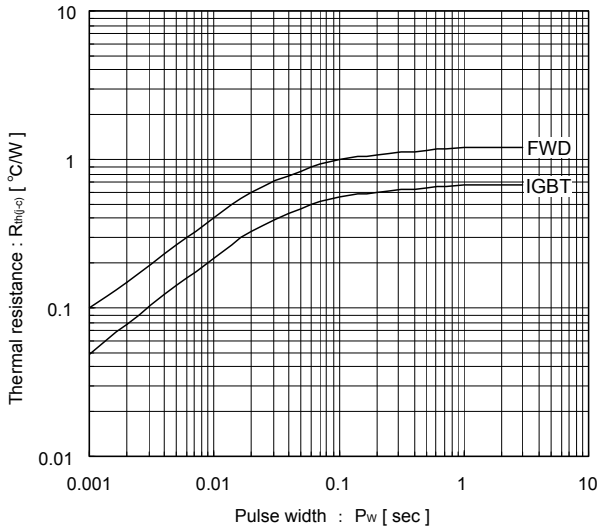
Power derating for IGBT (max.)
[per device]



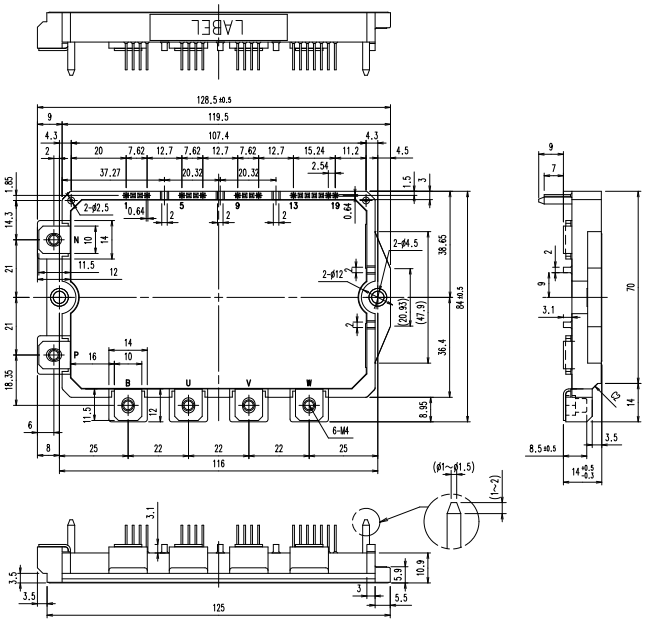
Power derating for FWD (max.)
[per device]



Transient thermal resistance (max.)



■ 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.

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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.