

4MBI300VG-120R1-50

IGBT Modules

IGBT Power Module (V series)

1200V/300A/IGBT, 900V/300A/RB-IGBT, 4-in-1 package

■ Features

- Higher efficiency
Optimized Advanced T-type circuit
Low inductance module structure

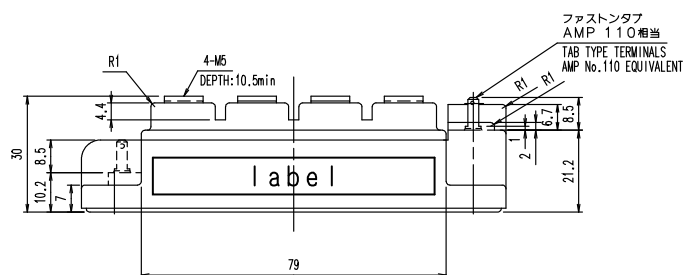
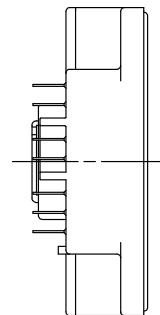
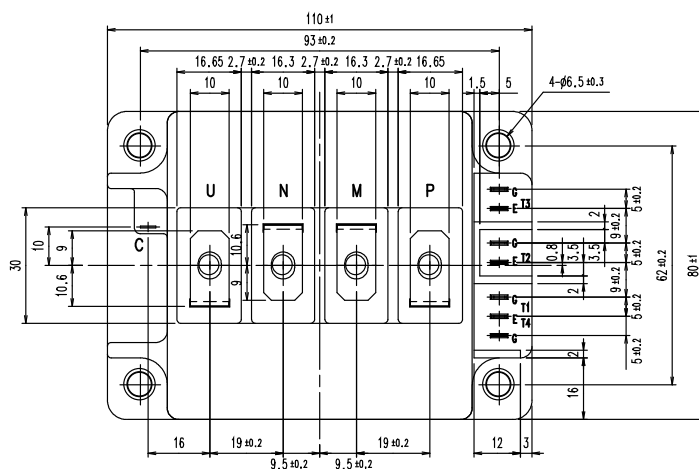
■ Applications

- Inverter for motor drive
Uninterruptible powere supply
Power conditioner



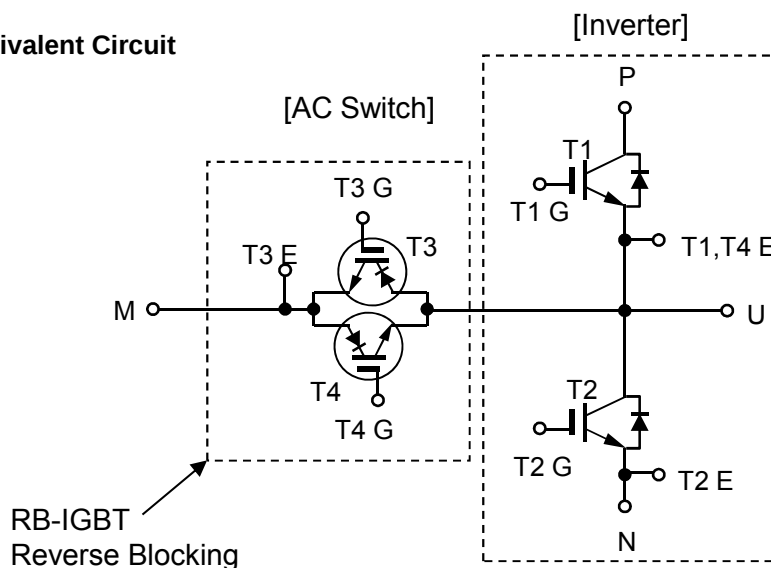
■ Outline drawing

(Unit : mm)



Weight: 460g (typ.)

■ Equivalent Circuit



4MBI300VG-120R1-50

IGBT Modules
■ Absolute Maximum Ratings (at Tc= 25°C unless otherwise specified)

Item			Symbol	Condition		Maximum Rating	Unit
Inverter	Collector-Emitter voltage		V _{CES}			1200	V
	Gate-Emitter voltage		V _{GES}			±20	V
	Collector current	IGBT	I _C	Continuous	Tc=80°C	300	A
			I _C pulse	1ms	Tc=80°C	600	
		FWD	-I _C			300	
			-I _C pulse			600	
	Collector power dissipation		P _C	1 device		1500	W
	Junction temperature		T _j			175	°C
Operating temperature (under switching conditions)		T _{jop}			150		
AC Switch	Collector-Emitter voltage		V _{CES}			±900	V
	Gate-Emitter voltage		V _{GES}			±20	V
	Collector current		I _C	Continuous	Tc=80°C	300	A
			I _C pulse	1ms	Tc=80°C	600	
	Collector power dissipation		P _C	1 device		1550	W
	Junction temperature		T _j			150	°C
	Operating temperature (under switching conditions)		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.		2500	
Screw torque	Mounting (*2)	-	M5 or M6		3.5	Nm	
	Terminal (*3)	-	M5		3.5		

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

(*2) Recommendable value : 2.5-3.5 Nm (M5 or M6)

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

4MBI300VG-120R1-50

IGBT Modules

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

	Items	Symbols	Conditions	Characteristics			Units
				min.	typ.	max.	
Inverter	Zero gate voltage collector current	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 1200V$	-	-	2.0	mA
	Gate-Emitter leakage current	I_{GES}	$V_{GE} = 0V$ $V_{CE} = \pm 20V$	-	-	400	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 300mA$	6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_C = 300A$	Tj= 25°C	1.85	2.10	V
			$I_C = 300A$	Tj=125°C	2.20	-	
				Tj=150°C	2.25	-	
		$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 300A$	Tj= 25°C	2.05	2.35	
			$I_C = 300A$	Tj=125°C	2.40	-	
				Tj=150°C	2.45	-	
	Internal gate resistance	$R_{g(int)}$	-	-	2.50	-	Ω
	Input capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1MHz$	-	25.2	-	nF
	Turn-on time	t_{on}	SW mode : A $V_{CC} = 500V$ $I_C = 300A$	-	0.60	-	μs
		t_r		-	0.25	-	
		$t_r(i)$		-	0.10	-	
	Turn-off time	t_{off}	$V_{GE} = \pm 15V$	-	0.60	-	μs
		t_f	$R_G = +1.5/-1 \Omega, L_S = 30nH$	-	0.05	-	
AC Switch	Forward on voltage	V_F (chip)	$I_F = 300A$	Tj= 25°C	1.70	1.95	V
				Tj=125°C	1.85	-	
				Tj=150°C	1.80	-	
		V_F (terminal)	$I_F = 300A$	Tj= 25°C	1.95	2.25	
			$I_F = 300A$	Tj=125°C	2.10	-	
				Tj=150°C	2.05	-	
	Reverse recovery time	t_{rr}	SW mode : B $V_{CC} = 500V$ $V_{GE} = \pm 15V$ $L_S = 30nH$ $I_F = 300A$ $R_G = +1/-1 \Omega$	-	0.15	-	μs
				-	-	-	
				-	-	-	
				-	-	-	
	Zero gate voltage collector current	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 900V$	-	-	4.0	mA
	Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0V$ $V_{GE} = \pm 20V$	-	-	800	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 300mA$	5.6	6.6	7.6	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_C = 300A$	Tj= 25°C	2.30	2.60	V
				Tj=125°C	2.70	-	
				Tj= 25°C	2.45	2.80	
		$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 300A$	Tj=125°C	2.85	-	
AC Switch	Internal gate resistance	$R_{g(int)}$	-	-	2.50	-	Ω
	Input capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1MHz$	-	17.6	-	nF
	Turn-on time	t_{on}	SW mode : B $V_{CC} = 500V$ $I_C = 300A$	-	0.25	-	μs
		t_r		-	0.15	-	
		$t_r(i)$		-	0.05	-	
	Turn-off time	t_{off}	$V_{GE} = \pm 15V$	-	0.35	-	μs
		t_f	$R_G = +1/-1 \Omega, L_S = 30nH$	-	0.05	-	
	Reverse recovery time	t_{rr}	SW mode : A $V_{CC} = 500V$ $V_{GE} = \pm 15V$ $L_S = 30nH$ $I_C = 300A$ $R_G = +1.5/-1 \Omega$	-	0.20	-	μs
				-	-	-	
				-	-	-	
				-	-	-	
Internal inductance	L	P-N	-	-	40	-	nH
		P-M	-	-	33	-	
		M-N	-	-	33	-	

■ Thermal resistance characteristics

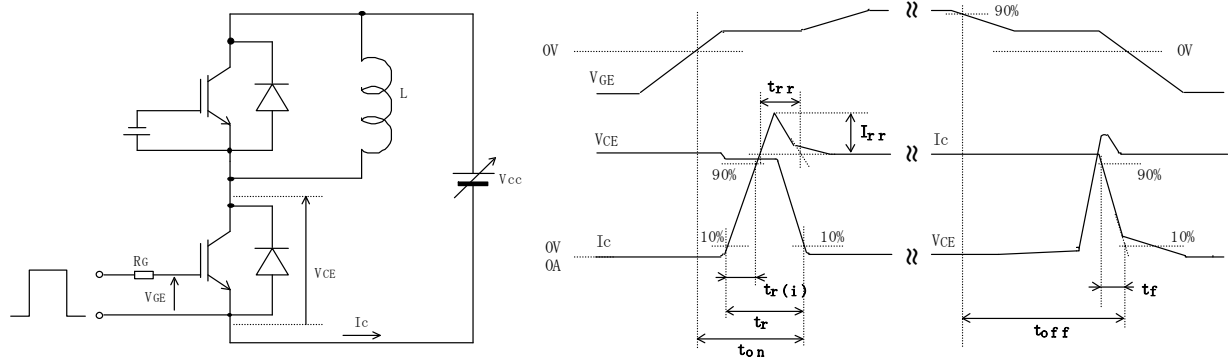
Item	Symbol	Condition	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	T1, T2 IGBT	-	-	0.10	°C/W
		T1, T2 FWD	-	-	0.16	
		T3, T4 RB-IGBT	-	-	0.08	
Contact thermal resistance (1device) (*1)	$R_{th(c-f)}$	T1, T2	-	0.025	-	
		T3, T4 with thermal compound	-	0.013	-	

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

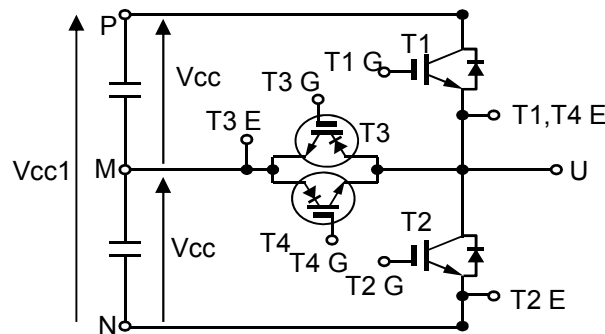
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IGBT Modules

Definitions of switching time



Definitions of switching mode

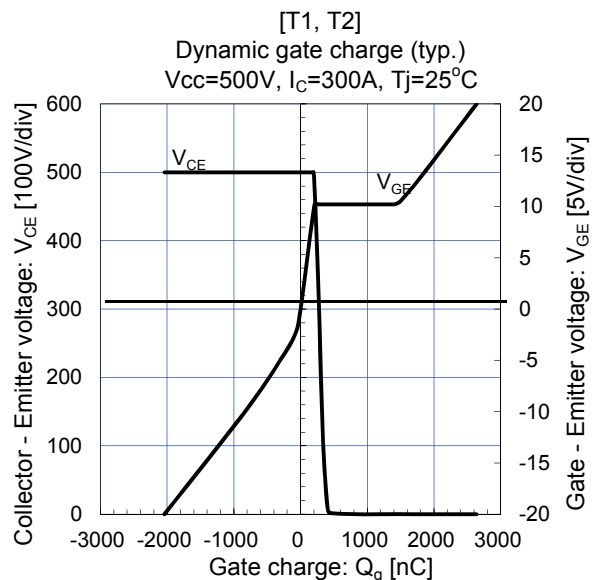
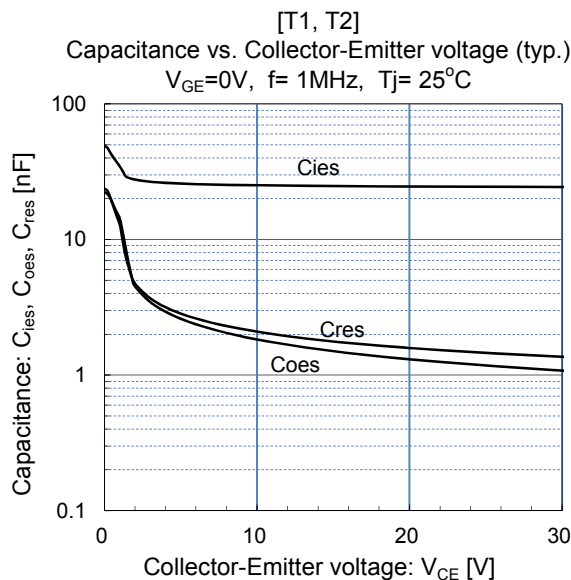
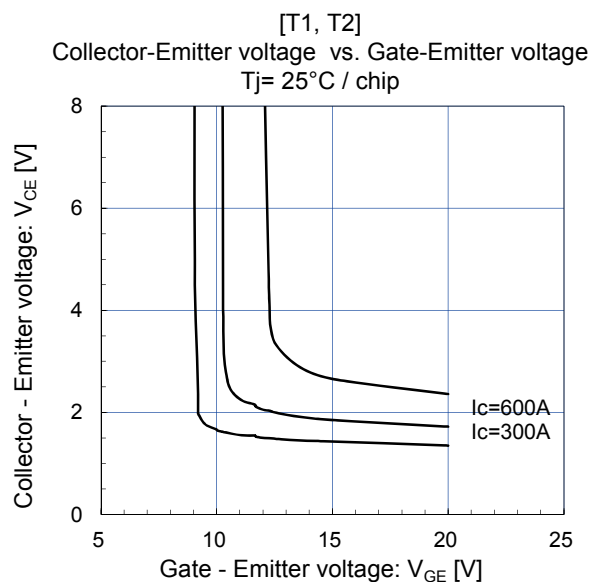
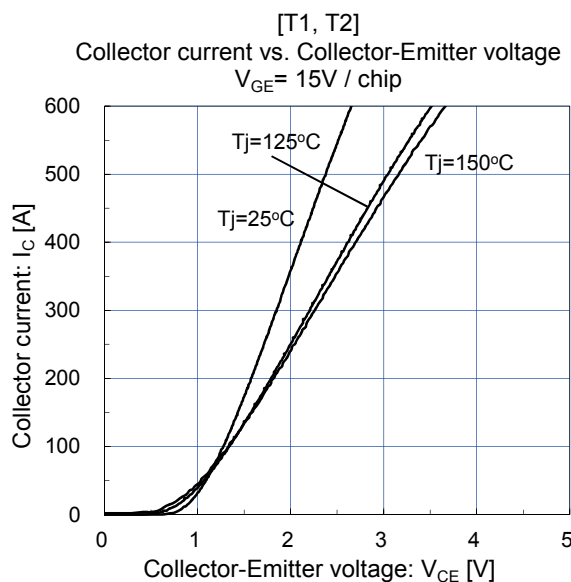
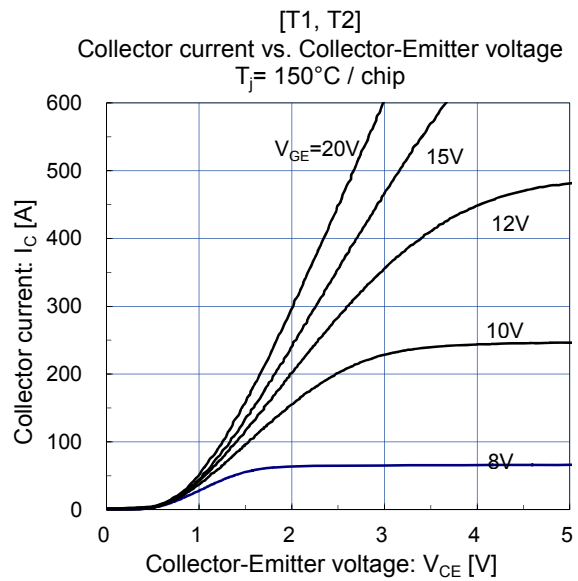
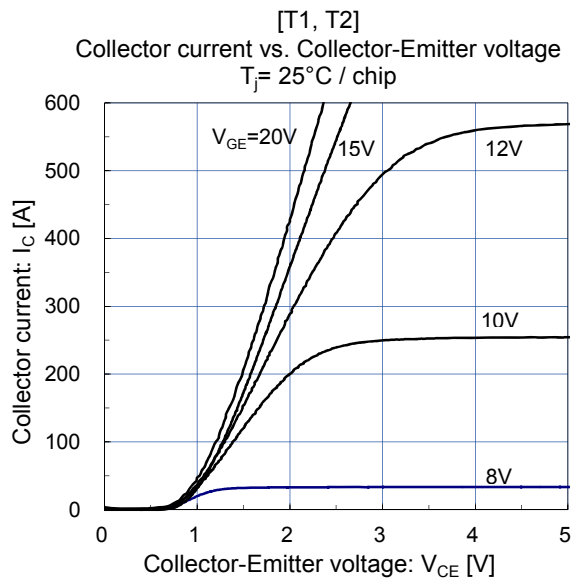


SW mode	Load L	T1	T2	T3	T4
A	M-U	SW	OFF	OFF	ON
	M-U	OFF	SW	ON	OFF
B	P-U	OFF	OFF	SW	ON
	U-N	OFF	OFF	ON	SW

SW: Connect to drive circuit and input gate signal
ON: Bias voltage of gate +15V
OFF: Reverse bias voltage of gate -15V
V_{cc1}=2 × V_{cc}

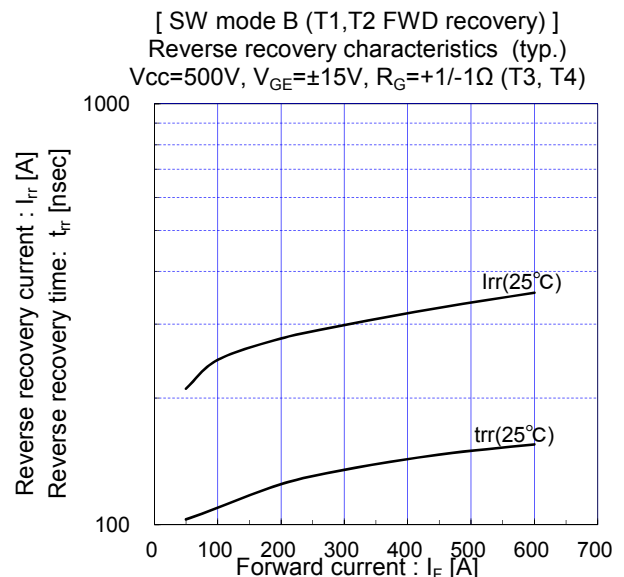
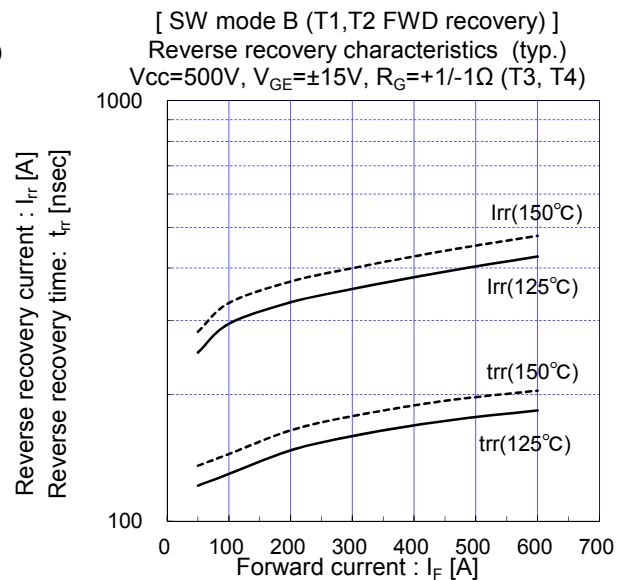
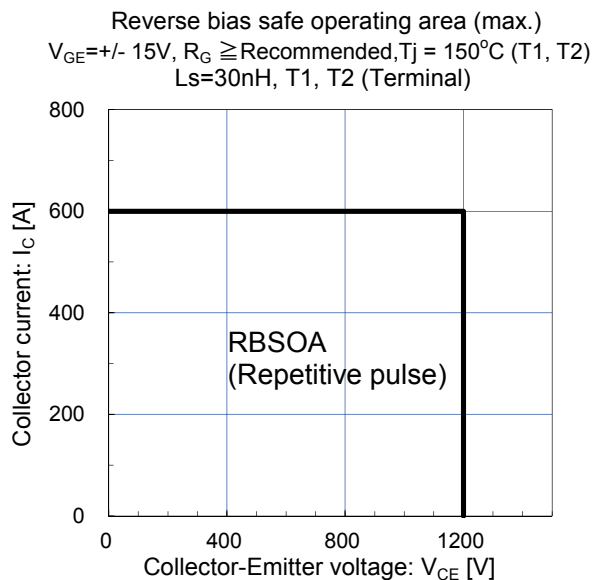
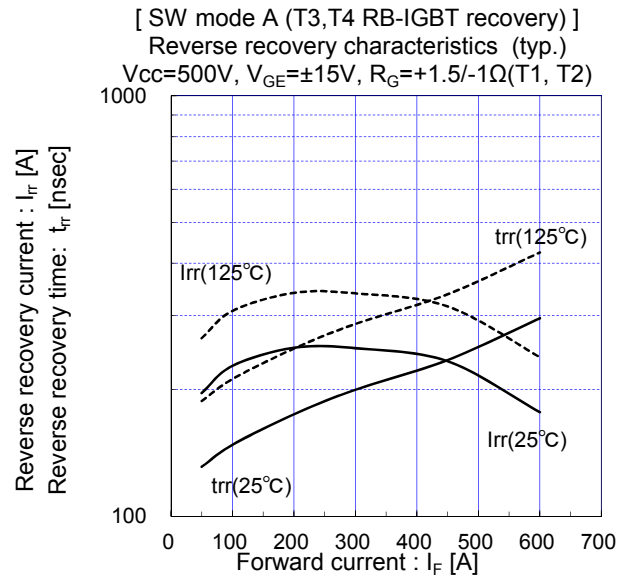
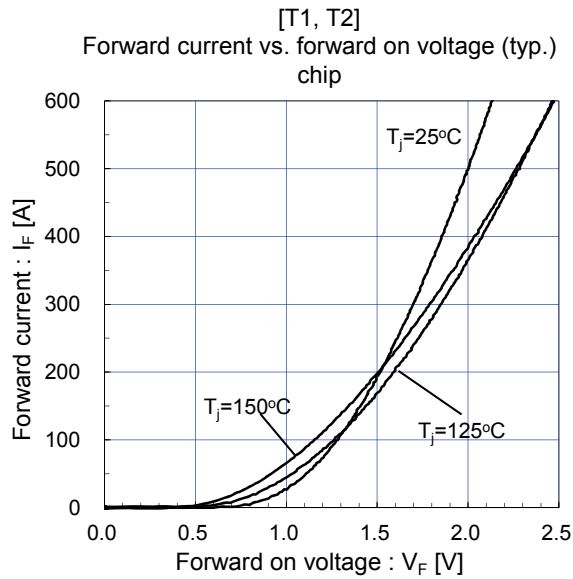
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IGBT Modules



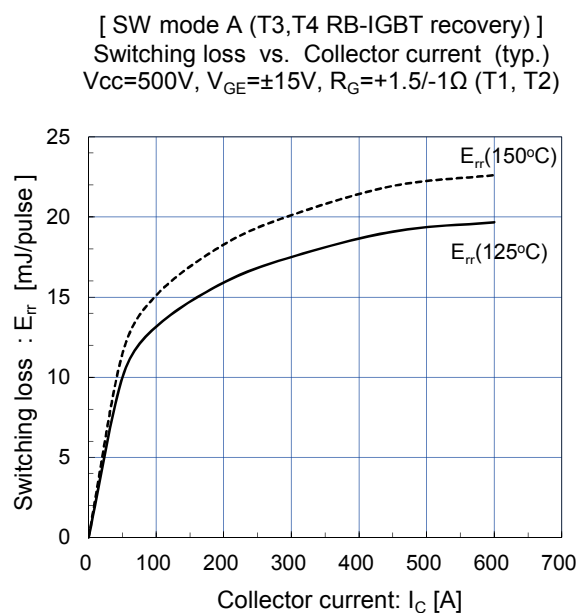
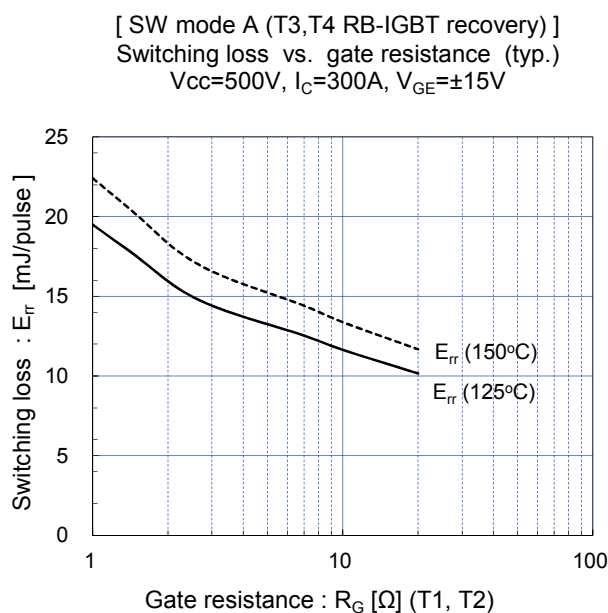
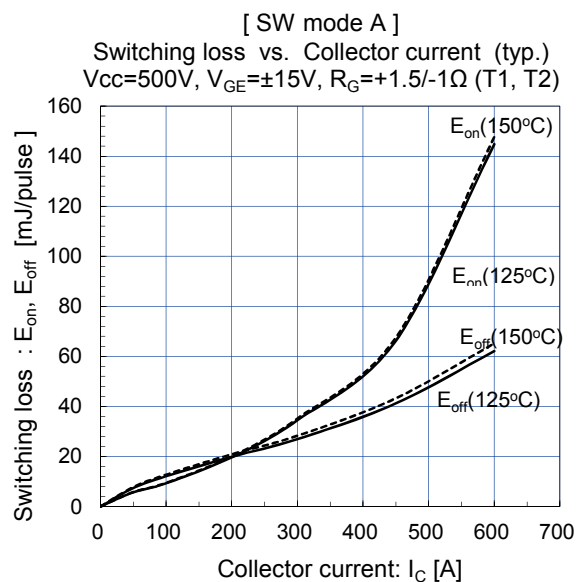
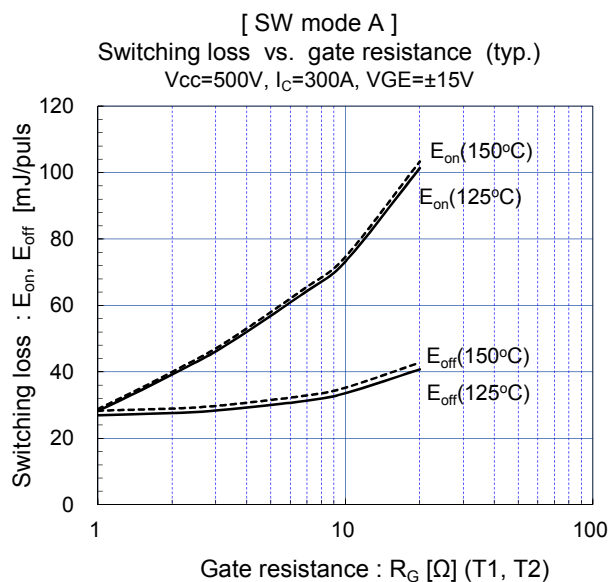
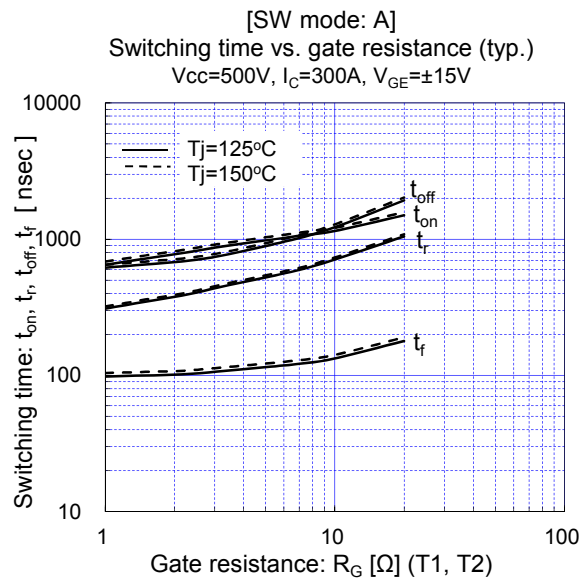
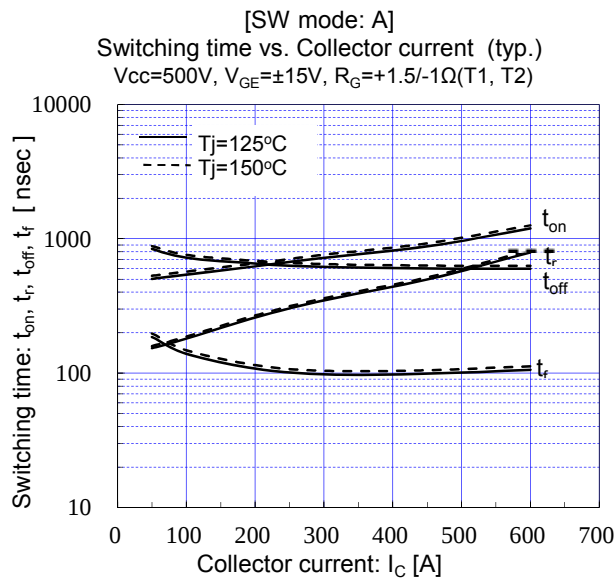
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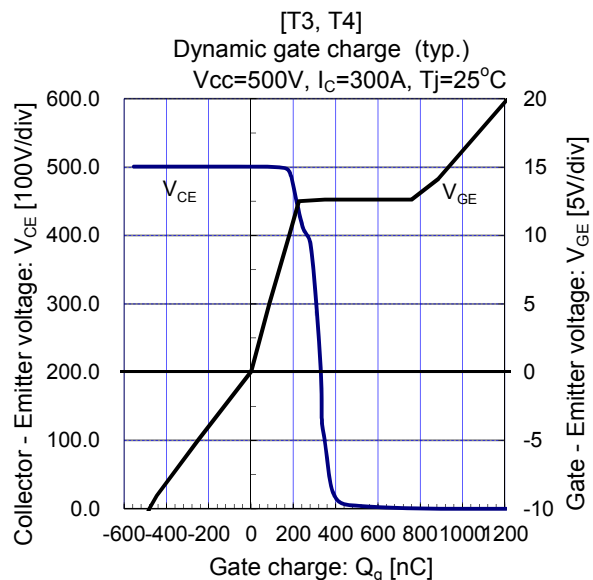
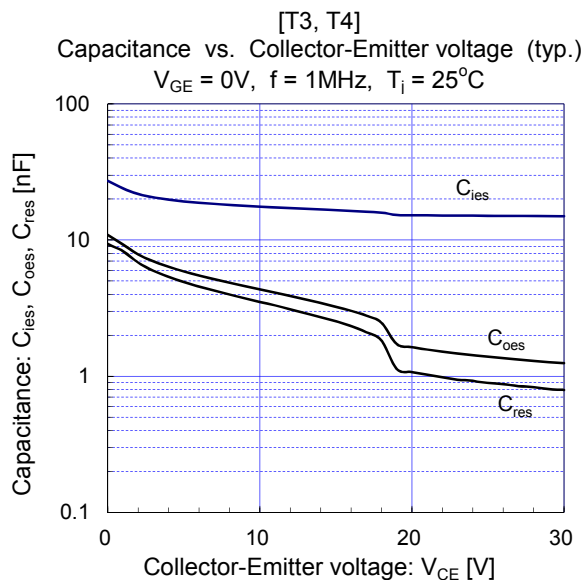
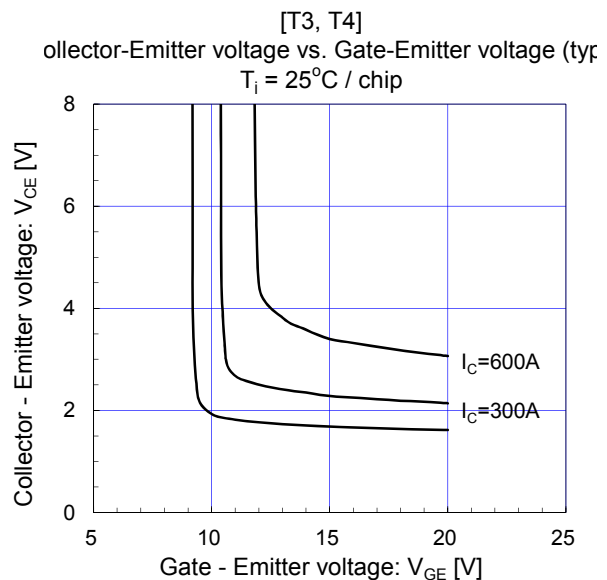
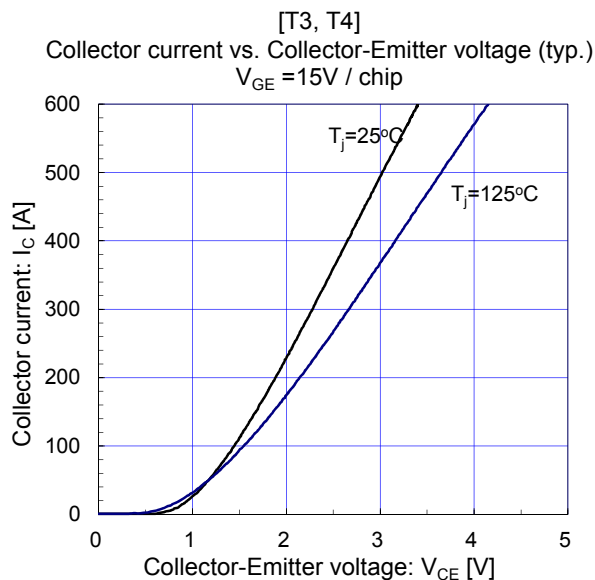
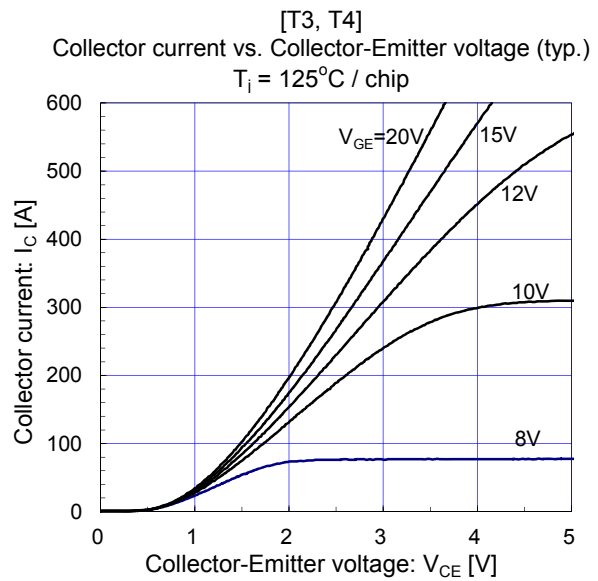
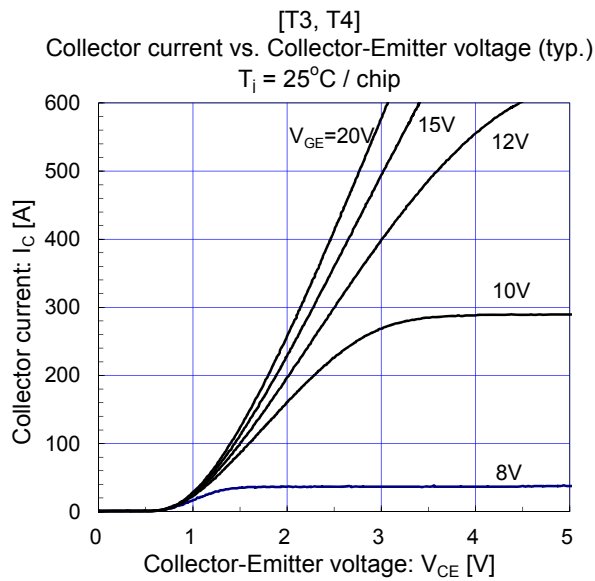
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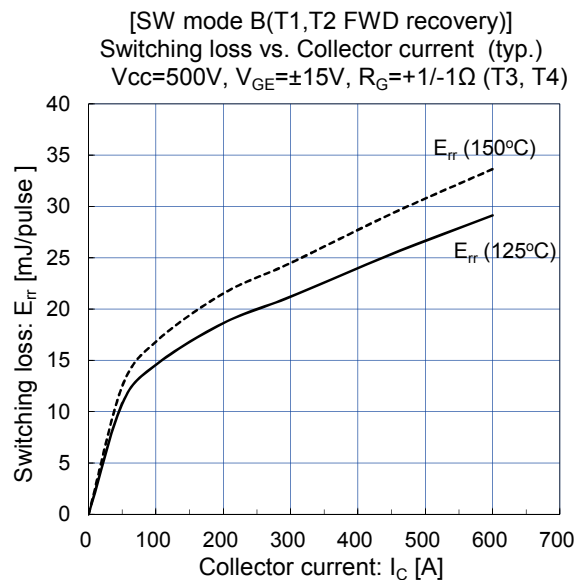
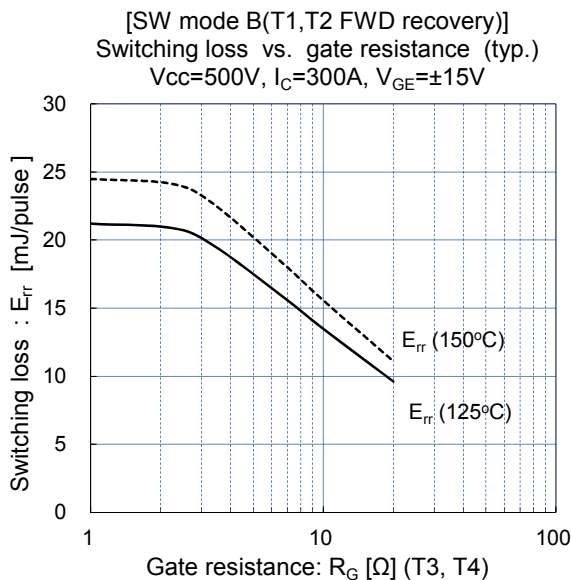
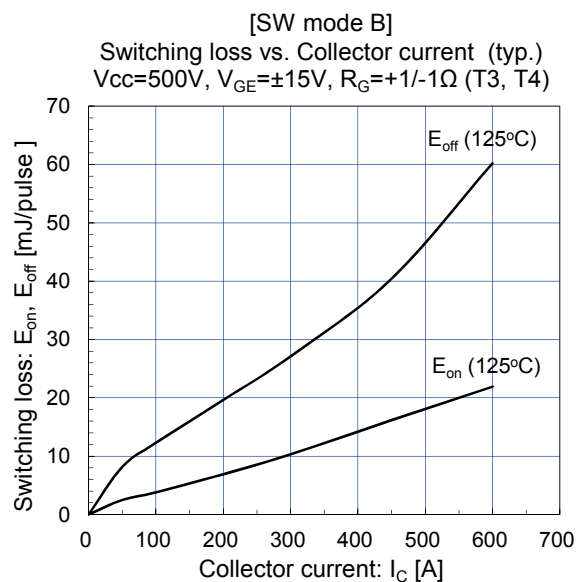
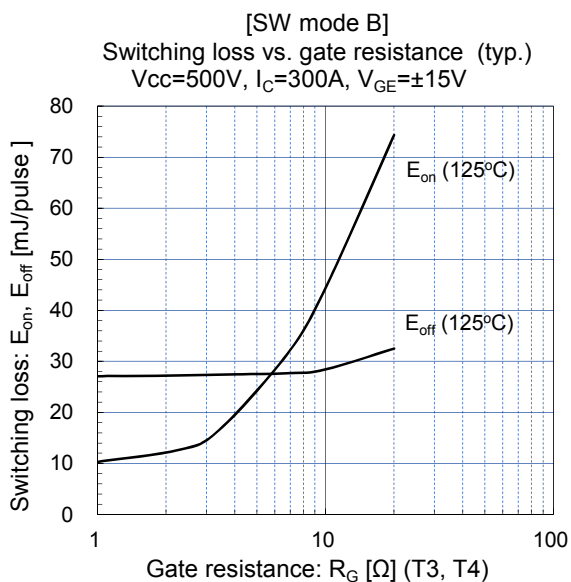
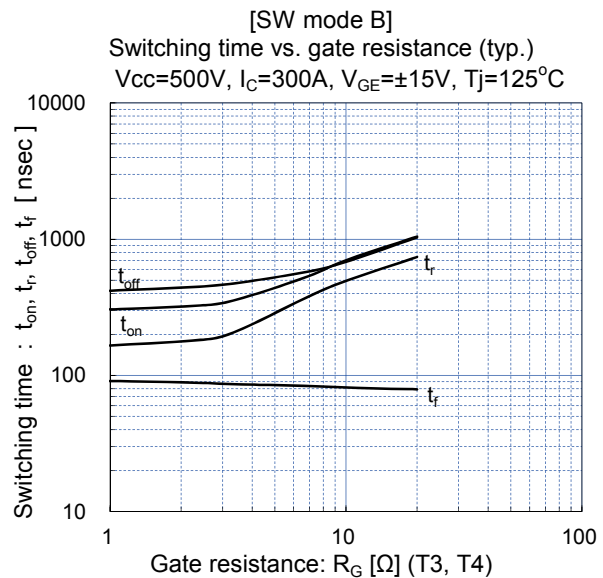
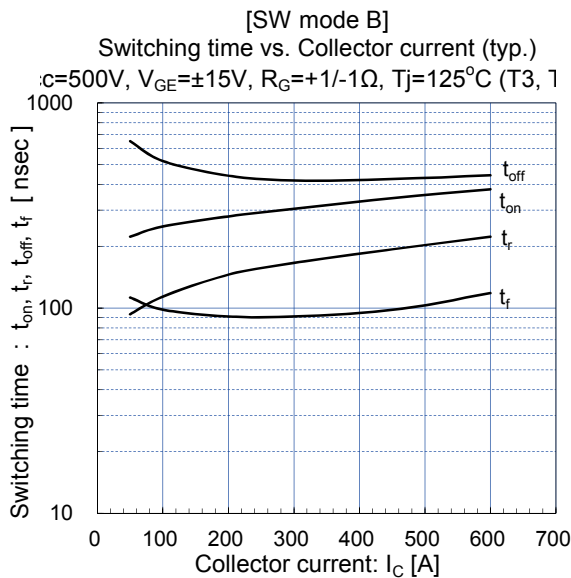
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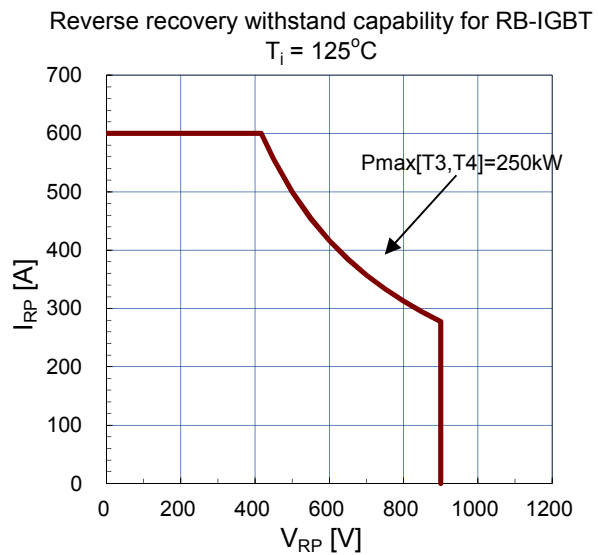
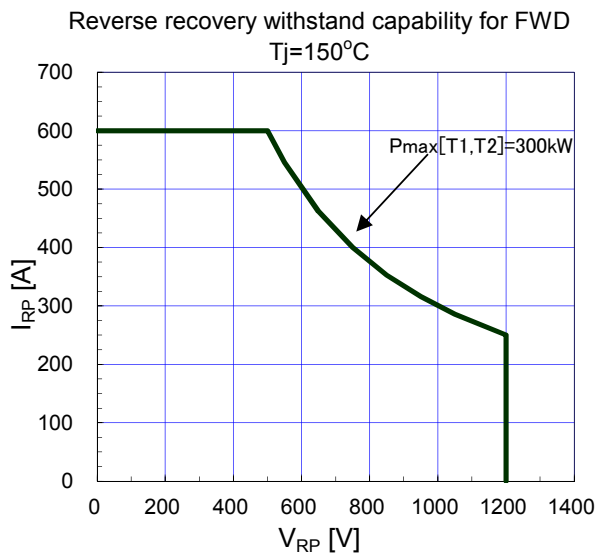
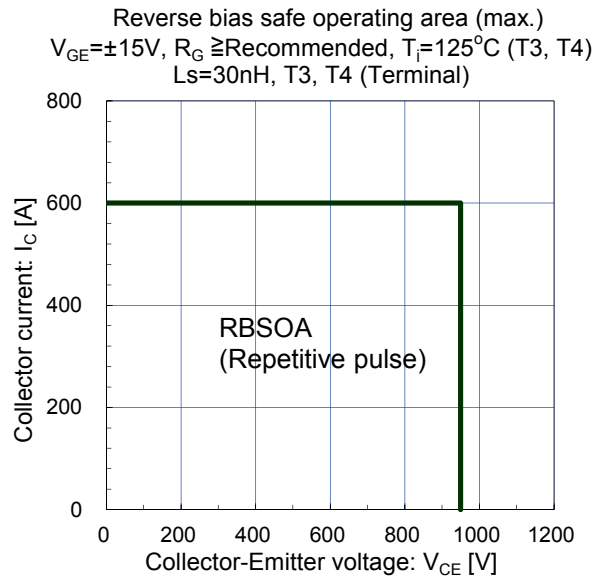
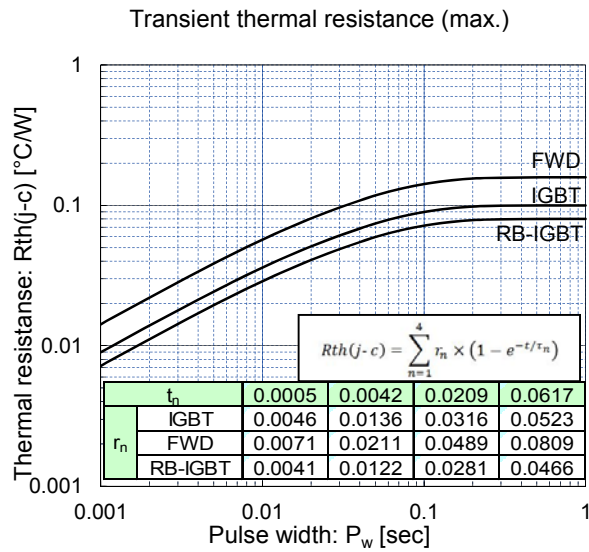
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IGBT Modules



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