

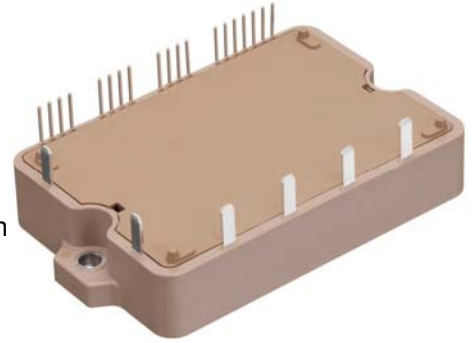
6MBP35VFN120-50

IGBT Modules

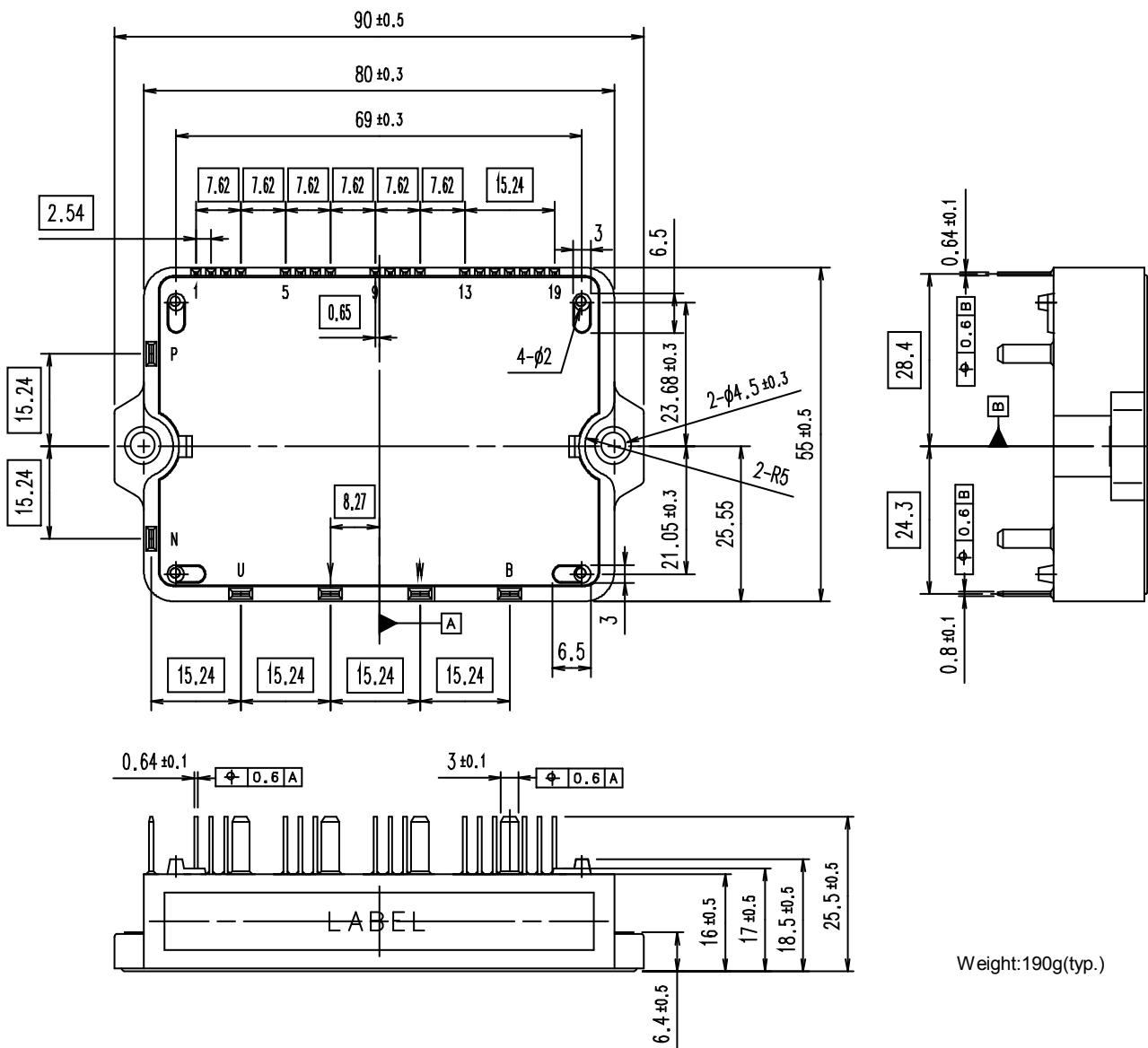
IGBT Module (V series)
1200V / 35A / IPM

■ **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



■ **Outline drawing (Unit : mm)**



Weight: 190g(typ.)

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Absolute Maximum Ratings

 $T_c=25^{\circ}\text{C}$, $V_{CC}=15\text{V}$ 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	-	35	A
		1ms	-	70	A
		Duty=100% *2	-	35	A
Collector Power Dissipation		1 device *3	-	290	W
Brake	Collector Current	DC	-	-	A
		1ms	-	-	A
		Forward Current of Diode	-	-	A
Collector Power Dissipation		1 device *3	-	-	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	$^{\circ}\text{C}$
Operating Case Temperature		T_{opr}	-20	110	$^{\circ}\text{C}$
Storage Temperature		T_{stg}	-40	125	$^{\circ}\text{C}$
Solder Temperature *8		T_{sol}	-	260	$^{\circ}\text{C}$
Isolating Voltage *9		V_{iso}	-	AC2500	Vrms
Screw Torque		Mounting (M4)	-	1.7	Nm

Notes

*1: V_{CES} shall be applied to the input voltage between terminal P-(U,V, W,B) and (U,V, W,B)-N.

*2: $Duty=125^{\circ}\text{C}/R_{th(j-c)D}/(I_F \times V_F \text{ Max.}) \times 100$

*3: $PC=125^{\circ}\text{C}/R_{th(j-c)Q}$ (Inverter & Brake)

*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.

*5: V_{in} shall be applied to the input voltage between terminal No.3 and 1, 7 and 5, 11 and 9,15~18 and 13.

*6: V_{ALM} shall be applied to the voltage between terminal No.2 and 1, 6 and 5, 10 and 9,19 and 13.

*7: I_{ALM} shall be applied to the input current to terminal No.2,6,10 and 19.

*8: Immersion time $10 \pm 1\text{sec}$. 1time

*9: Terminal to base, 50/60Hz sine wave 1min. All terminals should be connected together during the test.

Electrical Characteristics ($T_j=25^{\circ}\text{C}$, $V_{CC}=15\text{V}$ unless otherwise specified.)

Main circuit

Item		Symbol	Conditions	Min.	Typ.	Max.	Units	
Inverter	Collector Current at off signal input	I_{CES}	$V_{CE} = 1200\text{V}$	-	-	1.0	mA	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	$I_C = 35\text{A}$	Terminal	-	-	2.20	V
				Chip	-	1.7	-	V
Forward voltage of FWD	V_F	$I_F = 35\text{A}$	Terminal	-	-	2.65	V	
			Chip	-	2.1	-	V	
Brake	Collector Current at off signal input	I_{CES}	$V_{CE} =$	-	-	-	mA	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	$I_C =$	Terminal	-	-	-	V
				Chip	-	-	-	V
Forward voltage of FWD	V_F	$I_F =$	Terminal	-	-	-	V	
			Chip	-	-	-	V	
Switching time	t_{on}		$V_{DC} = 600\text{V}$, $T_j=125^{\circ}\text{C}$	1.1	-	-	μs	
	t_{off}		$I_C = 35\text{A}$	-	-	2.1	μs	
	t_{rr}		$V_{DC} = 600\text{V}$ $I_F = 35\text{A}$	-	-	0.3	μs	

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● **Control circuit**

Item	Symbol	Conditions	Min.	Typ.	Max.	Units	
Supply current of P-side pre-driver (per one unit)	I _{ccp}	Switching Frequency = 0-15kHz T _c =-20~110°C	-	-	11	mA	
Supply current of N-side pre-driver	I _{ccn}		-	-	33	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

● **Protection Circuit**

Item	Symbol	Conditions	Min.	Typ.	Max.	Units
Over Current Protection Level	I _{oc}	T _j =125°C Resistance Load	70	-	-	A
Over Current Protection Delay time	t _{dOC}	T _j =125°C	-	5	-	μs
Short Circuit Protection Delay time	t _{sc}	T _j =125°C	-	2	3	μs
IGBT Chips Over Heating Protection Temperature Level	T _{jOH}	Surface of IGBT Chips	150	-	-	°C
Over Heating Protection Hysteresis	T _{jH}		-	20	-	°C
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	1.0	2.0	2.4	ms
	t _{ALM(UV)}	T _c =-20~110°C V _{cc} ≥10V	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 = 25°C)**

Item	Symbol	Min.	Typ.	Max.	Units	
Junction to Case Thermal Resistance*10	Inverter	IGBT	-	-	0.43	°C/W
		FWD	-	-	0.62	°C/W
	Brake	IGBT	-	-	-	°C/W
		FWD	-	-	-	°C/W
Case to Fin Thermal Resistance with Compound	R _{th(c-f)}	-	0.05	-	°C/W	

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

■ **Noise Immunity (V_{DC}=600V, V_{CC}=15V)**

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

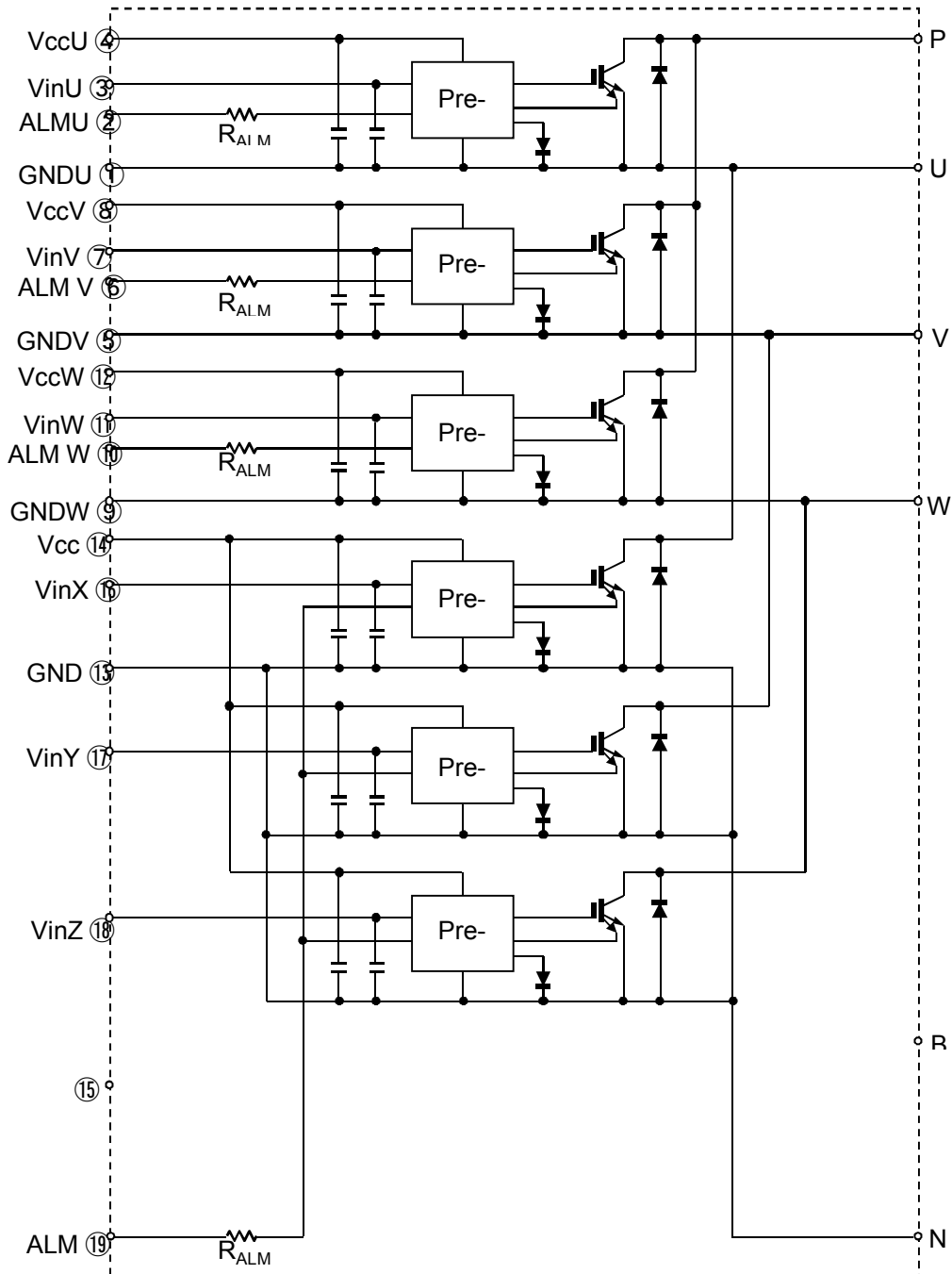
■ **Recommended Operating Conditions**

Item	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

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■ Block Diagram



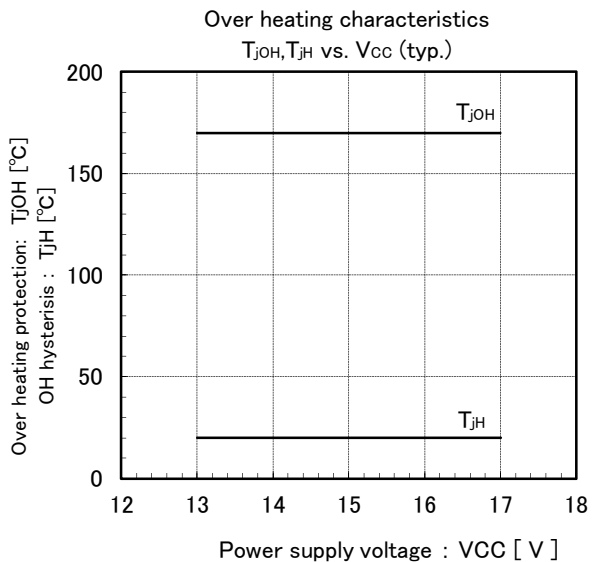
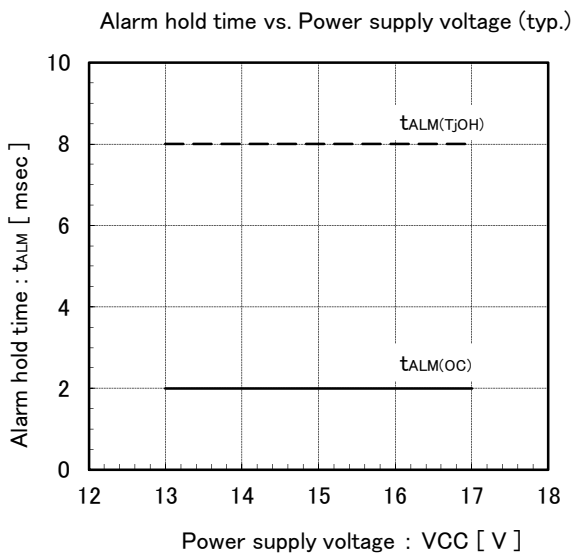
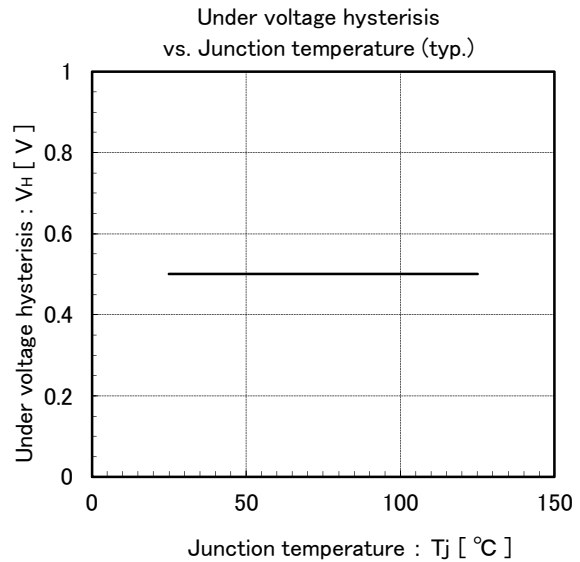
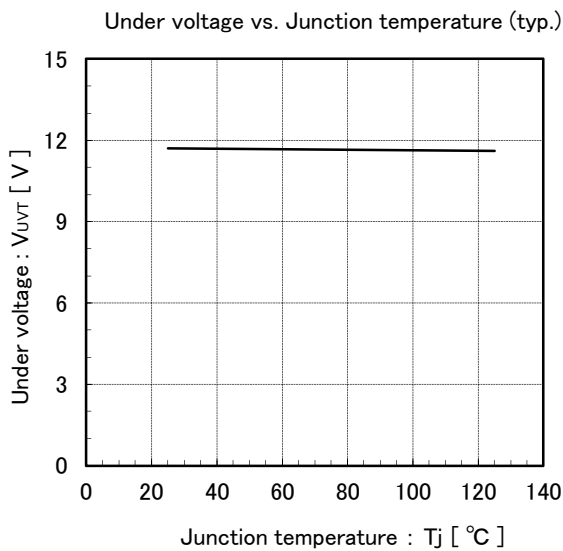
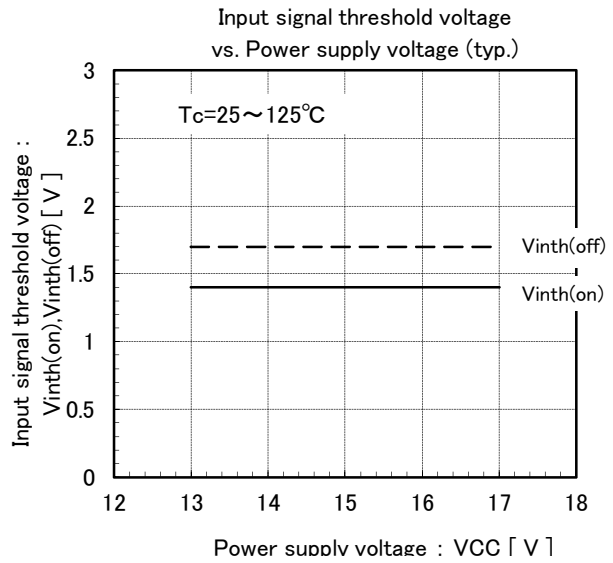
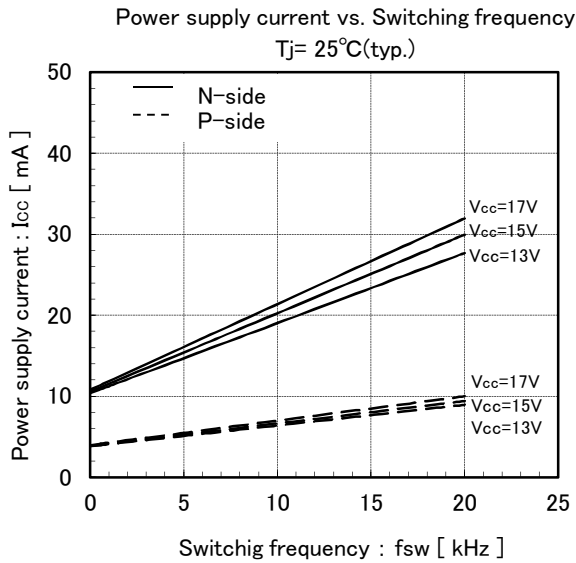
Pre-drivers include following functions

1. Amplifier for driver
2. Short circuit protection
3. Under voltage lockout circuit
4. Over current protection
5. IGBT chip over heating protection

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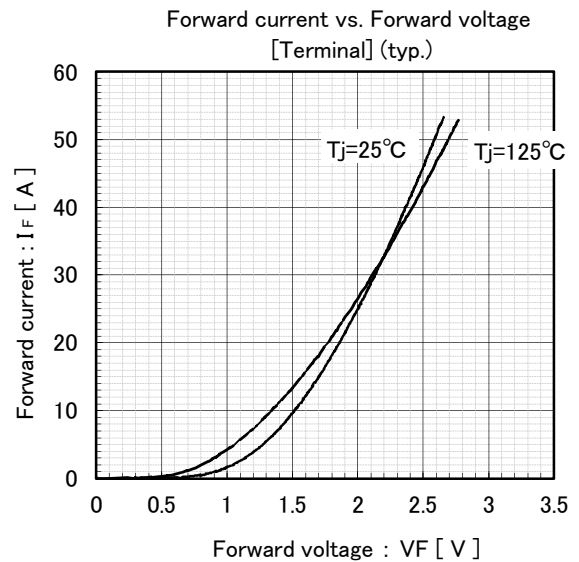
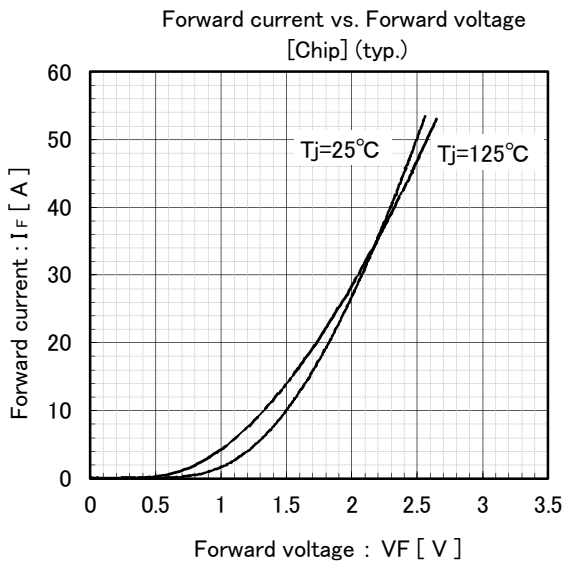
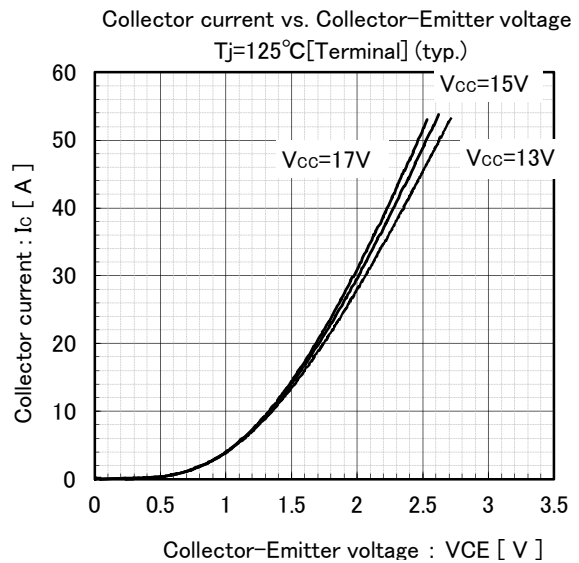
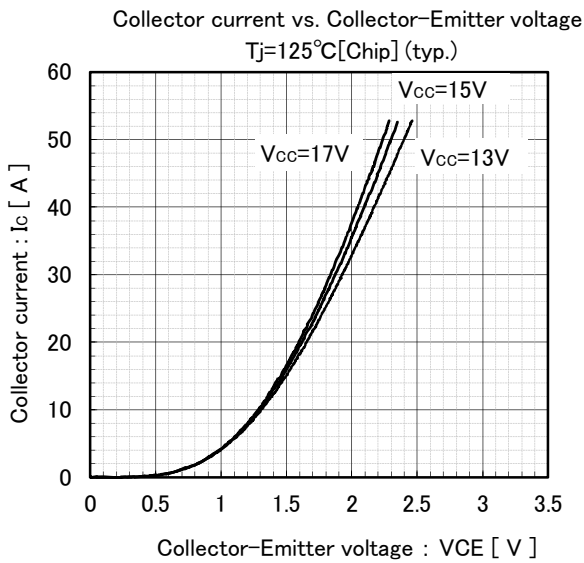
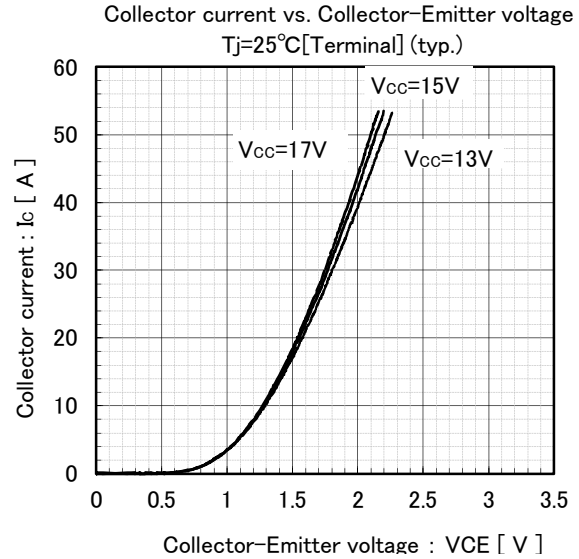
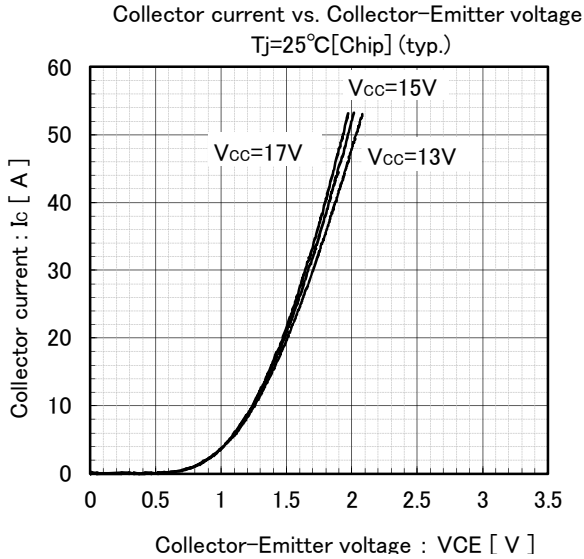
■ Characteristics (Representative)
● Control Circuit



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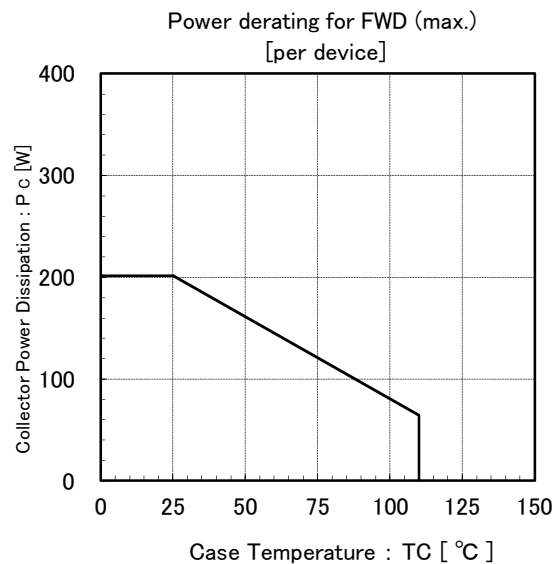
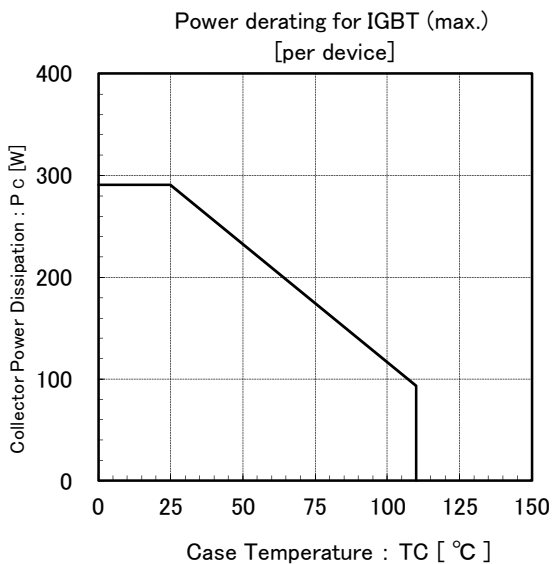
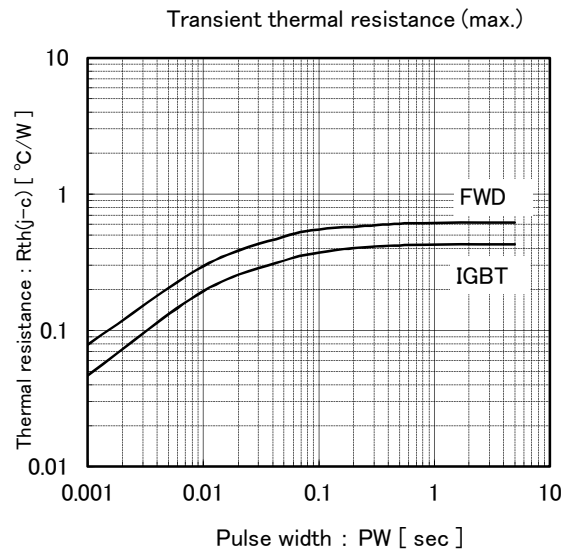
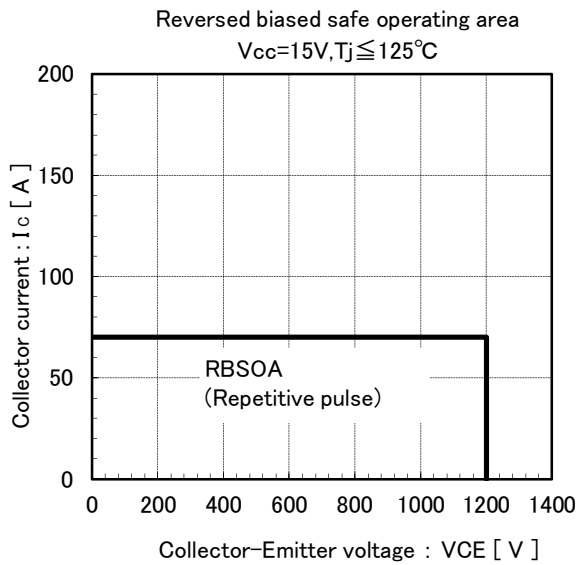
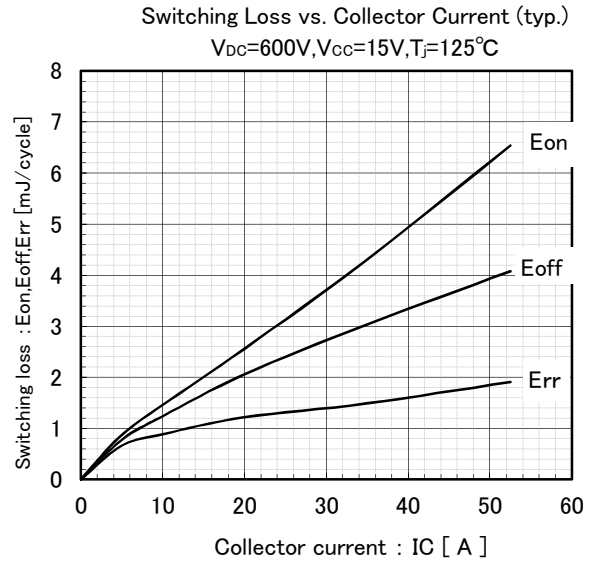
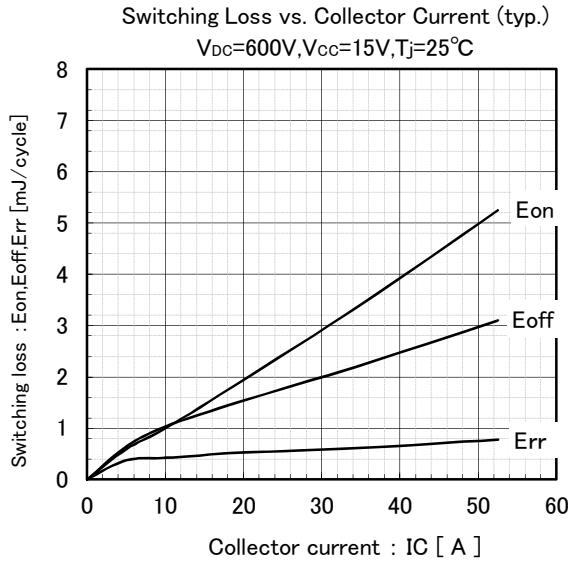
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● Inverter



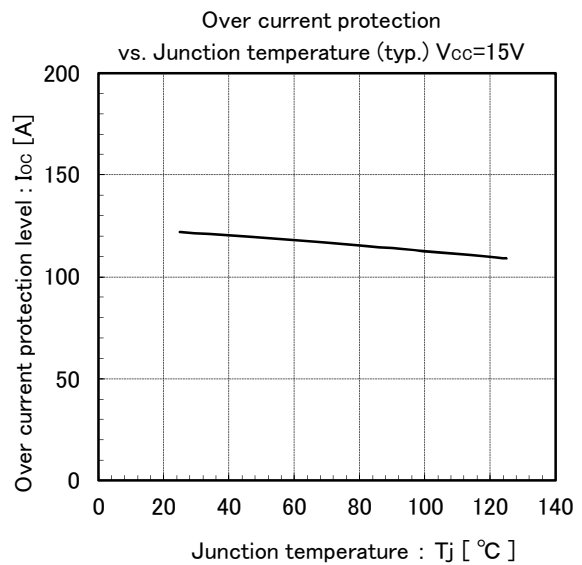
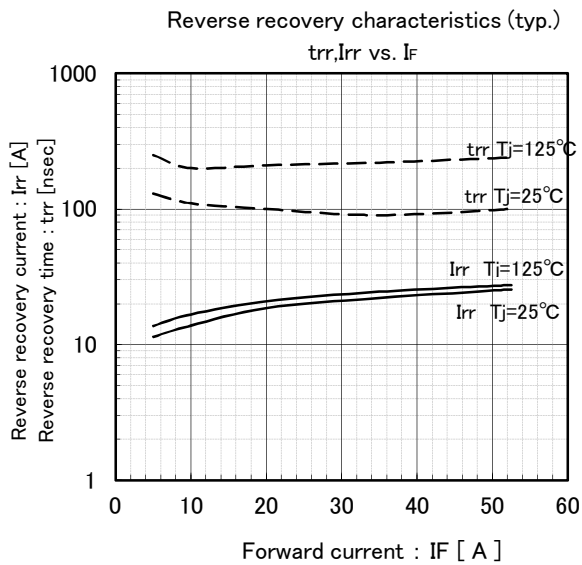
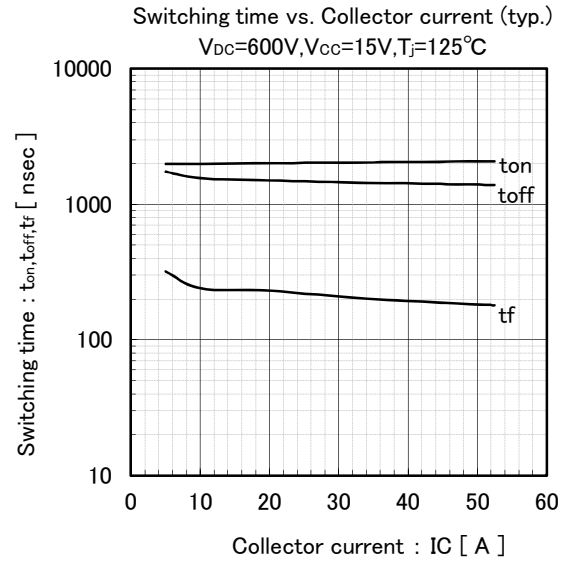
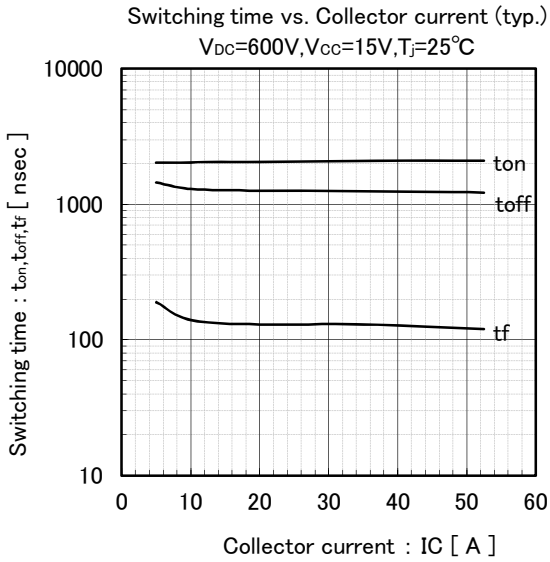
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