

4MBI900VB-120R1-50

IGBT Modules

IGBT Power Module (V series)

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

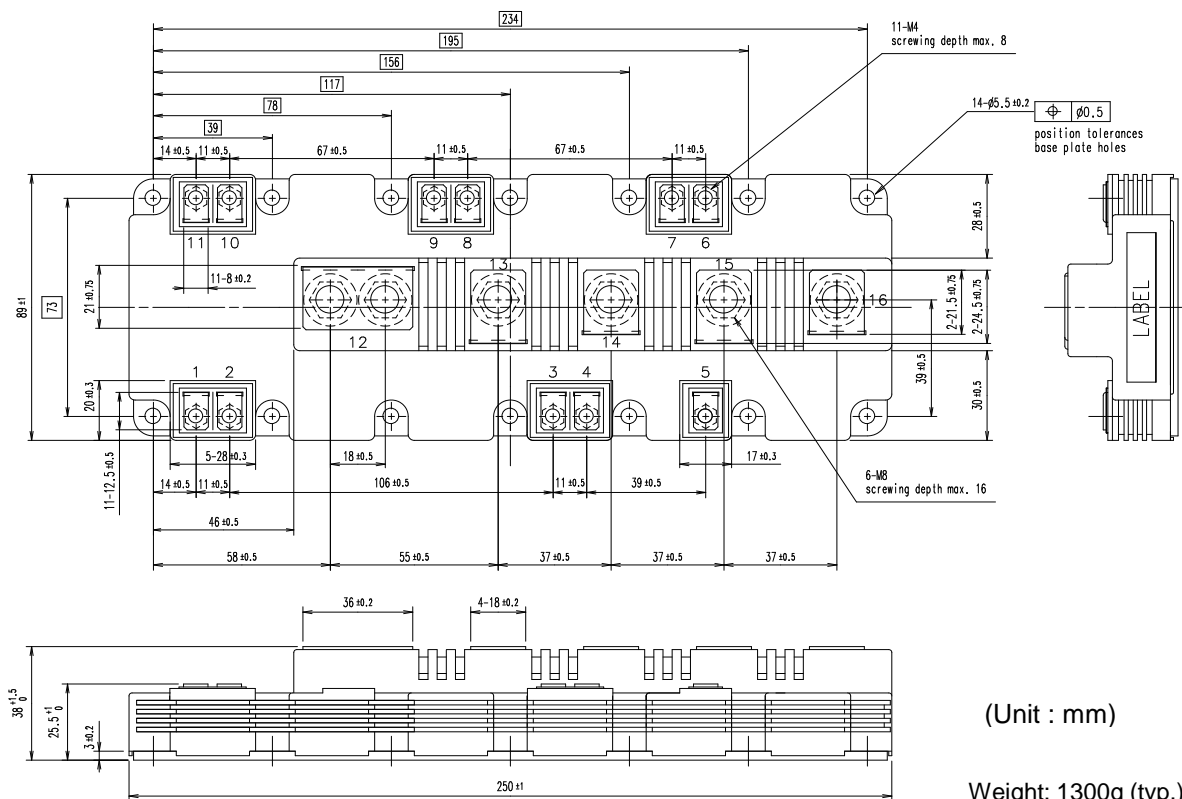
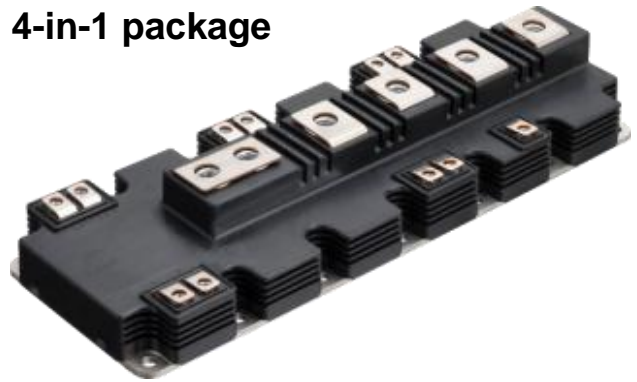
■ **Features**

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

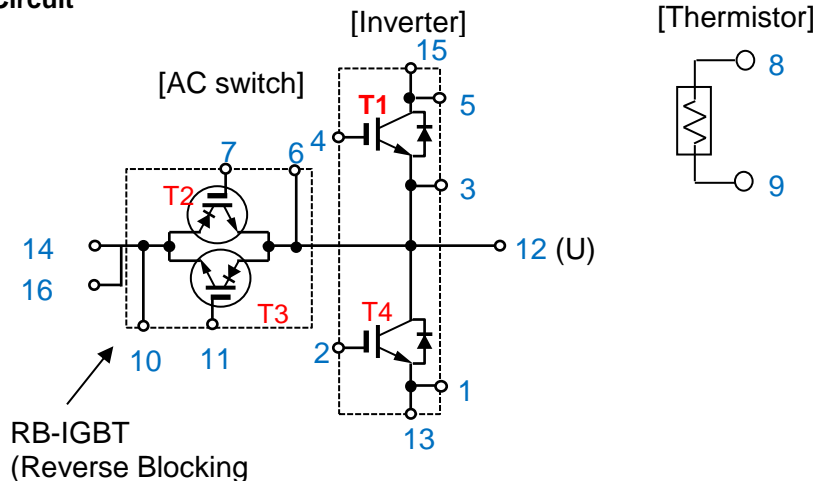
■ **Applications**

- 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 Tc= 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	IGBT	I_C	Continuous	$T_c=25^\circ\text{C}$ 1200 $T_c=100^\circ\text{C}$ 900	A
			I_C pulse	1ms	1800	
		FWD	$-I_C$		900	
			$-I_C$ pulse		1800	
	Collector power dissipation	P_C	1 device	3950	W	
	Junction temperature	T_j		175	°C	
	Operating temperature	T_{jop}		150		
	Collector-Emitter voltage	V_{CES}		±900		A
AC switch	Gate-Emitter voltage	V_{GES}		±20	V	
	Collector current	I_C	Continuous	$T_c=25^\circ\text{C}$ 1200 $T_c=80^\circ\text{C}$ 900	A	
			I_C pulse	1ms		1800
	Collector power dissipation	P_C	1 device	3675	W	
	Junction temperature	T_j		150	°C	
	Operating temperature	T_{jop}		125		
	Case temperature	T_c		125		
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 Tj= 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}	$V_{CE} = 0V$ $V_{GE} = \pm 20V$	-	-	1200	nA	
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 900mA$	6.0	6.5	7.0	V	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_C = 900A$	$T_j = 25^\circ C$	-	1.85	2.35	V
				$T_j = 125^\circ C$	-	2.20	-	
		$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 900A$	$T_j = 150^\circ C$	-	2.25	-	
				$T_j = 25^\circ C$	-	1.95	2.45	
	Internal gate	$R_{G(int)}$	-	-	-	0.80	-	Ω
				-	-	0.80	-	Ω
	Input capacitance	C_{ies}	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	75.5	-	nF	
	Turn-on time	t_{on}	Switching mode: A $V_{CC} = 500V$ $I_C = 900A$	t_r	-	0.60	-	μs
				$t_{r(i)}$	-	0.40	-	
				$t_{r(f)}$	-	0.15	-	
	Turn-off time	t_{off}	$V_{GE} = \pm 15V$ $R_G = +3.3/-0.56\Omega$	$t_{r(i)}$	-	0.90	-	μs
$t_{r(f)}$				-	0.08	-		
Forward on voltage	V_F (chip)	$I_F = 900A$	$T_j = 25^\circ C$	-	1.70	2.20	V	
			$T_j = 125^\circ C$	-	1.85	-		
	V_F (terminal)	$I_F = 900A$	$T_j = 150^\circ C$	-	1.80	-		
			$T_j = 25^\circ C$	-	1.85	2.35		
Reverse recovery time	t_{rr}	Switching mode: B $V_{CC} = 500V, I_F = 900A$ $V_{GE} = \pm 15V, R_G = +1.8/-12\Omega$	-	0.20	-	μs		
			-	0.20	-	μs		
AC-switch	Zero gate voltage Collector current	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 900V$	-	-	12	mA	
	Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0V$ $V_{GE} = \pm 20V$	-	-	2400	nA	
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 900mA$	5.6	6.6	7.6	V	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_C = 900A$	$T_j = 25^\circ C$	-	2.30	2.9	V
				$T_j = 125^\circ C$	-	2.70	-	
	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 900A$	$T_j = 25^\circ C$	-	2.40	3.00		
			$T_j = 125^\circ C$	-	2.80	-		
	Internal gate	$R_{G(int)}$	-	-	2.60	-	Ω	
	Input capacitance	C_{ies}	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	53.0	-	nF	
	Turn-on time	t_{on}	Switching mode: B $V_{CC} = 500V$ $I_C = 900A$	t_r	-	0.60	-	μs
				$t_{r(i)}$	-	0.25	-	
				$t_{r(f)}$	-	0.15	-	
	Turn-off time	t_{off}	$V_{GE} = \pm 15V$ $R_G = +1.8/-12\Omega$	$t_{r(i)}$	-	1.85	-	μs
				$t_{r(f)}$	-	0.15	-	
Reverse recovery time	t_{rr}	Switching mode: A $V_{CC} = 500V, I_F = 900A$ $V_{GE} = \pm 15V, R_G = +3.3/-0.56\Omega$	-	0.20	-	μs		
Thermistor	Resistance	R	$T = 25^\circ C$	-	5000	-	Ω	
	$T = 100^\circ C$	465	495	520				
B Value	B	$T = 25/50^\circ C$	3305	3375	3450	K		

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

■ Thermal resistance characteristics

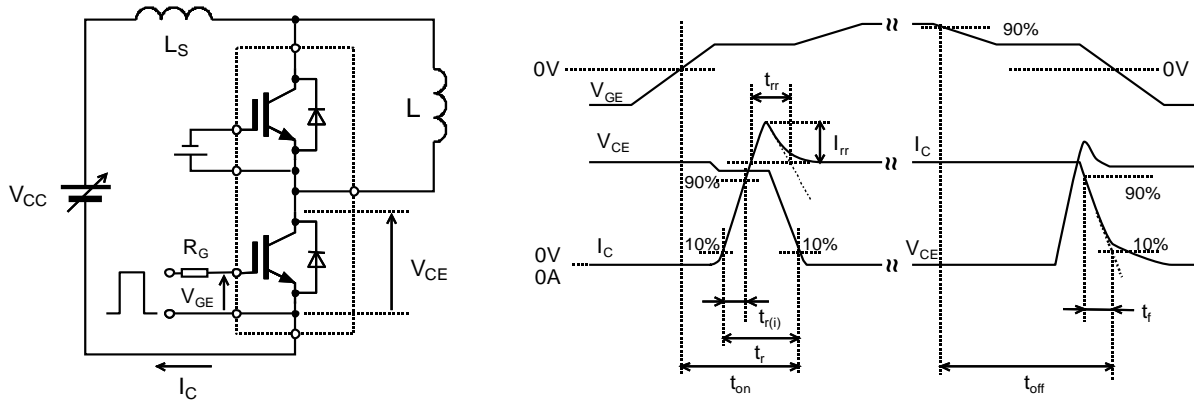
Item	Symbol	Condition	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	T1, T4 IGBT	-	-	0.038	$^\circ C/W$
		T1, T4 FWD	-	-	0.054	
		T2, T3 RB-IGBT	-	-	0.034	
Contact thermal resistance	$R_{th(c-f)}$	T1, T4	-	0.0083	-	$^\circ C/W$
		T2, T3 with thermal compound	-	0.0042	-	

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

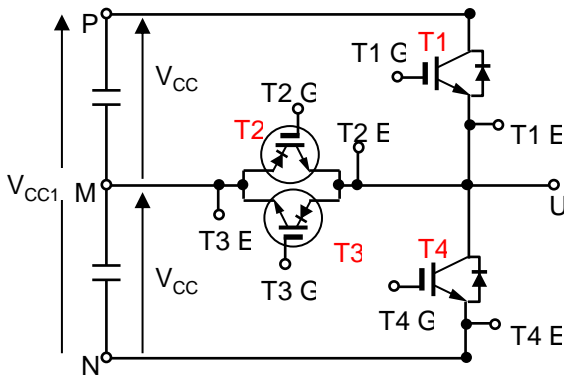
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■ Definitions of switching time



■ Definitions of switching mode



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

SW: Connect to drive circuit and input gate signal

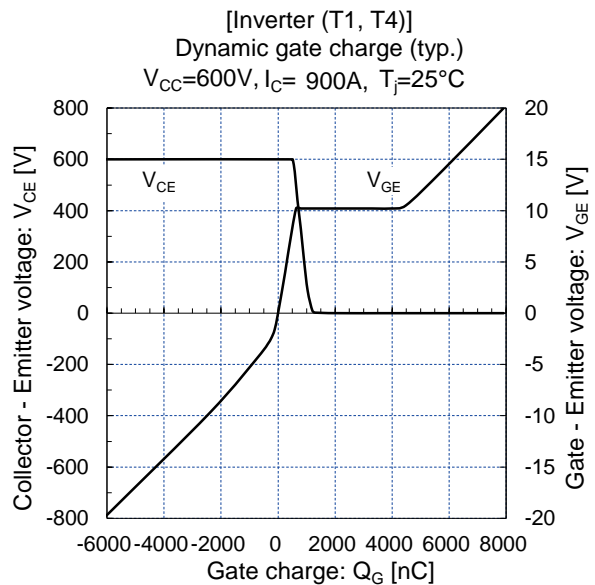
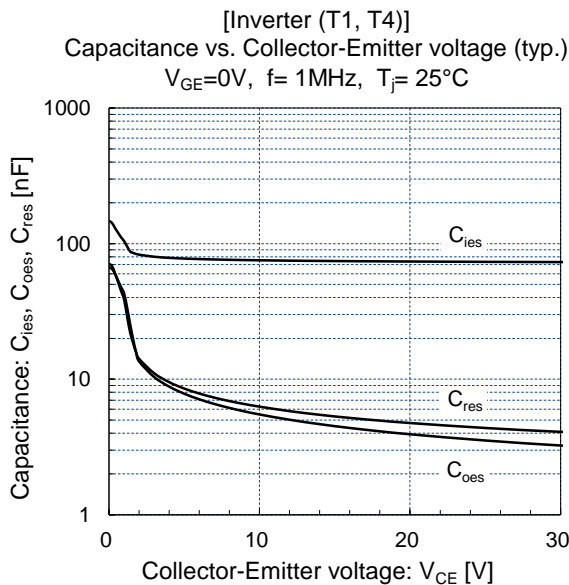
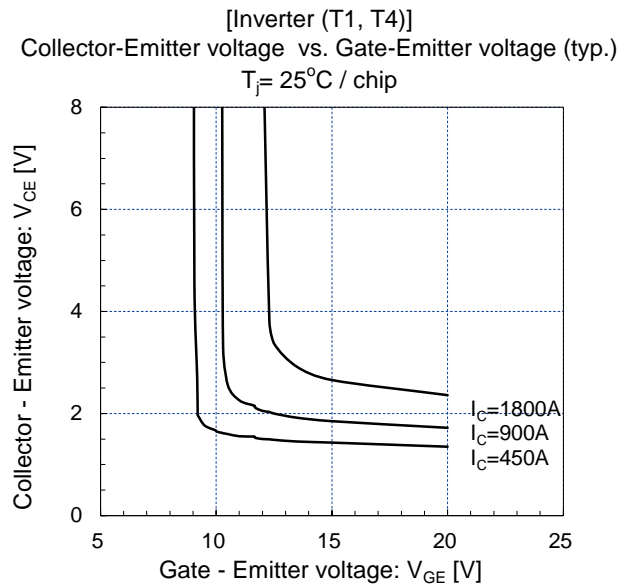
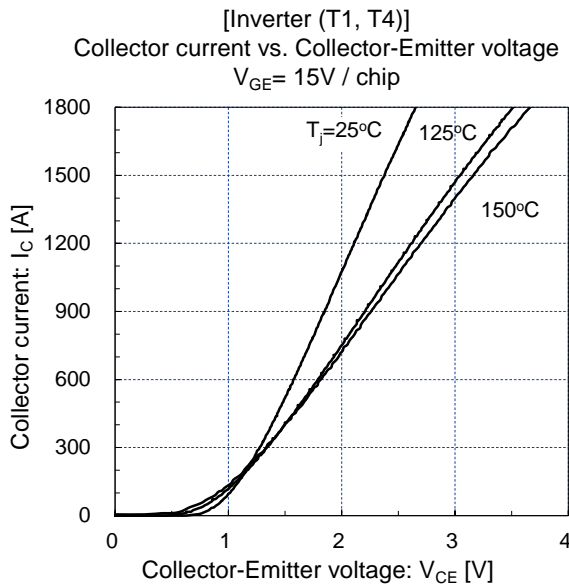
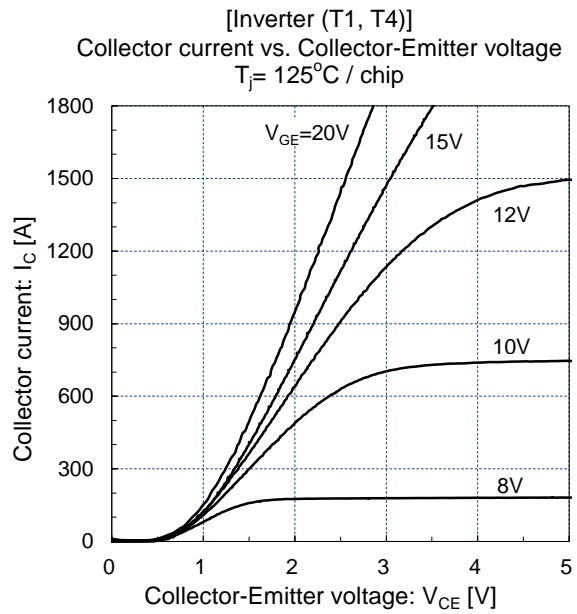
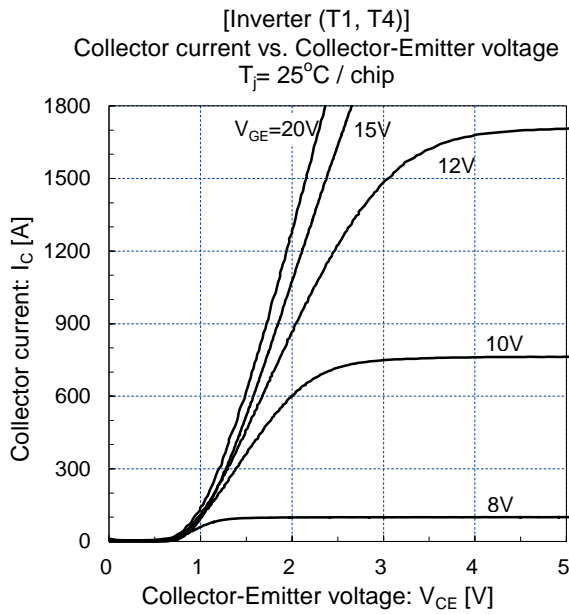
ON: Bias voltage of gate +15V

OFF: Reverse bias voltage of gate -15V

$V_{cc} = V_{cc1}/2$

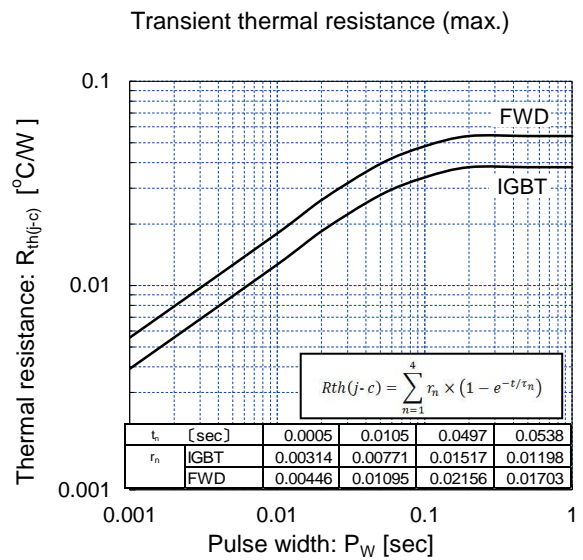
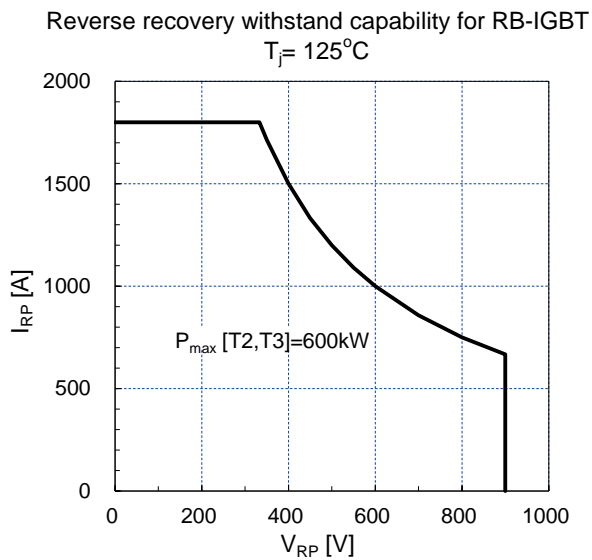
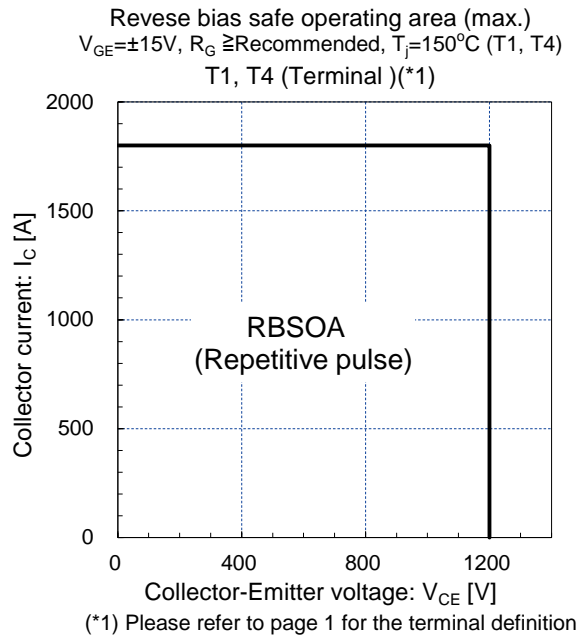
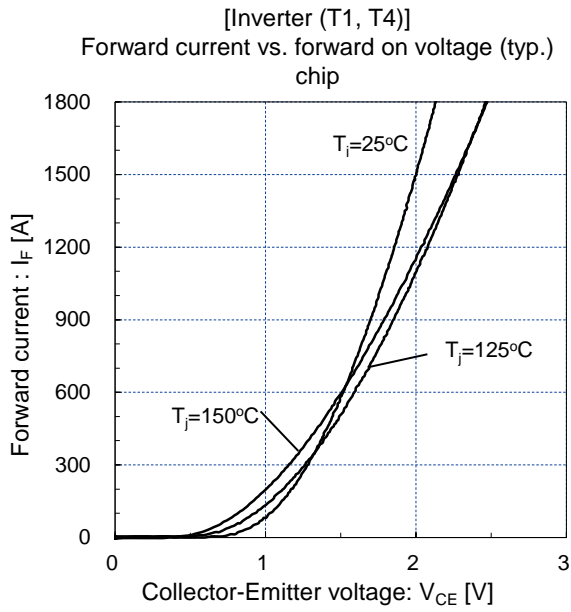
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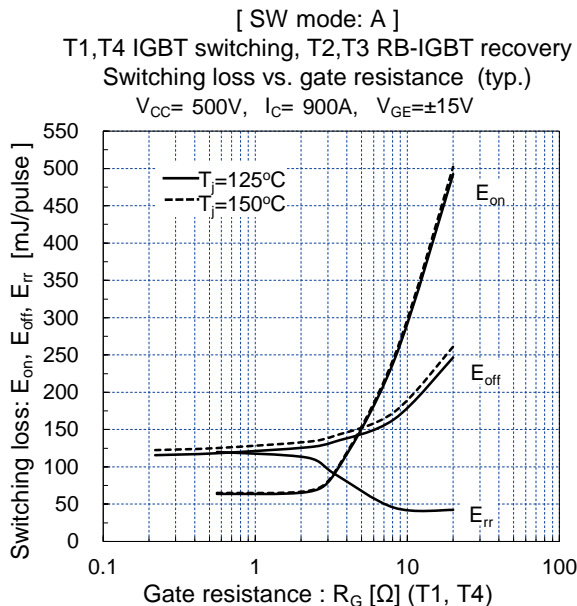
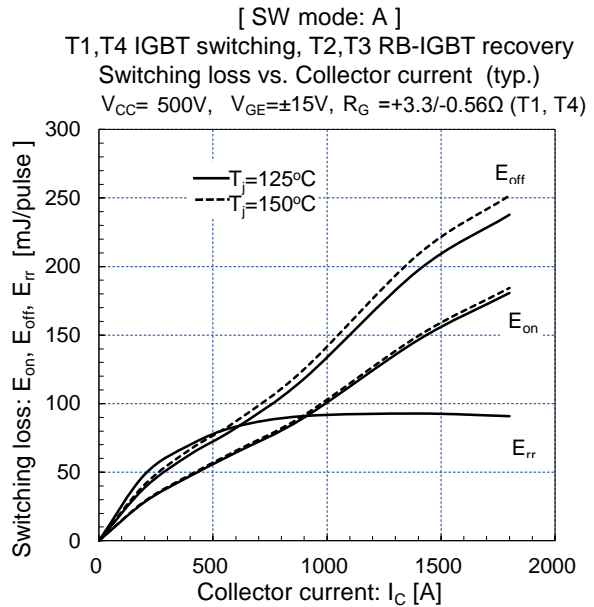
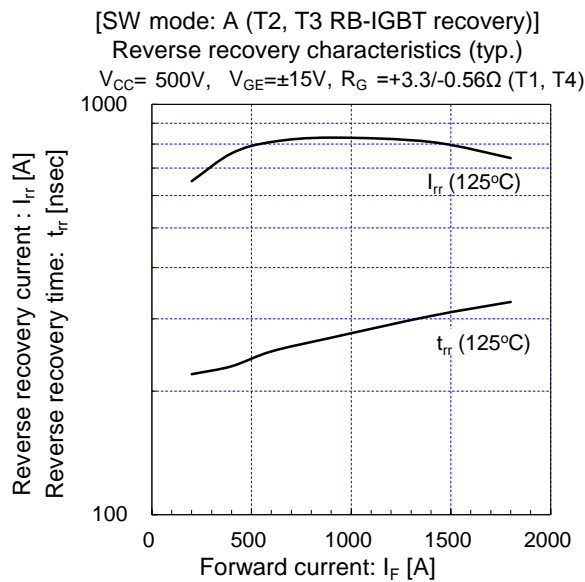
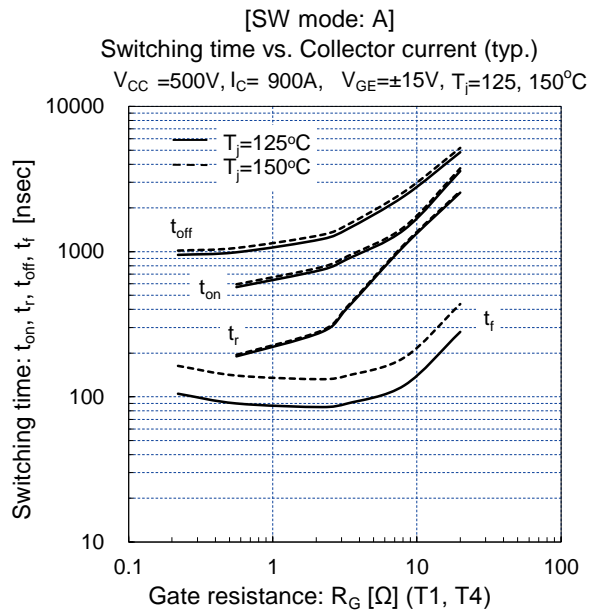
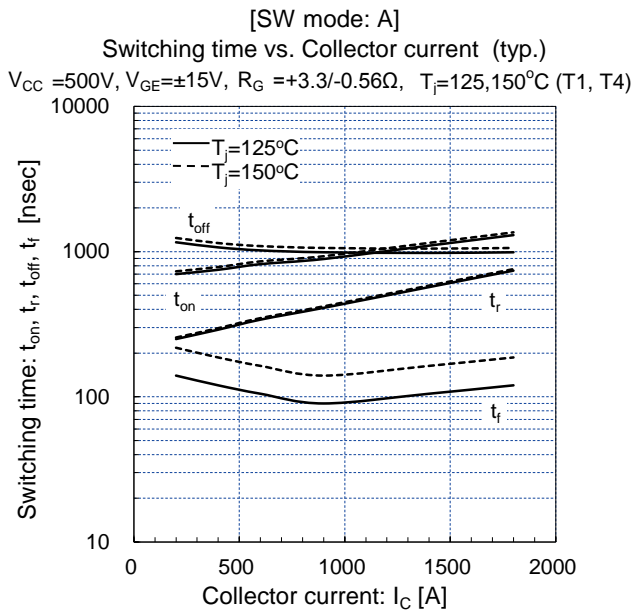
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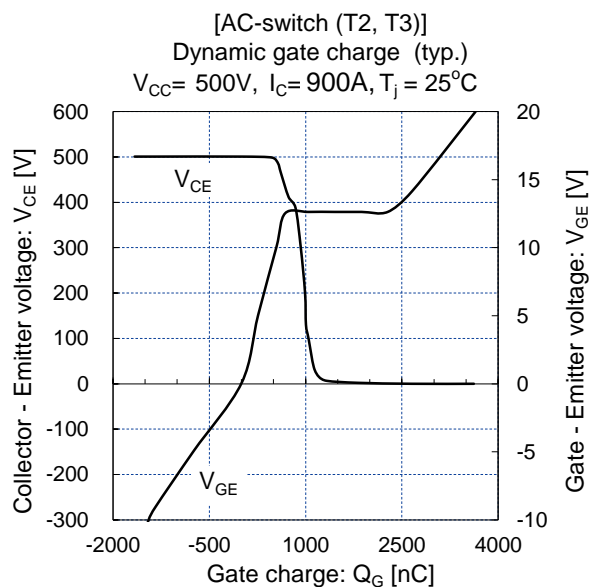
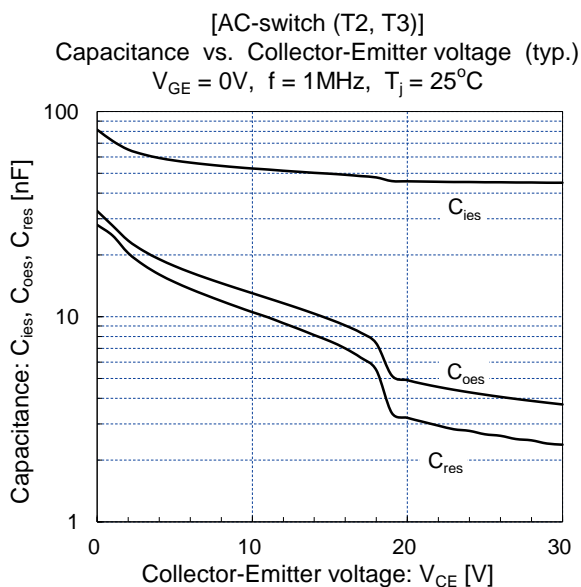
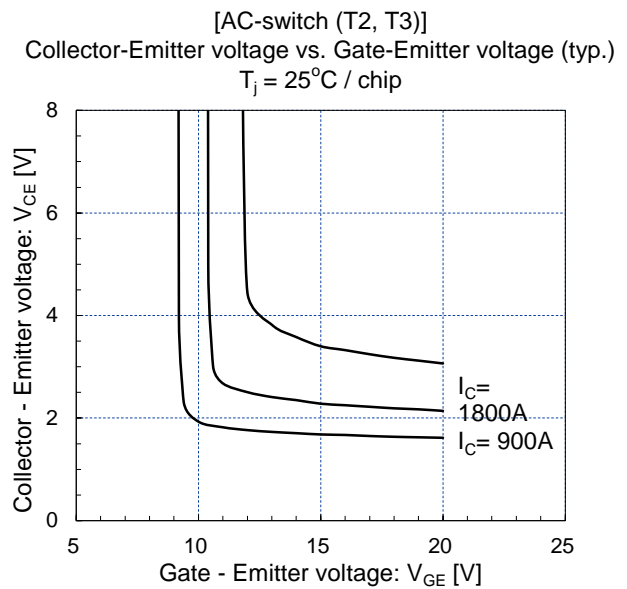
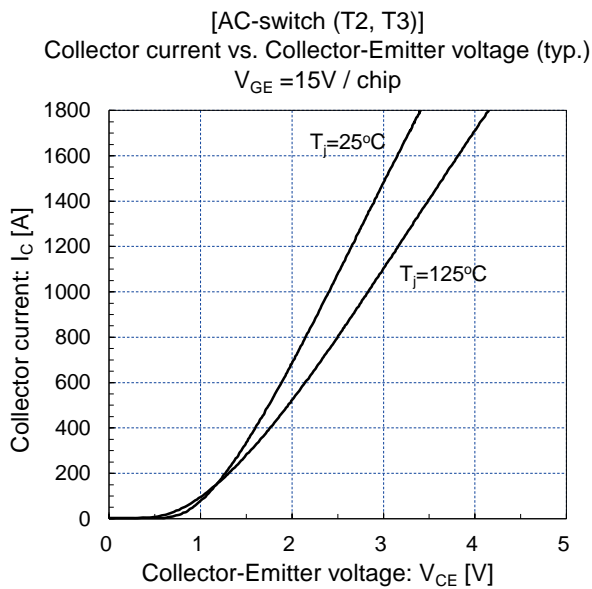
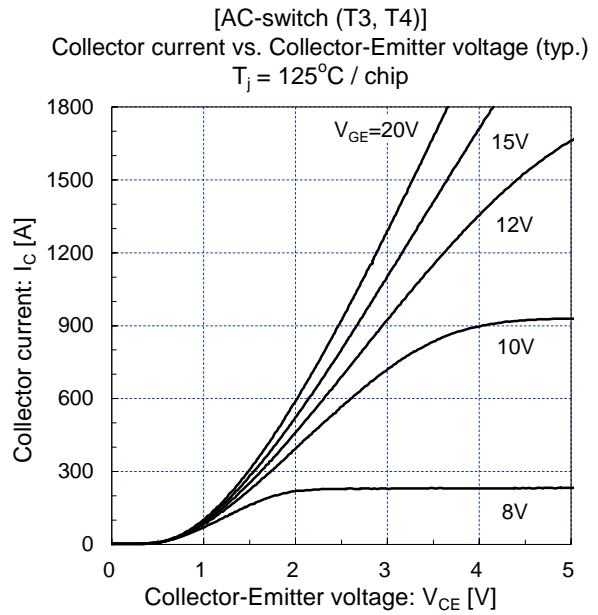
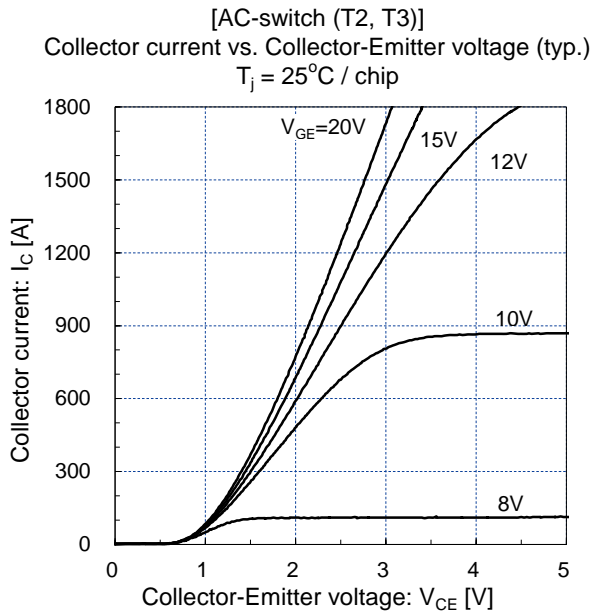
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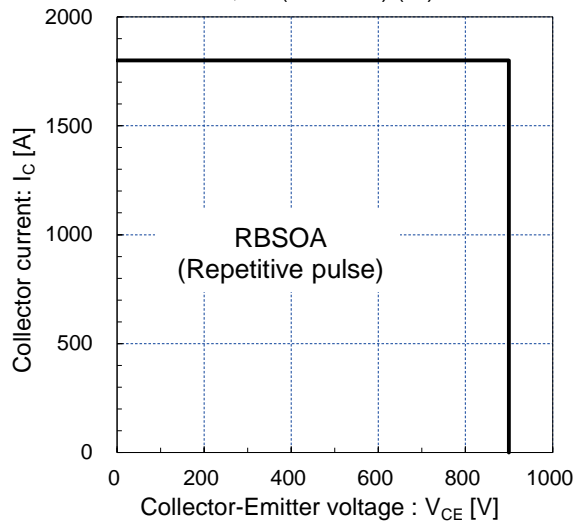
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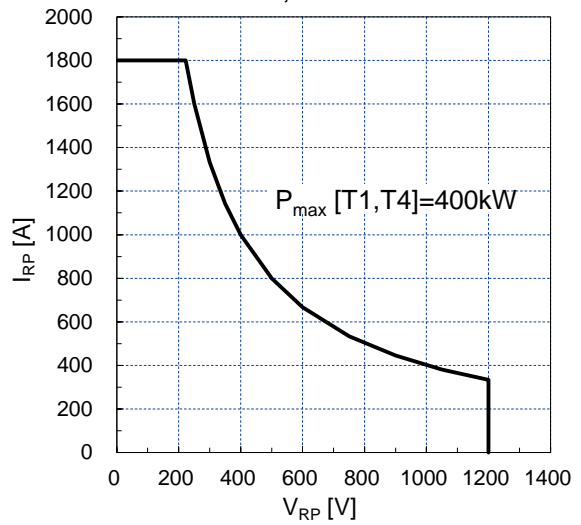
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Reverse bias safe operating area (max.)
 $V_{GE} = \pm 15V$, $R_G \geq \text{Recommended}$, $T_J = 125^\circ C$ (T2, T3)
 T2, T3 (Terminal) (*1)

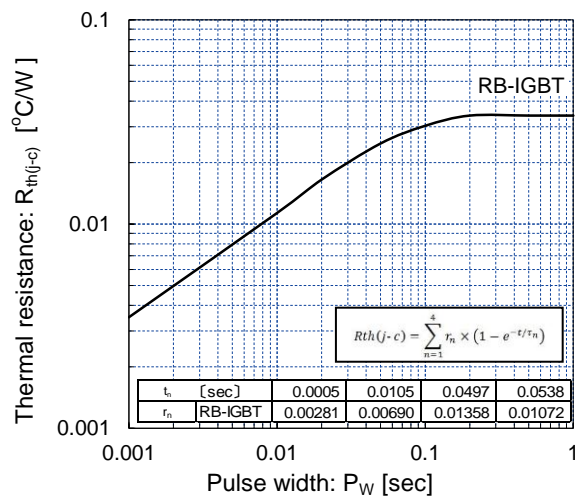


(*1) Please refer to page 1 for the terminal definition

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

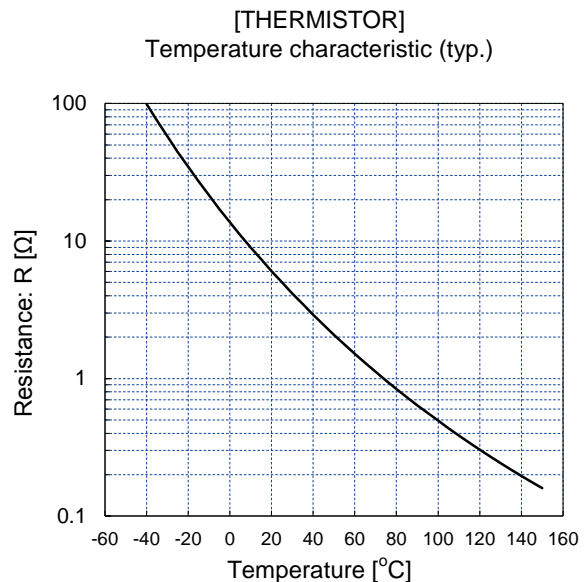
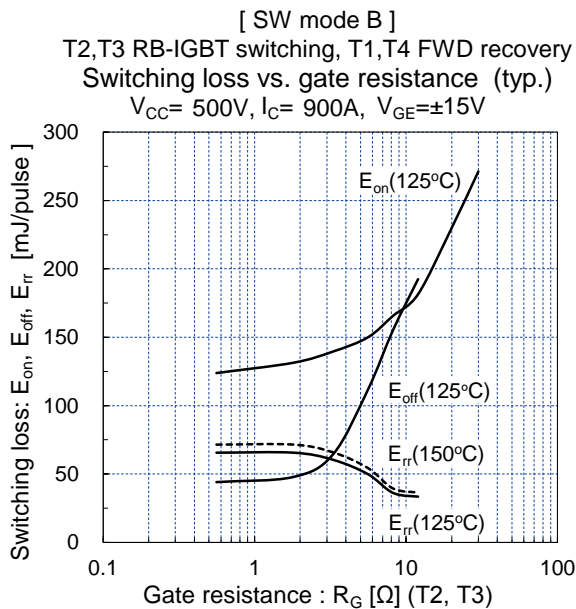
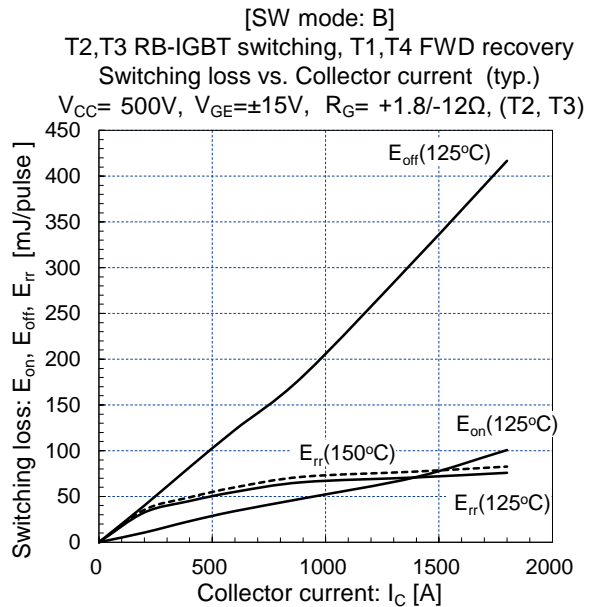
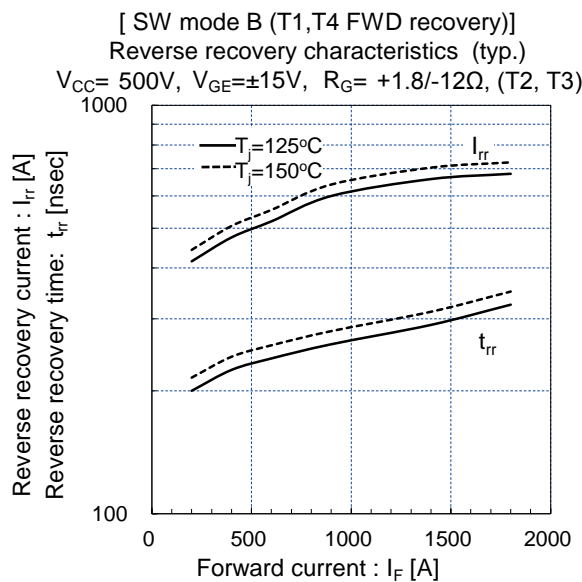
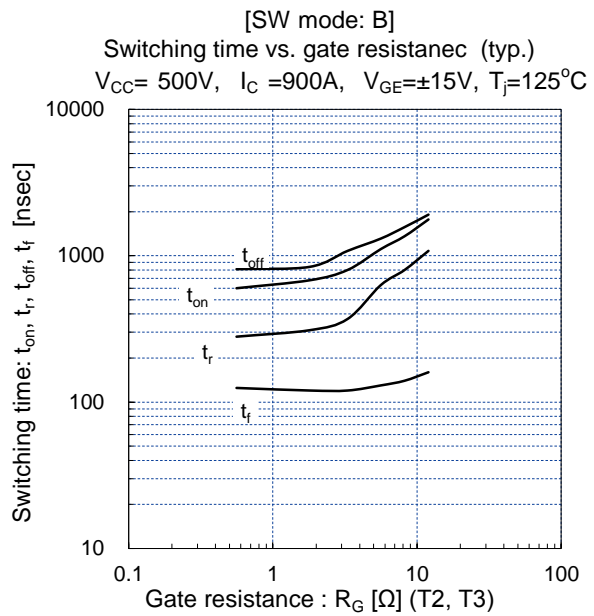
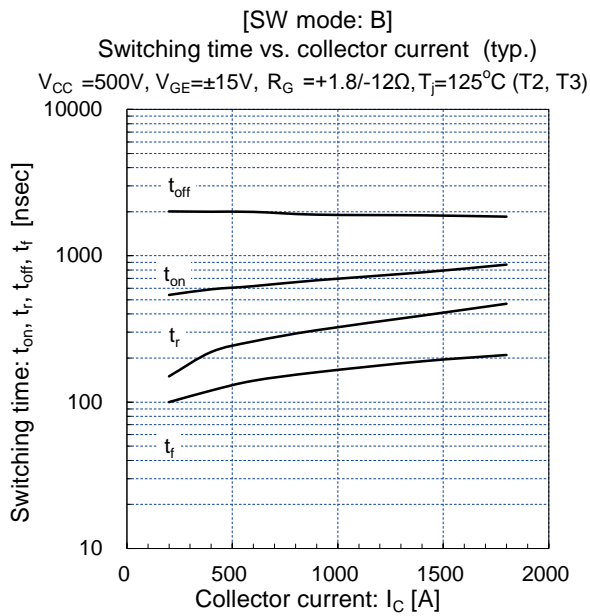


Transient thermal resistance (max.)



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