

7MBR50VY060-50

IGBT Modules

IGBT MODULE (V series)

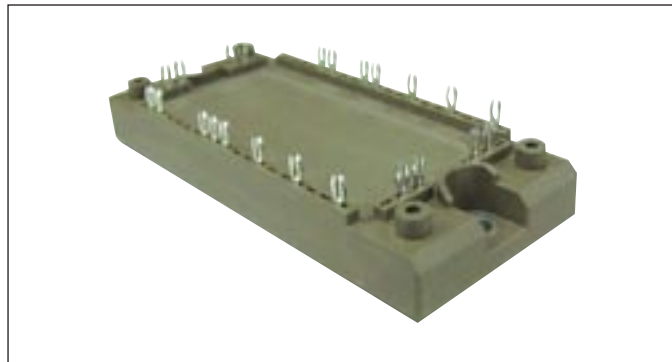
600V / 50A / PIM

■ Features

- Low $V_{CE(sat)}$
- Compact Package
- P.C.Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit
- RoHS compliant product

■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply



■ Maximum Ratings and Characteristics

● Absolute Maximum Ratings (at $T_c=25^\circ\text{C}$ unless otherwise specified)

Items	Symbols	Conditions	Maximum ratings	Units
Inverter	Collector-Emitter voltage	V_{CES}	600	V
	Gate-Emitter voltage	V_{GES}	± 20	V
	Collector current	I_c Continuous $T_c=80^\circ\text{C}$	50	A
		I_{cp} 1ms $T_c=80^\circ\text{C}$	100	
		$-I_c$	50	
		$-I_c$ pulse 1ms	100	
	Collector power dissipation	P_c 1 device	200	W
Brake	Collector-Emitter voltage	V_{CES}	600	V
	Gate-Emitter voltage	V_{GES}	± 20	V
	Collector current	I_c Continuous $T_c=80^\circ\text{C}$	50	A
		I_{cp} 1ms $T_c=80^\circ\text{C}$	100	
	Collector power dissipation	P_c 1 device	200	W
Converter	Repetitive peak reverse voltage (Diode)	V_{RRM}	600	V
	Repetitive peak reverse voltage	V_{RRM}	800	V
	Average output current	I_o 50Hz/60Hz, sine wave	50	A
	Surge current (Non-Repetitive)	I_{FSM} 10ms, $T_j=150^\circ\text{C}$	210	A
	I^2t (Non-Repetitive)	I^2t half sine wave	221	A^2s
Junction temperature		T_j Inverter, Brake	175	$^\circ\text{C}$
		Converter	150	
Operating junction temperature (under switching conditions)		T_{jop} Inverter, Brake	150	
		Converter	150	
Case temperature		T_c	125	$^\circ\text{C}$
Storage temperature		T_{stg}	-40 to +125	
Isolation voltage	between terminal and copper base (*1) between thermistor and others (*2)	V_{iso} AC : 1min.	2500	VAC
Screw torque	Mounting (*3)	- M5	3.5	N m

Note *1: All terminals should be connected together during the test.

Note *2: Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

Note *3: Recommendable value : 2.5-3.5 Nm (M5)

● Electrical characteristics (at T_j = 25°C unless otherwise specified)

Items		Symbols	Conditions		Characteristics			Units
					min.	typ.	max.	
Inverter	Zero gate voltage collector current	I _{CES}	V _{GE} = 0V, V _{CE} = 600V		-	-	1.0	mA
	Gate-Emitter leakage current	I _{GES}	V _{GE} = 0V, V _{GE} = ±20V		-	-	200	nA
	Gate-Emitter threshold voltage	V _{GE (th)}	V _{CE} = 20V, I _C = 50mA		6.2	6.7	7.2	V
	Collector-Emitter saturation voltage	V _{CE (sat)} (terminal)	V _{GE} = 15V I _C = 50A	T _J =25°C	-	1.85	2.30	V
				T _J =125°C	-	2.15	-	
				T _J =150°C	-	2.25	-	
		V _{CE (sat)} (chip)	V _{GE} = 15V I _C = 50A	T _J =25°C	-	1.60	2.05	
				T _J =125°C	-	1.90	-	
				T _J =150°C	-	2.00	-	
	Input capacitance	C _{ies}	V _{CE} = 10V, V _{GE} = 0V, f = 1MHz		-	3.3	-	nF
	Turn-on time	ton	V _{CC} = 300V I _C = 50A V _{GE} = +15 / -15V R _G = 43Ω		-	0.36	1.20	μs
		tr			-	0.25	0.60	
		tr (i)			-	0.07	-	
	Turn-off time	toff			-	0.52	1.20	
		tf			-	0.03	0.45	
	Forward on voltage	V _F (terminal)	I _F = 50A	T _J =25°C	-	1.85	2.30	V
				T _J =125°C	-	1.75	-	
T _J =150°C				-	1.70	-		
V _F (chip)		I _F = 50A	T _J =25°C	-	1.60	2.05		
			T _J =125°C	-	1.50	-		
			T _J =150°C	-	1.45	-		
Reverse recovery time	trr	I _F = 50A		-	-	0.35	μs	
Brake	Zero gate voltage collector current	I _{CES}	V _{GE} = 0V V _{CE} = 600V		-	-	1.0	mA
	Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V V _{GE} = +20 / -20V		-	-	200	nA
	Collector-Emitter saturation voltage	V _{CE (sat)} (terminal)	V _{GE} = 15V I _C = 50A	T _J =25°C	-	1.85	2.30	V
				T _J =125°C	-	2.15	-	
				T _J =150°C	-	2.25	-	
		V _{CE (sat)} (chip)	V _{GE} = 15V I _C = 50A	T _J =25°C	-	1.60	2.05	
				T _J =125°C	-	1.90	-	
				T _J =150°C	-	2.00	-	
	Turn-on time	ton	V _{CE} = 300V I _C = 50A		-	0.36	1.20	μs
		tr			-	0.25	0.60	
	Turn-off time	toff	V _{GE} = +15 / -15V R _G = 43Ω		-	0.52	1.20	
		tf			-	0.03	0.45	
Reverse current	IRRM	V _R = 600V		-	-	1.00	mA	
Converter	Forward on voltage	V _{FM} (chip)	I _F = 50A	terminal	-	1.55	2.00	V
	Reverse current	IRRM	V _R = 800V		-	-	1.0	
Thermistor	Resistance	R	T = 25°C		-	5000	-	Ω
			T = 100°C		465	495	520	
	B value	B	T = 25 / 50°C		3305	3375	3450	K

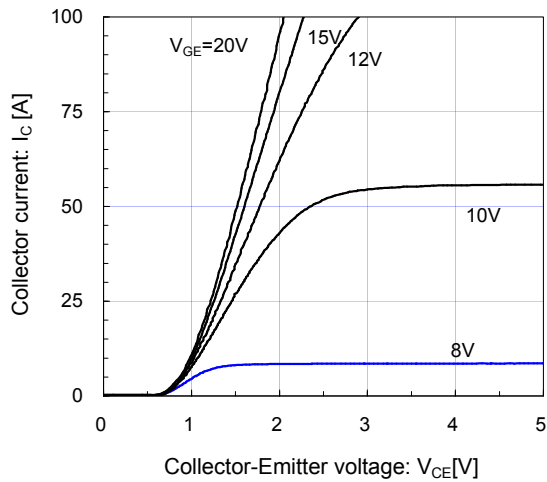
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R _{th(j-c)}	Inverter IGBT	-	-	0.75	°C/W
		Inverter FWD	-	-	1.15	
		Brake IGBT	-	-	0.75	
		Converter Diode	-	-	1.20	
Contact thermal resistance (1device) (*4)	R _{th(c-f)}	with Thermal Compound	-	0.05	-	

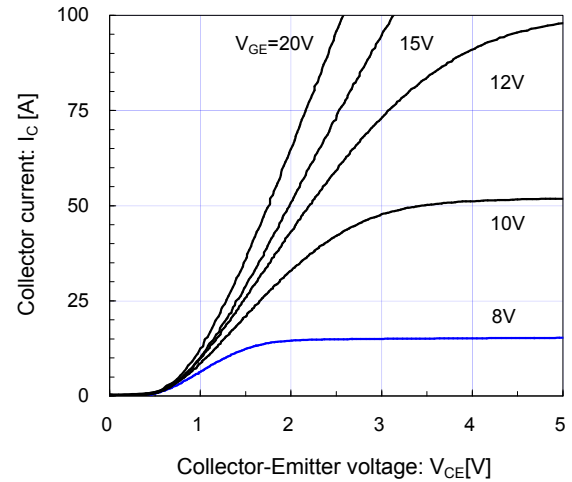
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

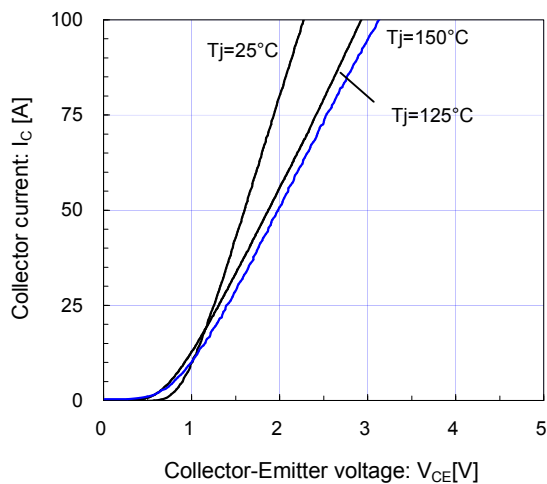
[Inverter]
Collector current vs. Collector-Emittervoltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



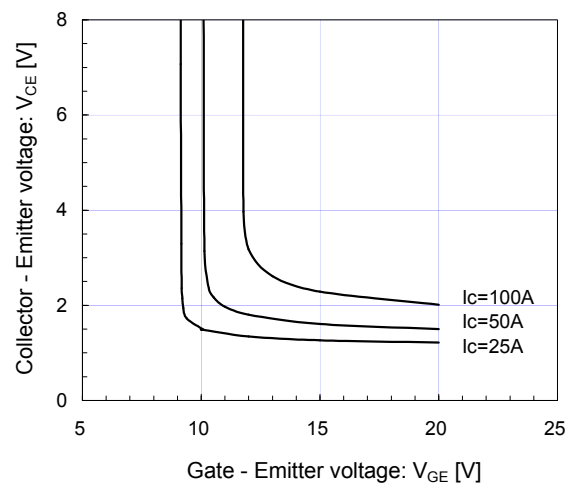
[Inverter]
Collector current vs. Collector-Emittervoltage (typ.)
 $T_j = 150^\circ\text{C}$ / chip



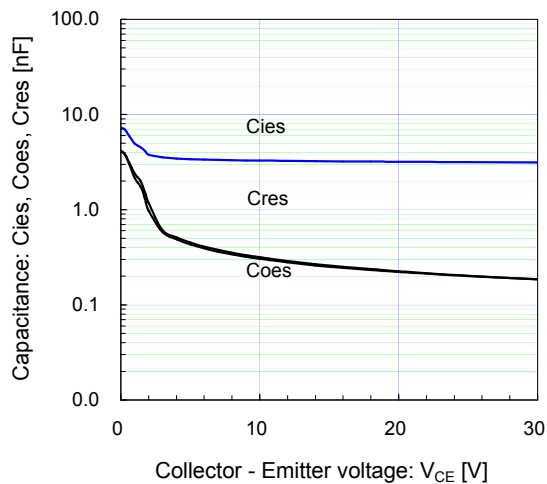
[Inverter]
Collector current vs. Collector-Emittervoltage (typ.)
 $V_{GE} = 15\text{V}$ / chip



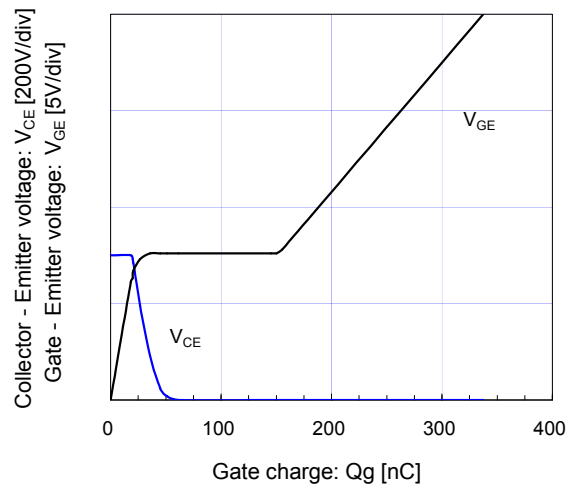
[Inverter]
Collector-Emittervoltage vs. Gate-Emittervoltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



[Inverter]
Capacitance vs. Collector-Emittervoltage (typ.)
 $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$

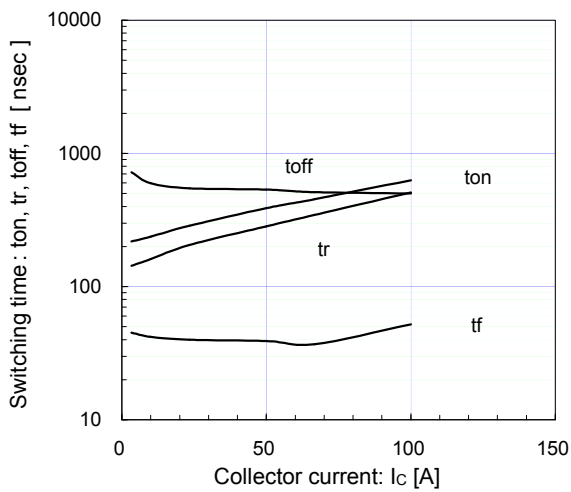


[Inverter]
Dynamic gate charge (typ.)
 $V_{CC} = 300\text{V}$, $I_C = 50\text{A}$, $T_j = 25^\circ\text{C}$



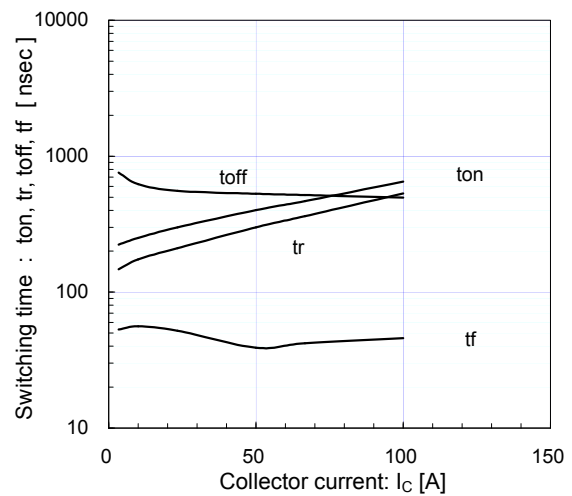
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{cc}=300V$, $V_{GE}=\pm 15V$, $R_g=43\Omega$, $T_j=125^\circ C$



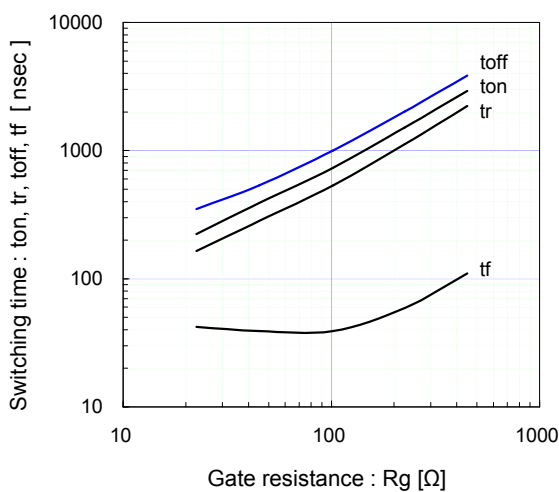
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{cc}=300V$, $V_{GE}=\pm 15V$, $R_g=43\Omega$, $T_j=150^\circ C$



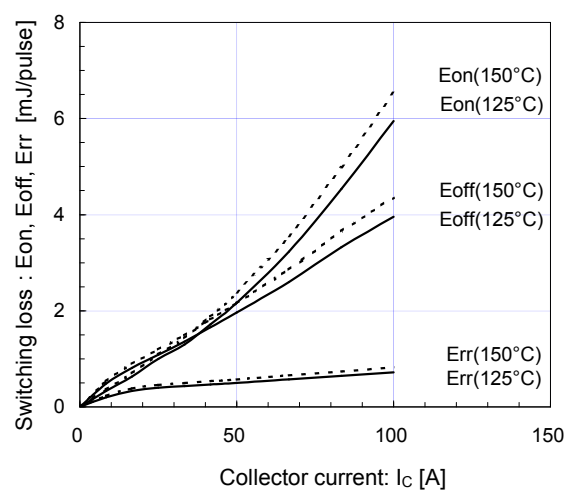
[Inverter]

Switching time vs. gate resistance (typ.)
 $V_{cc}=300V$, $I_c=50A$, $V_{GE}=\pm 15V$, $T_j=125^\circ C$



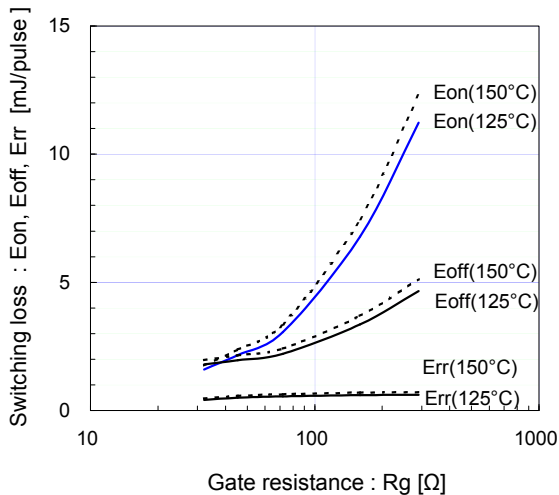
[Inverter]

Switching loss vs. Collector current (typ.)
 $V_{cc}=300V$, $V_{GE}=\pm 15V$, $R_g=43\Omega$



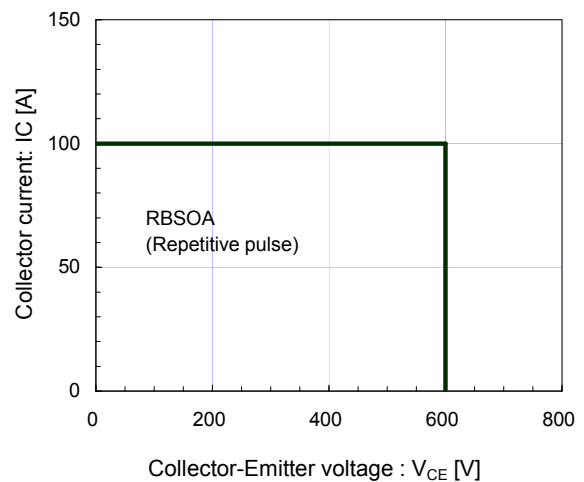
[Inverter]

Switching loss vs. gate resistance (typ.)
 $V_{cc}=300V$, $I_c=50A$, $V_{GE}=\pm 15V$



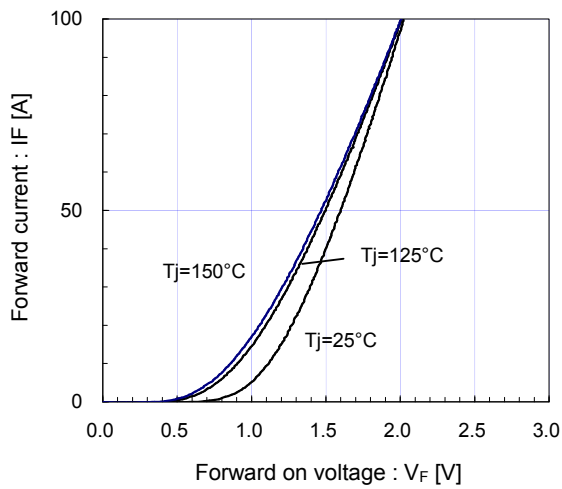
[Inverter]

Reverse bias safe operating area (max.)
 $+V_{GE}=15V$, $-V_{GE} \leq 15V$, $R_g \geq 43\Omega$, $T_j \leq 125^\circ C$



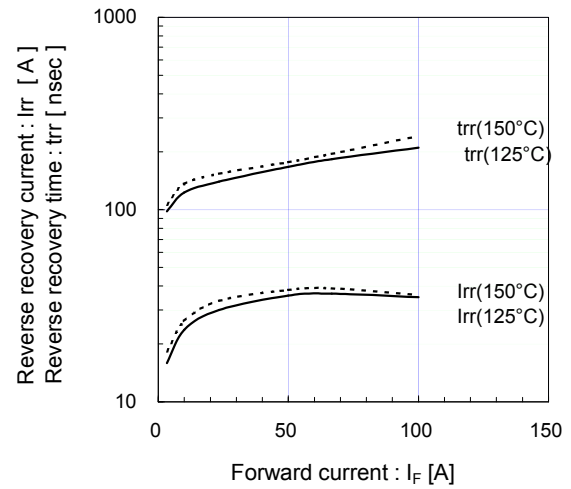
[Inverter]

Forward current vs. forward on voltage (typ.)
chip



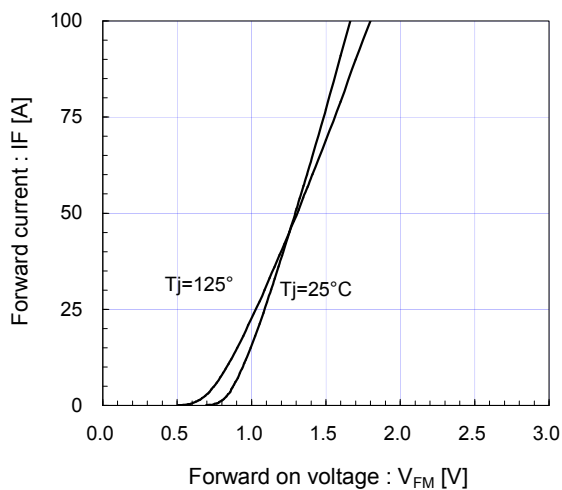
[Inverter]

Reverse recovery characteristics (typ.)
 $V_{CC}=300\text{V}$, $V_{GE}=\pm 15\text{V}$, $R_g=43\Omega$

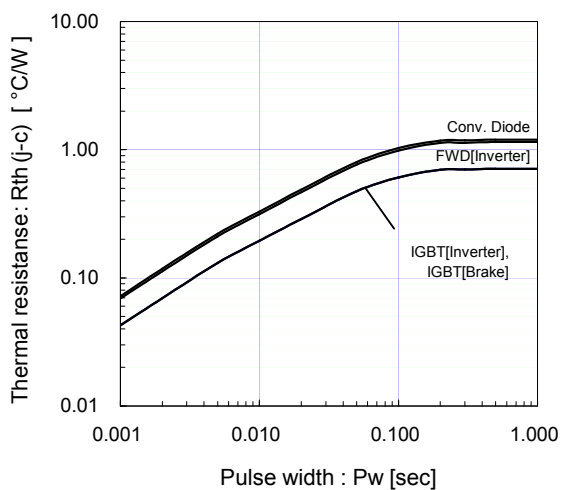


[Converter]

Forward current vs. forward on voltage (typ.)
chip

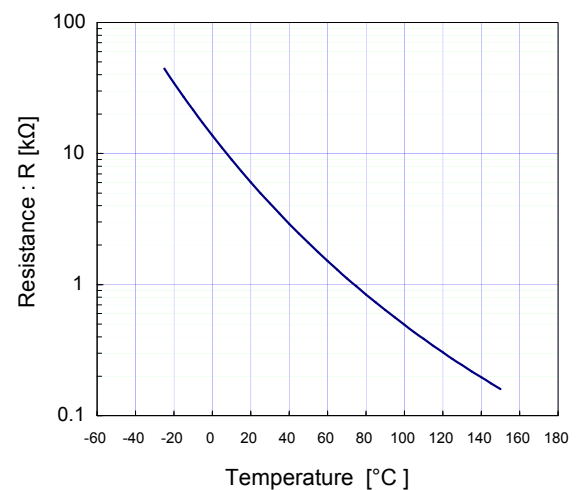


Transient thermal resistance (max.)



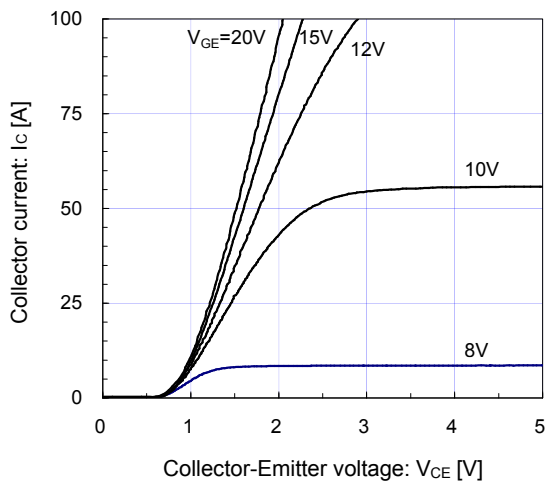
[Thermistor]

Temperature characteristic (typ.)



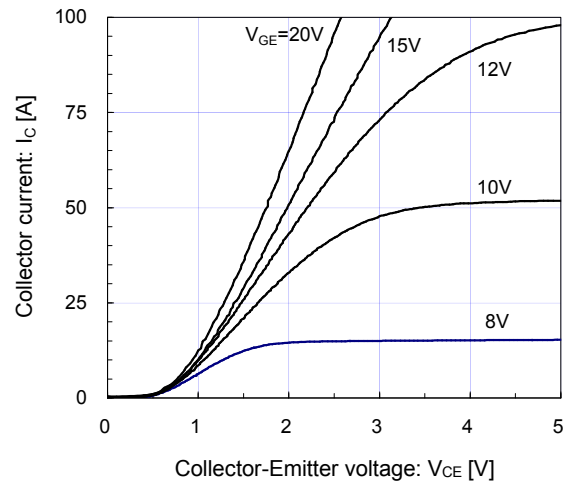
[Brake]

Collector current vs. Collector-Emittor voltage (typ.)

 $T_j = 25^\circ\text{C}$ / chip

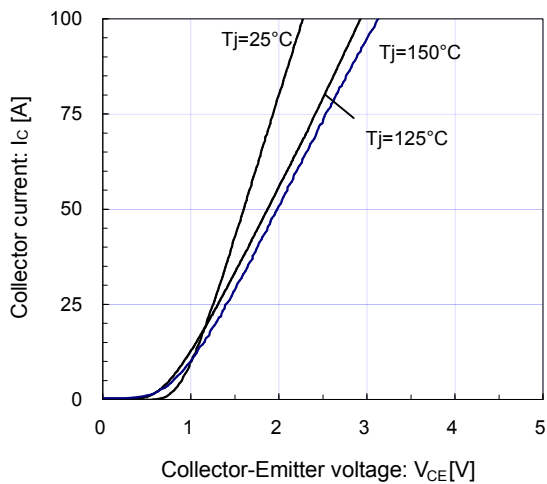
[Brake]

Collector current vs. Collector-Emittor voltage (typ.)

 $T_j = 150^\circ\text{C}$ / chip

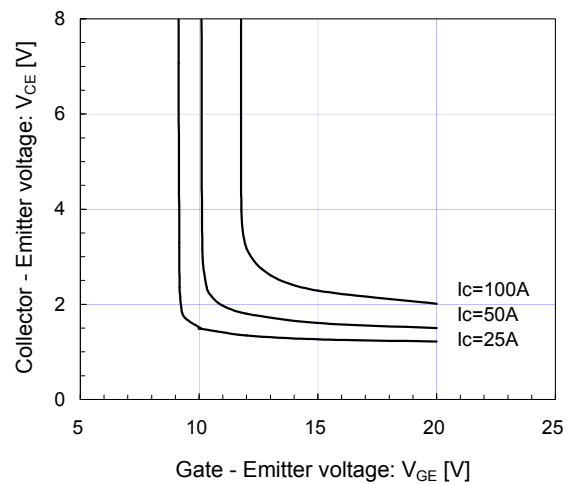
[Brake]

Collector current vs. Collector-Emittor voltage (typ.)

 $V_{GE} = 15\text{V}$ / chip

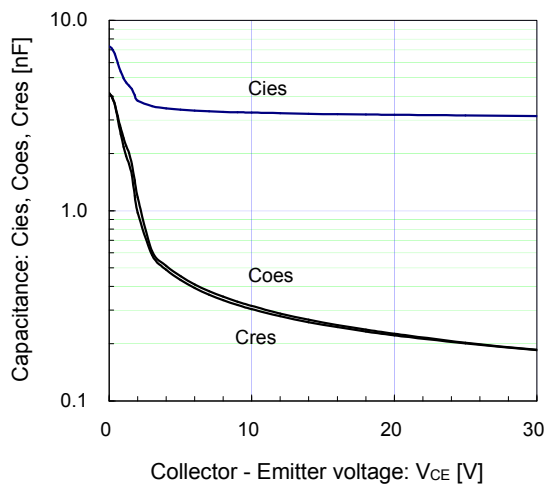
[Brake]

Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)

 $T_j = 25^\circ\text{C}$ / chip

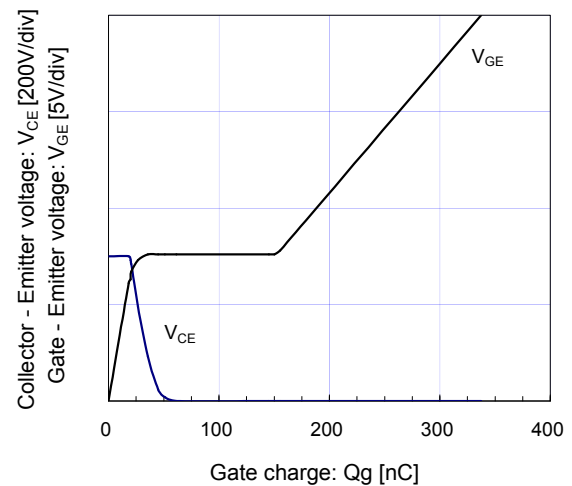
[Brake]

Capacitance vs. Collector-Emittor voltage (typ.)

 $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$ 

[Brake]

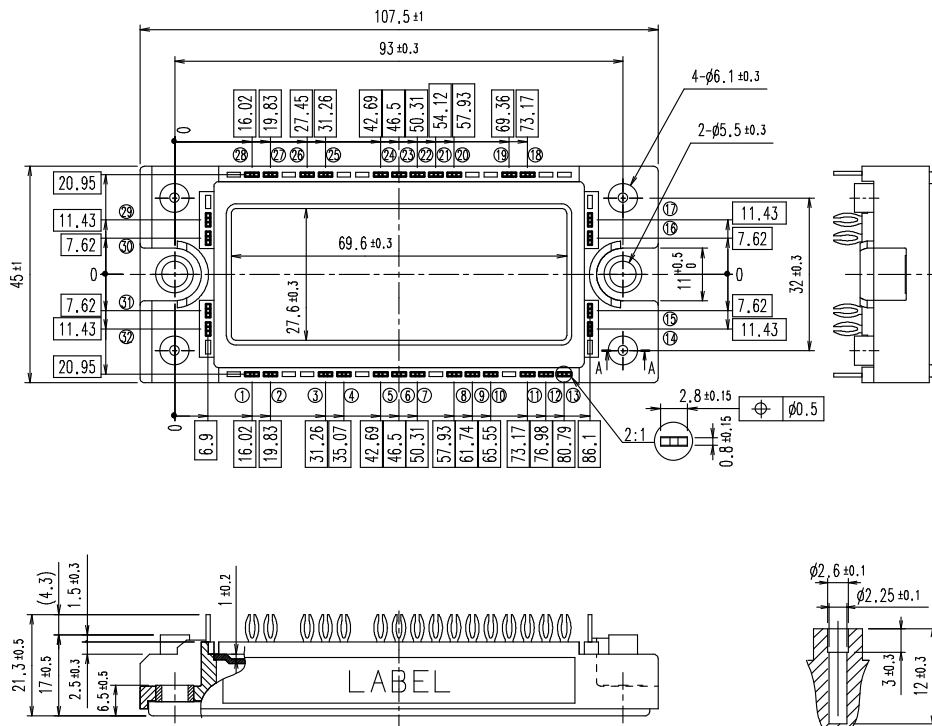
Dynamic gate charge (typ.)

 $V_{CC} = 300\text{V}$, $I_c = 50\text{A}$, $T_j = 25^\circ\text{C}$ 

Outline Drawings, mm

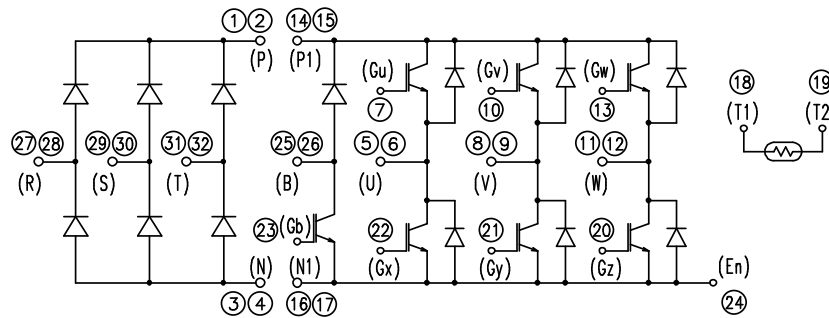
□ shows theoretical dimension.

() shows reference dimension.



Section A-A

Equivalent Circuit Schematic



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• Machine tools	• Audiovisual equipment	• Electrical home appliances	• Personal equipment
			• Industrial robots etc.
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• 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	
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