

4MBI450VB-120R1-50

IGBT Modules

IGBT Power Module (V series)

1200V/450A/IGBT, $\pm 900\text{V}/450\text{A}/\text{RB-IGBT}$, 4-in-1 package

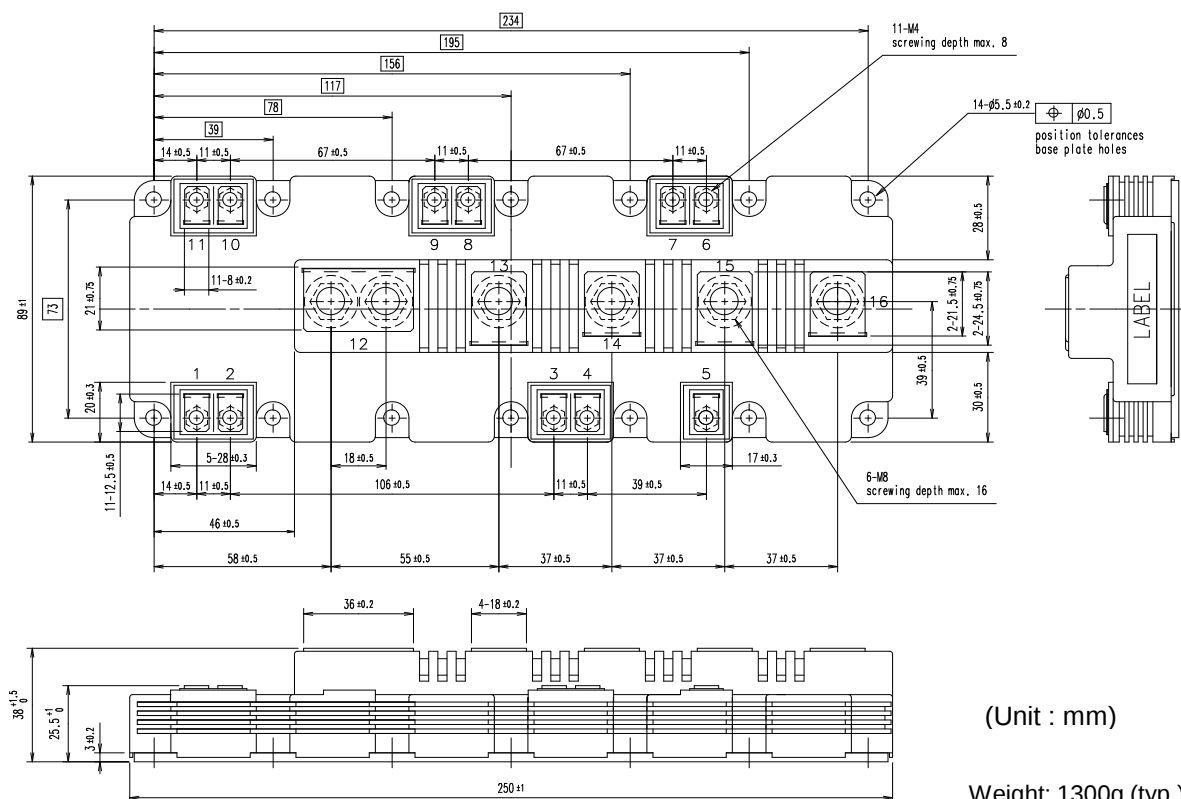
■ Features

- Higher efficiency
- Optimized Advanced T-type circuit
- Reverse-Blocking IGBT as for AC Switch
- Low inductance module structure

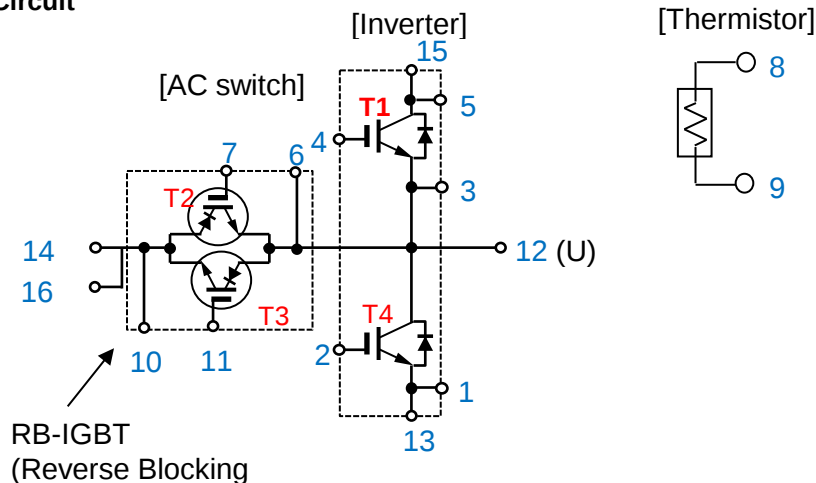
■ Applications

- Inverter for motor drive
- Uninterruptible power supply
- Power conditioner for PV, Wind turbine

■ Outline drawing



■ Equivalent Circuit



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■ Absolute Maximum Ratings (at T_c= 25°C unless otherwise specified)

Item		Symbol	Condition	Maximum Rating	Unit
Inverter	Collector-Emitter voltage	V _{CES}		1200	A
	Gate-Emitter voltage	V _{GES}		±20	V
	Collector current	I _C	Continuous	T _c =25°C	600
				T _c =100°C	450
		I _C pulse	1ms	900	A
		-I _C		450	
	FWD	-I _C pulse		900	A
				900	
	Collector power dissipation	P _C	1 device	2205	W
	Junction temperature	T _j		175	°C
	Operating temperature	T _{jop}		150	
AC switch	Collector-Emitter voltage	V _{CES}		±900	A
	Gate-Emitter voltage	V _{GES}		±20	V
	Collector current	I _C	Continuous	T _c =25°C	600
				T _c =80°C	450
	Collector power dissipation	P _C	1 device	1980	W
				1980	
	Junction temperature	T _j		150	°C
	Operating temperature	T _{jop}		125	
Case temperature		T _c		125	°C
Storage temperature		T _{stg}		-40 ~ 125	
Isolation voltage	between terminal and copper base (*1)	V _{iso}	AC: 1min.	4000	VAC
Screw torque	Mounting	-	M5	6.0	N m
	Main terminals	-	M8	10.0	
	Sense terminals	-	M4	2.1	

(*1) All terminals should be connected together during the test.

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

(*3) Recommended value : Mounting 3.0 ~ 6.0 Nm (M5)
 Recommended value : Main Terminals 8.0 ~ 10.0 Nm (M8)
 Recommended value : Sense Terminals 1.8 ~ 2.1 Nm (M4)

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

Item		Symbol	Condition	Characteristics			Units
				min.	typ.	max.	
Inverter	Zero gate voltage Collector current	I _{CES}	V _{GE} = 0V V _{CE} = 1200V	-	-	6	mA
	Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V V _{GE} = ±20V	-	-	1200	nA
	Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V I _C = 450mA	6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	V _{CE(sat)} (chip)	V _{GE} = 15V I _C = 450A	T _j =25°C	1.85	2.35	V
				T _j =125°C	2.20	-	
		V _{CE(sat)} (terminal)	V _{GE} = 15V I _C = 450A	T _j =150°C	2.25	-	
				T _j =25°C	1.90	2.40	
				T _j =125°C	2.25	-	
				T _j =150°C	2.30	-	
	Internal gate	R _{G(int)}	-	-	1.70	-	Ω
	Input capacitance	C _{ies}	V _{CE} =10V, V _{GE} =0V, f=1MHz	-	35	-	nF
	Turn-on time	t _{on}	Switching mode: A V _{CC} = 500V I _C = 450A	-	0.65	-	μs
		t _r		-	0.30	-	
		t _{r(l)}		-	0.10	-	
	Turn-off time	t _{off}	V _{GE} = ±15V R _G = +3.9/-0.22Ω	-	0.60	-	μs
		t _f		-	0.10	-	
	Forward on voltage	V _F (chip)	I _F = 450A	T _j =25°C	1.70	2.25	V
				T _j =125°C	1.85	-	
		V _F (terminal)	I _F = 450A	T _j =150°C	1.80	-	
				T _j =25°C	1.80	2.35	
				T _j =125°C	1.95	-	
				T _j =150°C	1.90	-	
	Reverse recovery time	t _{rr}	Switching mode: B V _{CC} = 500V I _F = 450A V _{GE} = ±15V R _G = +2.7/-18Ω	-	0.15	-	μs
AC-switch	Zero gate voltage Collector current	I _{CES}	V _{GE} = 0V V _{CE} = 900V	-	-	6	mA
	Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V V _{GE} = ±20V	-	-	1200	nA
	Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V I _C = 450mA	5.3	6.3	7.3	V
	Collector-Emitter saturation voltage	V _{CE(sat)} (chip)	V _{GE} = 15V I _C = 450A	T _j =25°C	2.30	2.85	V
				T _j =125°C	2.70	-	
		V _{CE(sat)} (terminal)	V _{GE} = 15V I _C = 450A	T _j =25°C	2.35	2.90	
				T _j =125°C	2.75	-	
	Internal gate	R _{G(int)}	-	-	5.20	-	Ω
	Input capacitance	C _{ies}	V _{CE} =10V, V _{GE} =0V, f=1MHz	-	26.5	-	nF
	Turn-on time	t _{on}	Switching mode: B V _{CC} = 500V I _C = 450A	-	0.10	-	μs
		t _r		-	0.20	-	
		t _{r(l)}		-	0.10	-	
	Turn-off time	t _{off}	V _{GE} = ±15V R _G = +2.7/-18Ω	-	1.40	-	μs
		t _f		-	0.10	-	
	Reverse recovery time	t _{rr}	Switching mode: A V _{CC} = 500V I _F = 450A V _{GE} = ±15V R _G = +3.9/-0.22Ω	-	0.20	-	μs
Thermistor	Resistance	R	T=25°C	-	5000	-	Ω
	B Value	B	T=100°C	465	495	520	
			T=25/50°C	3305	3375	3450	K

(*1) Please refer to section 8, there is definition of A mode and B mode.

■ Thermal resistance characteristics

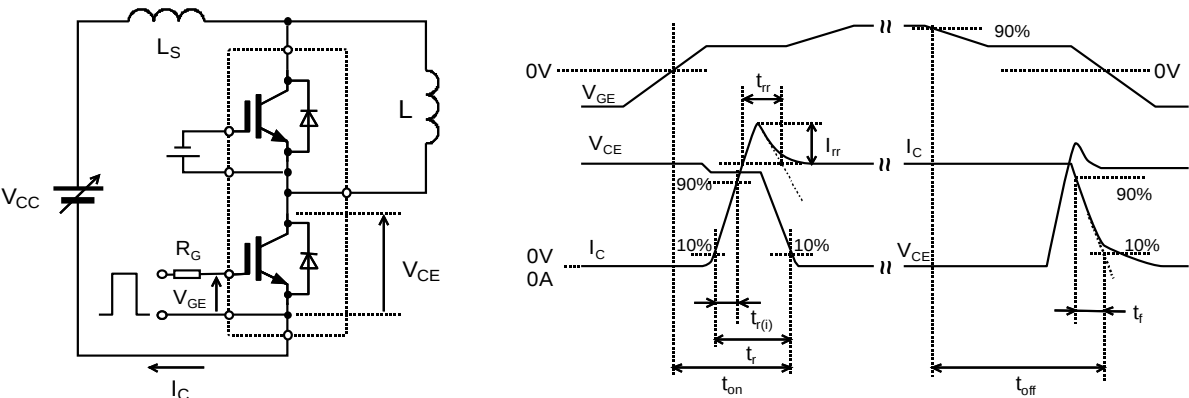
Item		Symbol	Condition	Characteristics			Units
				min.	typ.	max.	
Thermal resistance (1device)	R _{th(j-c)}		T1, T4 IGBT	-	-	0.068	°C/W
			T1, T4 FWD	-	-	0.098	
			T2, T3 RB-IGBT	-	-	0.063	
Contact thermal resistance	R _{th(c-f)}		T1, T4	-	0.0083	-	
			T2, T3 with thermal compound	-	0.0083	-	

(*2) This is the value which is defined mounting on the additional cooling fin with thermal compound.

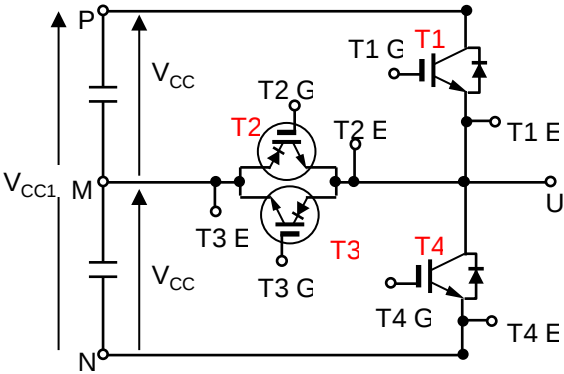
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Definitions of switching time



Definitions of switching mode



SW mode	Load L	T1	T2	T3	T4
A	M-U	SW	ON	OFF	OFF
	M-U	OFF	OFF	ON	SW
B	P-U	OFF	ON	SW	OFF
	U-N	OFF	SW	ON	OFF

SW: Connect to drive circuit and input gate signal

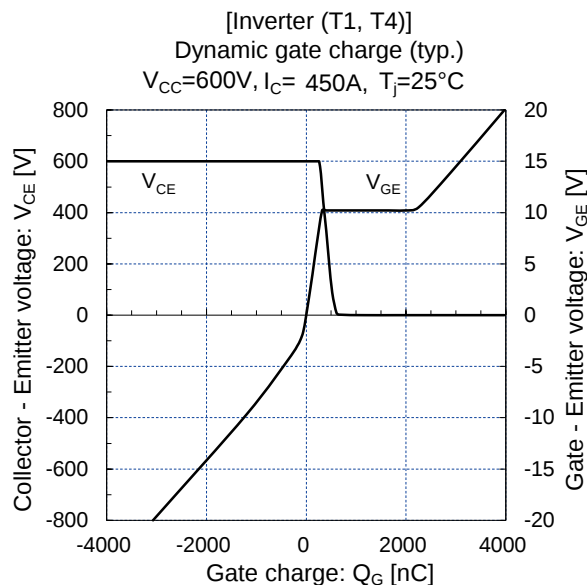
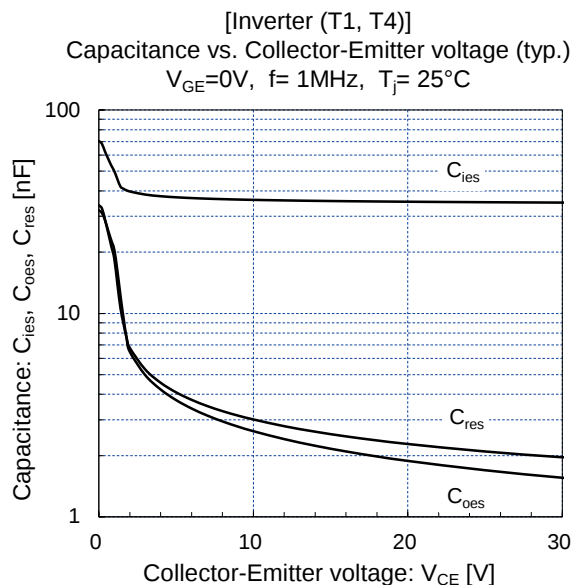
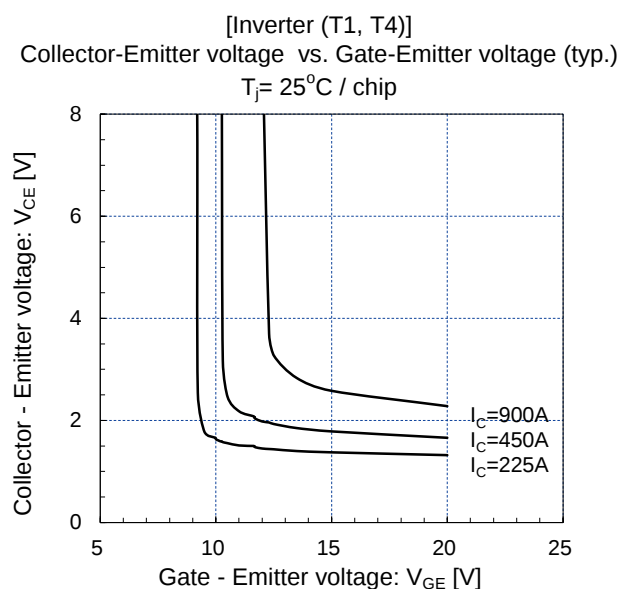
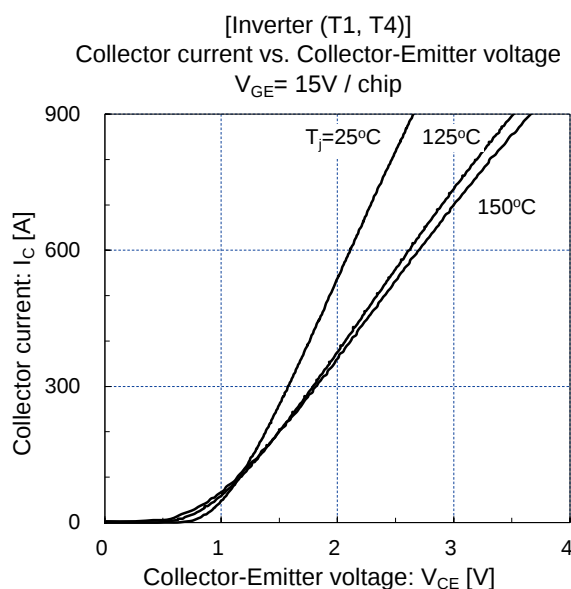
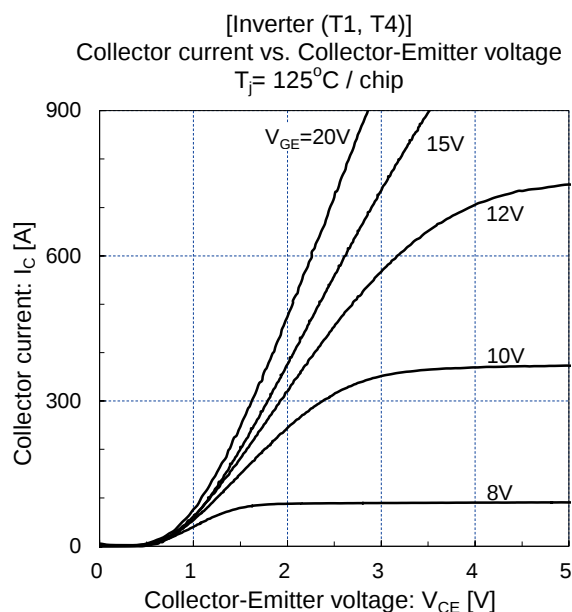
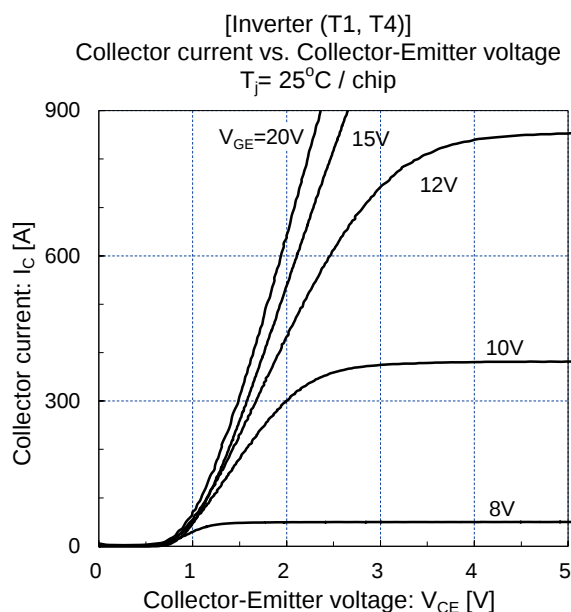
ON: Bias voltage of gate +15V

OFF: Reverse bias voltage of gate -15V

$V_{CC} = V_{CC1}/2$

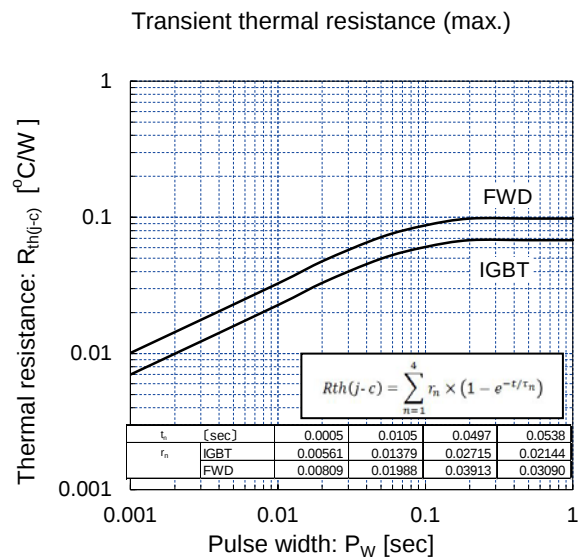
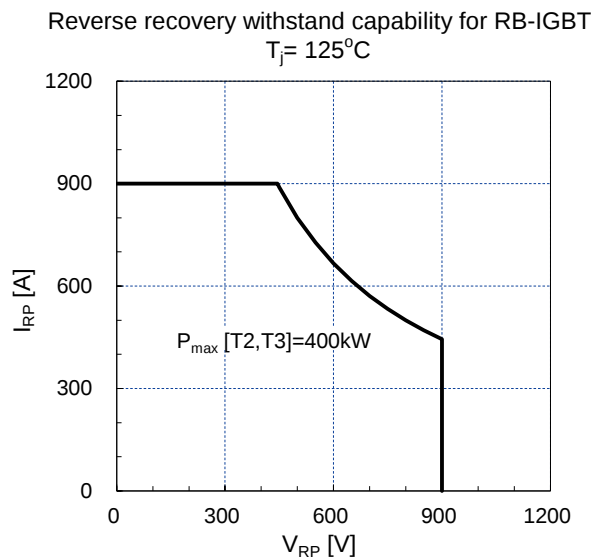
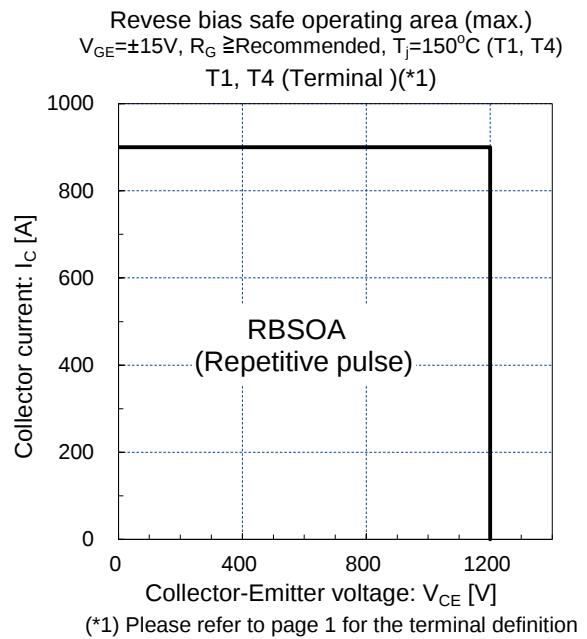
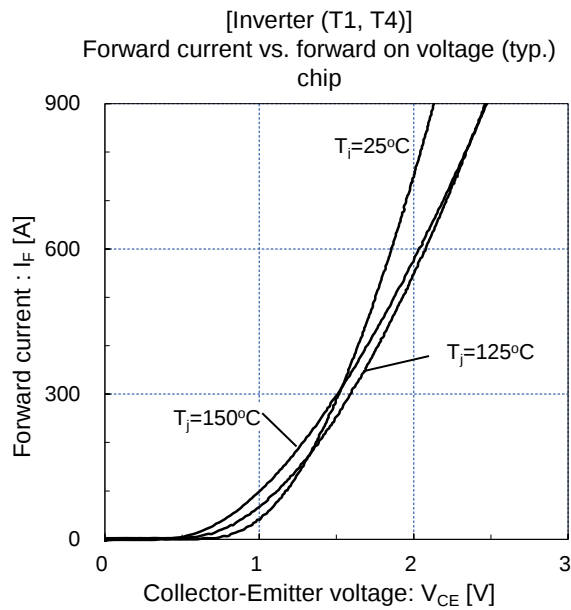
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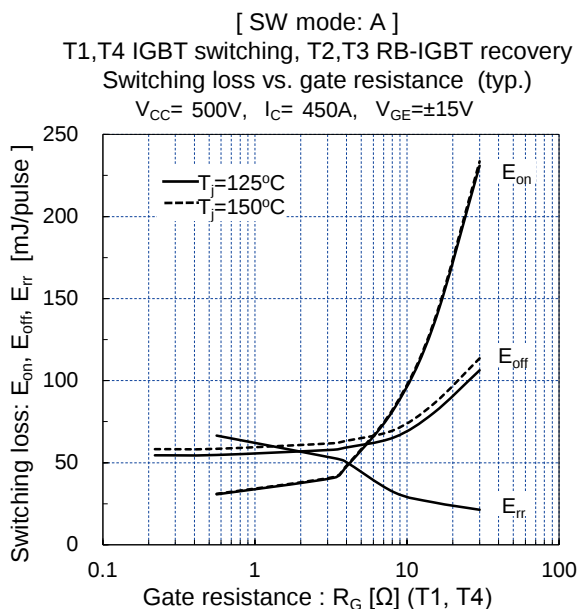
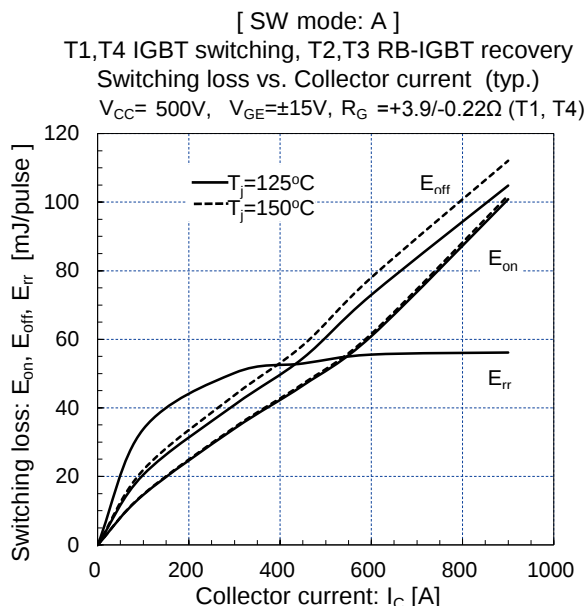
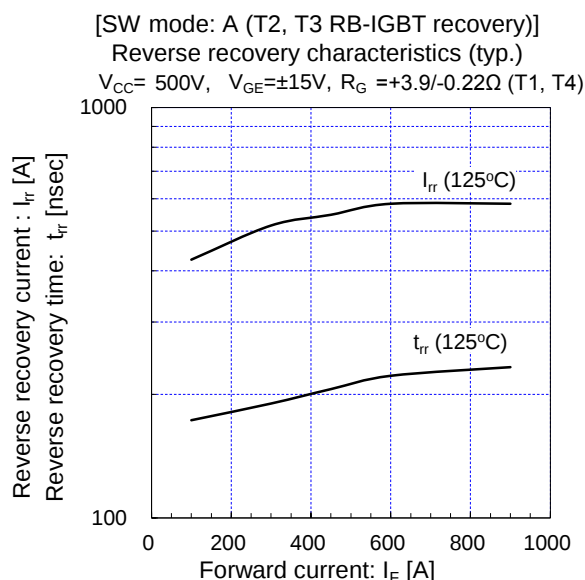
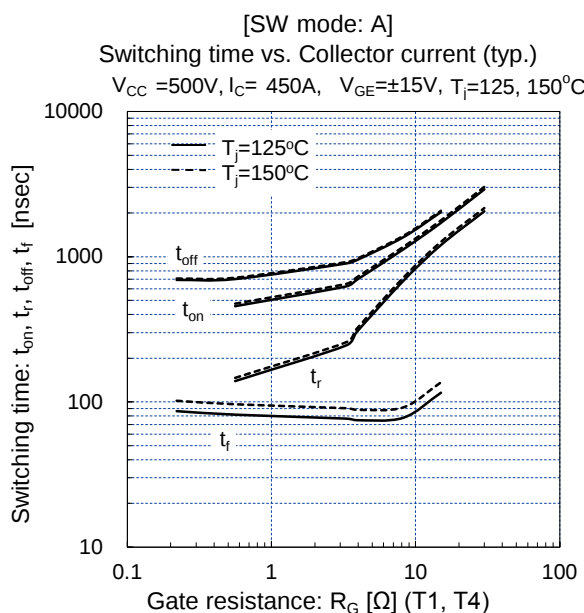
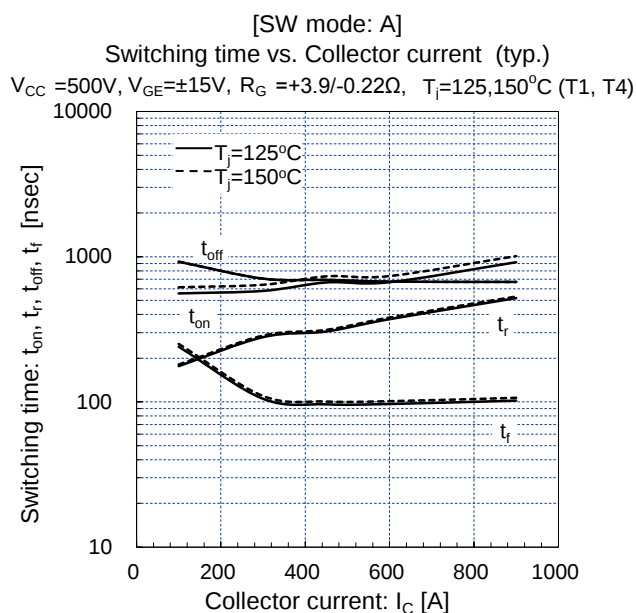
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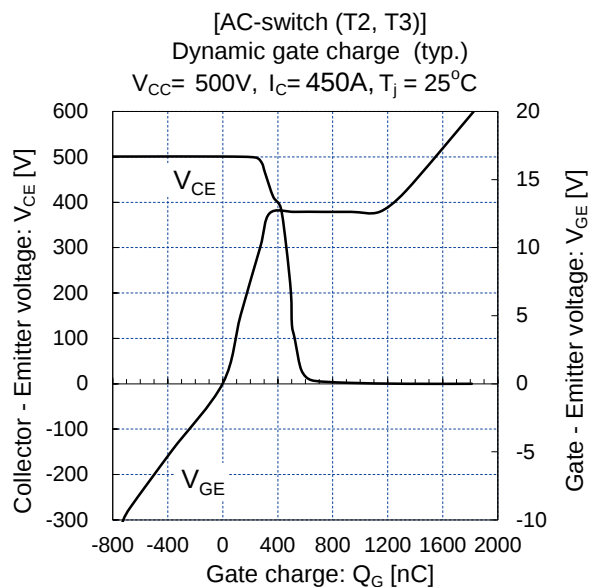
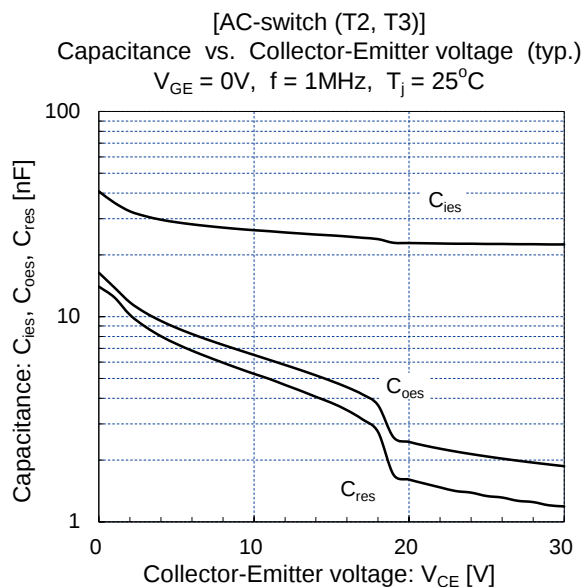
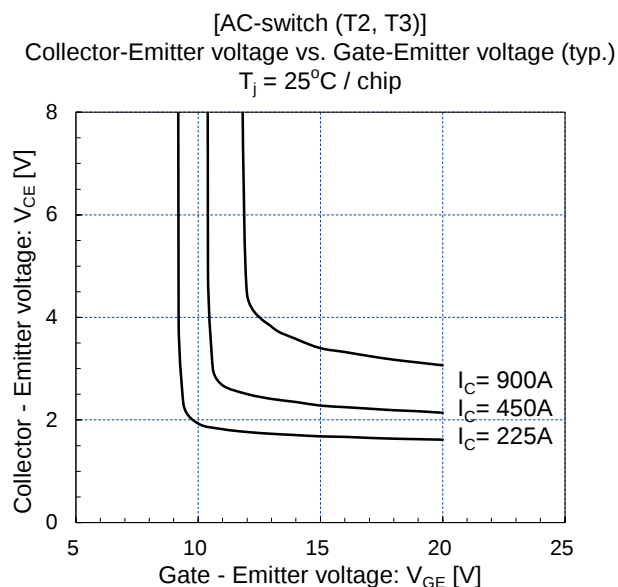
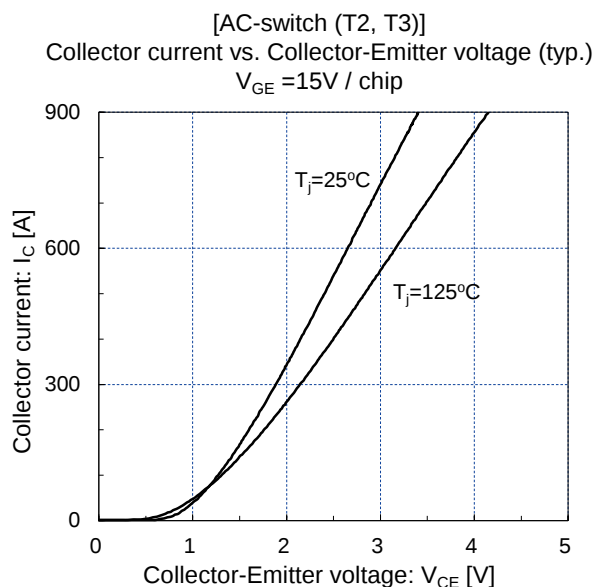
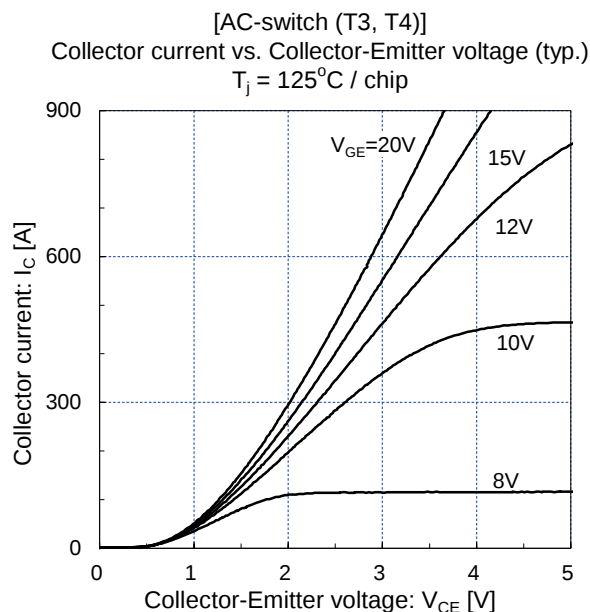
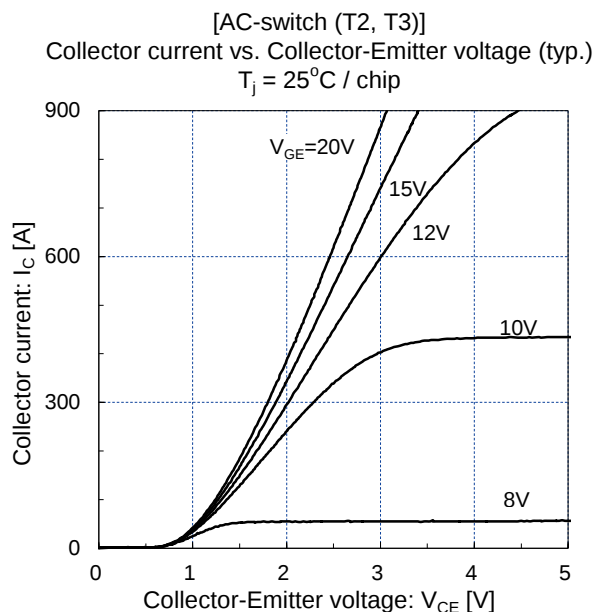
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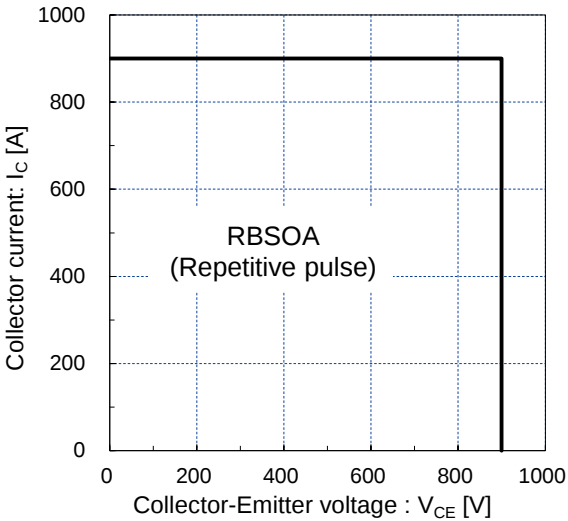
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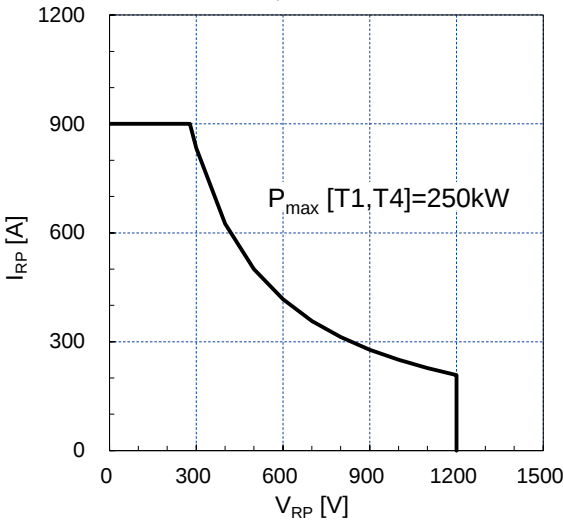
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Reverse bias safe operating area (max.)
 $V_{GE}=\pm 15V$, $R_G \geq \text{Recommended}$, $T_J=125^{\circ}C$ (T2, T3)
T2, T3 (Terminal) (*1)

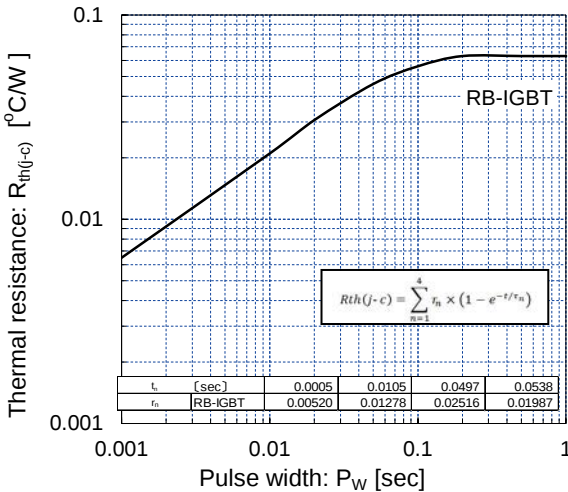


(*1) Please refer to page 1 for the terminal definition

Reverse recovery withstand capability for FWD
 $T_J=150^{\circ}C$

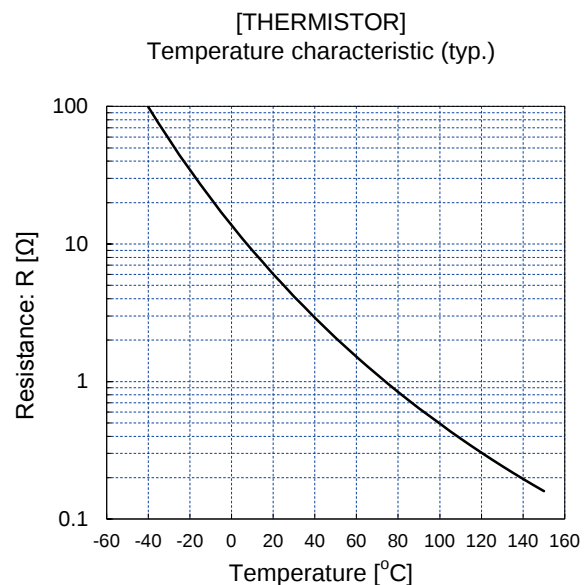
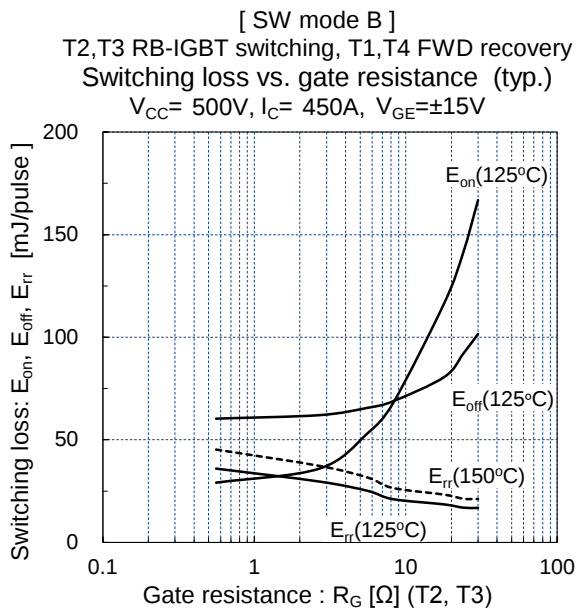
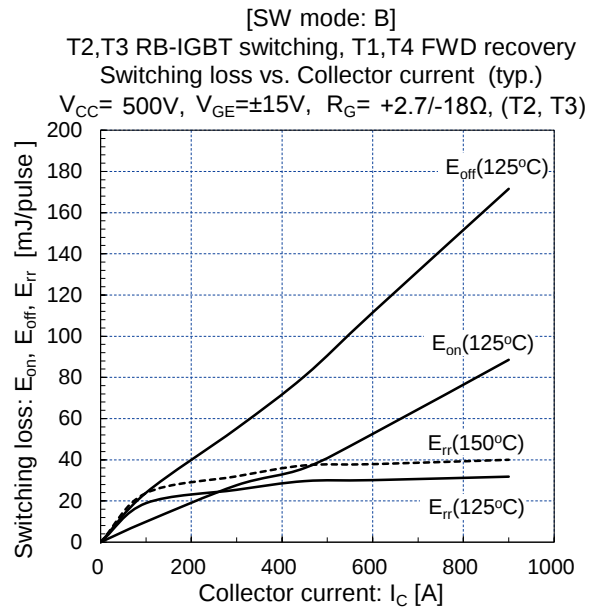
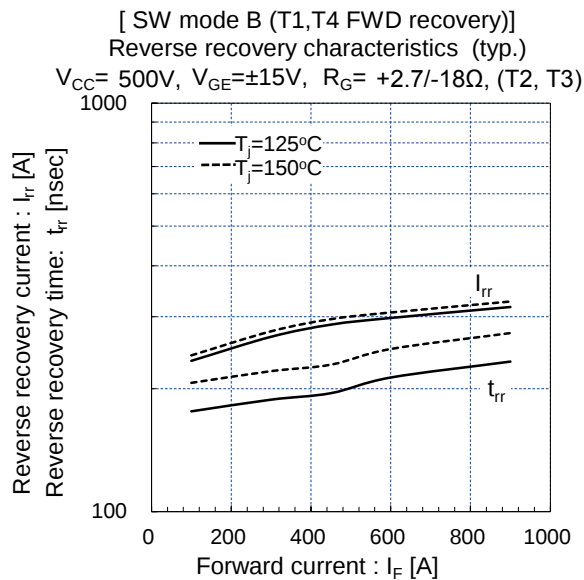
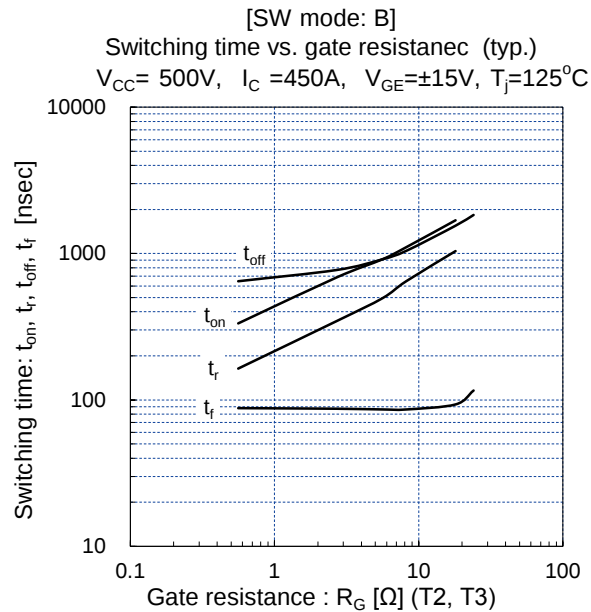
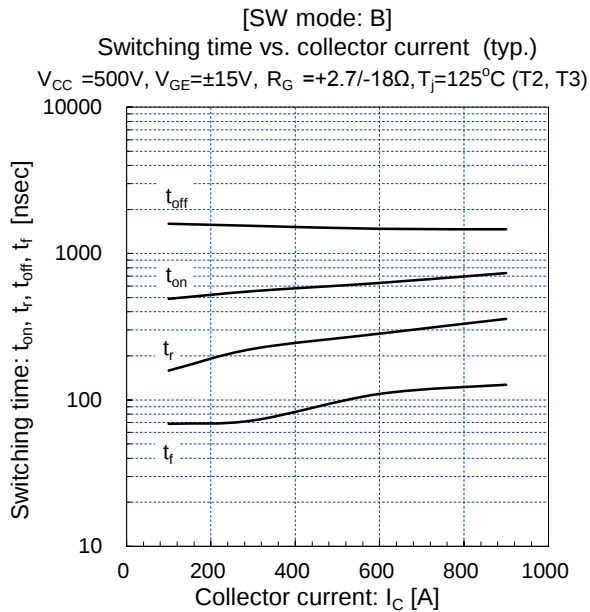


Transient thermal resistance (max.)



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