

4MBI300VG-120R-50

IGBT Modules

IGBT MODULE (V series)

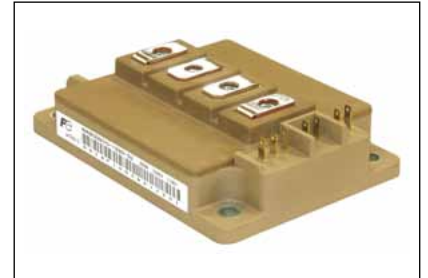
1200V / 300A / IGBT, 600V/300A/RB-IGBT, 4 in one package

■ Features

- Higher Efficiency
- Optimized A (T-type) -3 level circuit
- Low inductance module structure
- Featuring Reverse Blocking IGBT (RB-IGBT)

■ Applications

- Inverter for Motor Drive
- Uninterruptible Power Supply
- Power conditioner



■ Maximum Ratings and Characteristics

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

Items		Symbols	Conditions		Maximum ratings	Units	
T1, T2	Collector-Emitter voltage	V _{CEs}			1200	V	
	Gate-Emitter voltage	V _{GEs}			±20	V	
	Collector current	IGBT	I _c	Continuous	T _c =80°C	300	A
			I _{cp}	1ms	T _c =80°C	600	
		FWD	-I _c			300	
			-I _{c pulse}	1ms		600	
Collector power dissipation	P _c	1 device		1250	W		
T3, T4	Collector-Emitter voltage	V _{CEs}			600	V	
	Repetitive peak reverse voltage	V _{PRM}			600	V	
	Gate-Emitter voltage	V _{GEs}			±20	V	
	Collector current	I _c	Continuous	T _c =80°C	300	A	
		I _{cp}	1ms	T _c =80°C	600		
Collector power dissipation	P _c	1 device		1250	W		
Junction temperature		T _j			150	°C	
Case temperature		T _c			125		
Storage temperature		T _{stg}			-40 ~ +125		
Isolation voltage	between terminal and copper base (*1)	V _{iso}	AC : 1min.		2500	VAC	
Screw torque	Mounting (*2)	-	M5 or M6		3.5	N m	
	Terminals (*3)	-	M5		3.5		

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

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

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

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

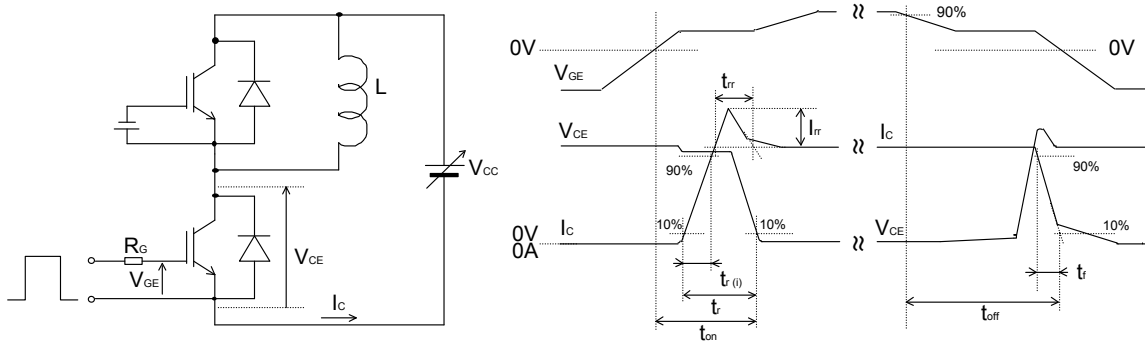
Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
T1, T2	Zero gate voltage collector current	I _{CES}	V _{GE} = 0V, V _{CE} = 1200V	-	-	2.0	mA	
	Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V, V _{GE} = ±20V	-	-	400	nA	
	Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V, I _c = 300mA	6.0	6.5	7.0	V	
	Collector-Emitter saturation voltage	V _{CE(sat)} (chip)	V _{GE} = 15V I _c = 300A	T _J = 25°C	-	1.85	2.10	V
				T _J = 125°C	-	2.20	-	
		V _{CE(sat)} (terminal)	V _{GE} = 15V I _c = 300A	T _J = 25°C	-	2.05	2.35	
				T _J = 125°C	-	2.40	-	
	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} = 400V I _c = 300A	-	0.75	1.30	μs	
		t _r		-	0.45	0.80		
		t _{r(f)}		-	0.15	-		
	Turn-off time	t _{off}	V _{GE} = ±15V R _G = +10/-1Ω	-	0.60	1.00	μs	
		t _f	-	-	0.10	0.35		
Forward on voltage	V _F (chip)	I _F = 300A	T _J = 25°C	-	1.70	1.95	V	
			T _J = 125°C	-	1.85	-		
	V _F (terminal)	I _F = 300A	T _J = 25°C	-	1.95	2.25		
			T _J = 125°C	-	2.10	-		
Reverse recovery time	t _{rr}	SW mode : B V _{CC} = 400V V _{GE} = ±15V I _F = 300A R _G = +8.2/-39Ω	-	-	0.30	μs		
T3, T4	Zero gate voltage collector current	I _{CES}	V _{GE} = 0V, V _{CE} = 600V	-	-	3.0	mA	
	Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V, V _{GE} = ±20V	-	-	600	nA	
	Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V, I _c = 300mA	5.5	6.5	7.5	V	
	Collector-Emitter saturation voltage	V _{CE(sat)} (chip)	V _{GE} = 15V I _c = 300A	T _J = 25°C	-	2.45	2.80	V
				T _J = 125°C	-	2.60	-	
		V _{CE(sat)} (terminal)	V _{GE} = 15V I _c = 300A	T _J = 25°C	-	2.55	2.95	
				T _J = 125°C	-	2.70	-	
	Internal gate resistance	R _{g(int)}	-	-	2.93	-	Ω	
	Input capacitance	C _{ies}	V _{CE} = 10V, V _{GE} = 0V, f = 1MHz	-	19.5	-	nF	
	Turn-on time	t _{on}	SW mode : B V _{CC} = 400V I _c = 300A	-	0.45	1.05	μs	
		t _r		-	0.27	0.53		
		t _{r(f)}		-	0.12	-		
	Turn-off time	t _{off}	V _{GE} = ±15V R _G = +8.2/-39Ω	-	1.32	3.00	μs	
		t _f	-	-	0.11	0.35		
Reverse recovery time	t _{rr}	SW mode : A V _{CC} = 400V V _{GE} = ±15V I _F = 300A R _G = +10/-1Ω	-	-	0.30	μs		
Internal inductance	L	P-N	-	40	-	nH		
		P-M	-	33	-			
		M-N	-	33	-			

● Thermal resistance characteristics

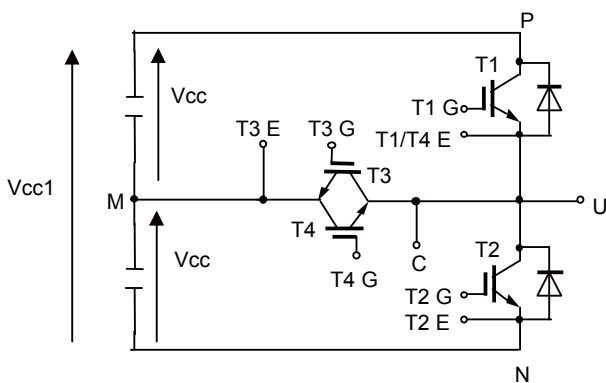
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R _{th(j-c)}	T1, T2 IGBT	-	-	0.10	°C/W
		T1, T2 FWD	-	-	0.16	
		T3, T4 RB-IGBT	-	-	0.10	
Contact thermal resistance (1device) (*4)	R _{th(c-f)}	T1, T2	-	0.025	-	°C/W
		T3, T4	-	0.017	-	

Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound (thermal conductivity = 1W/m·K).

■ 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

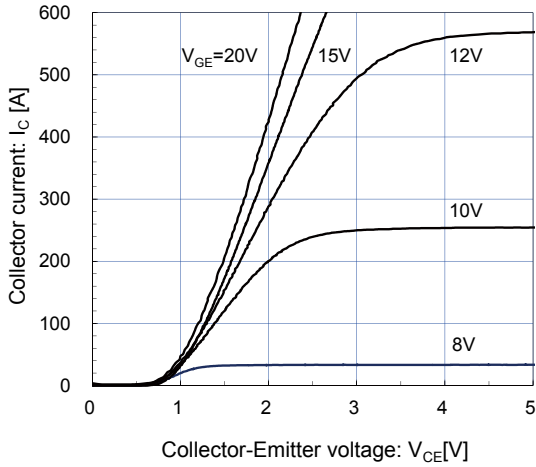
Vcc1=2 × Vcc

■ Characteristics (Representative)

[T1, T2]

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

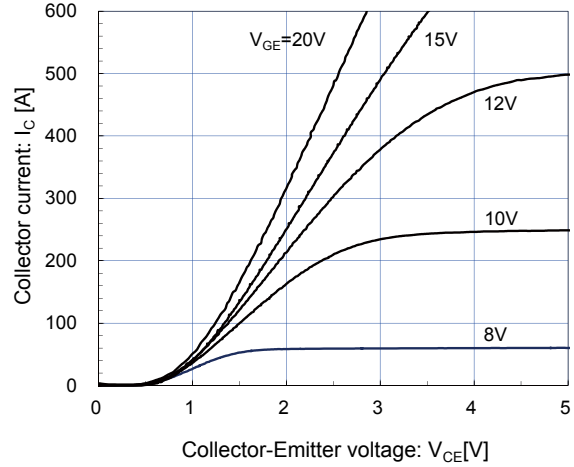
$T_j = 25^\circ\text{C}$ / chip



[T1, T2]

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

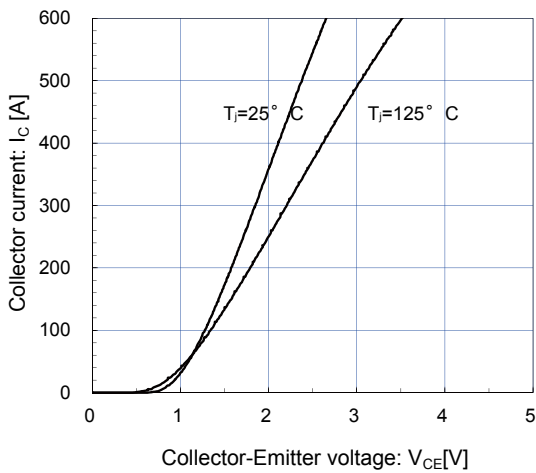
$T_j = 125^\circ\text{C}$ / chip



[T1, T2]

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

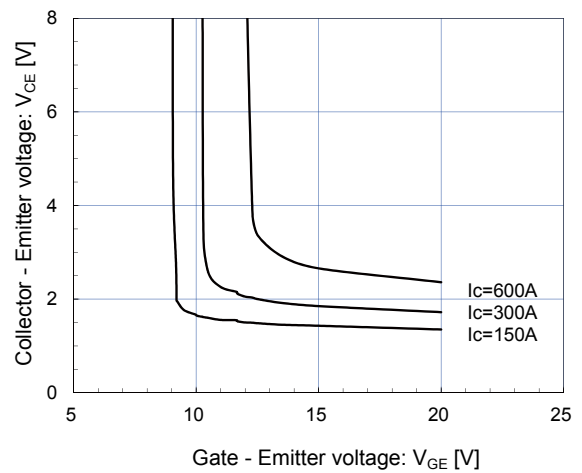
$V_{GE} = 15\text{V}$ / chip



[T1, T2]

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

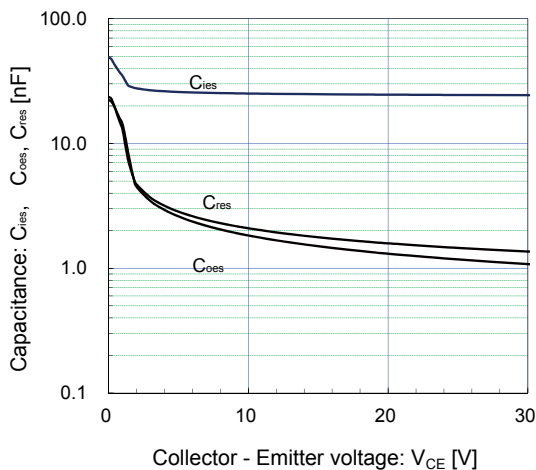
$T_j = 25^\circ\text{C}$ / chip



[T1, T2]

Capacitance vs. Collector-Emitter voltage (typ.)

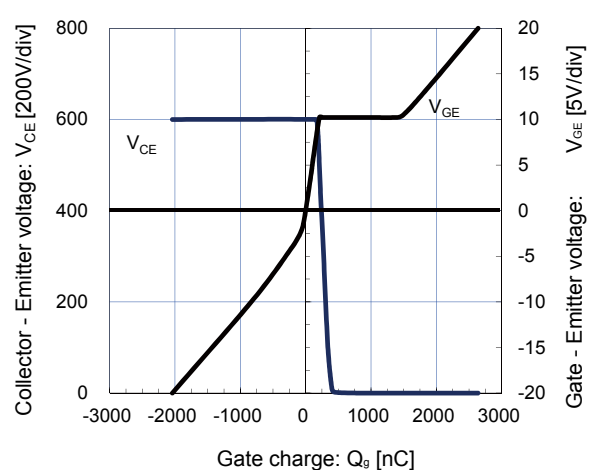
$V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$

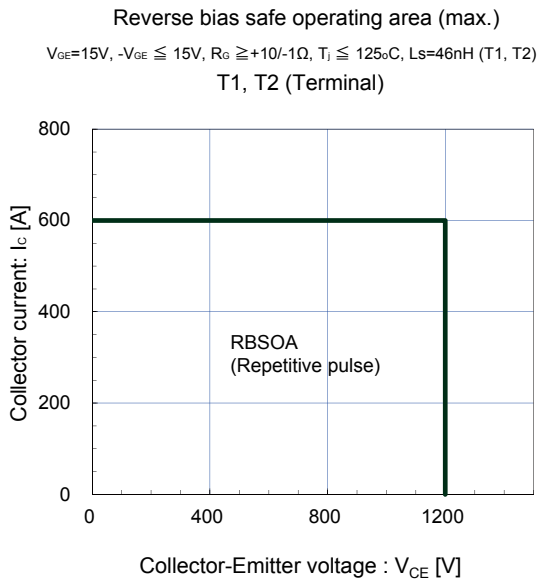
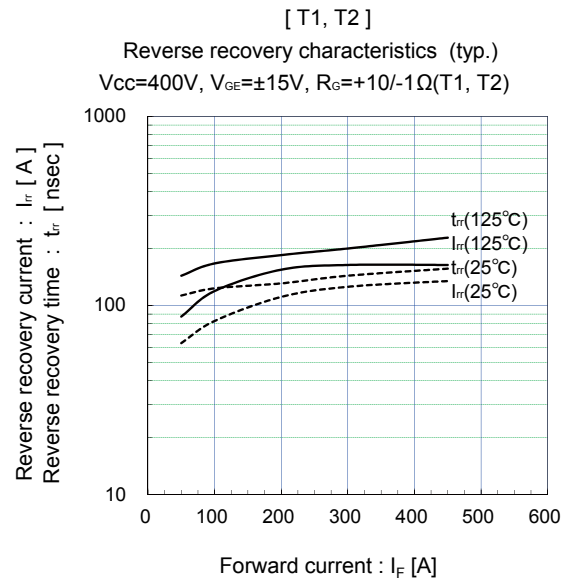
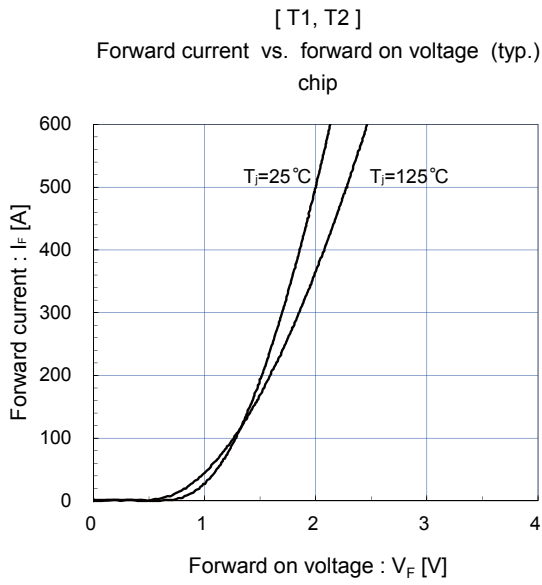


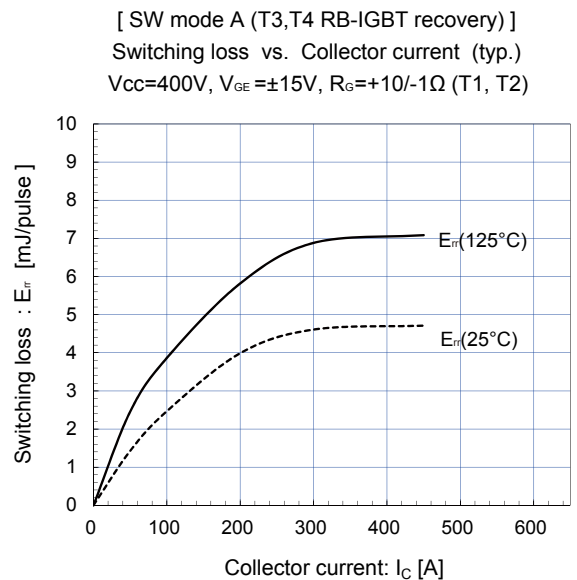
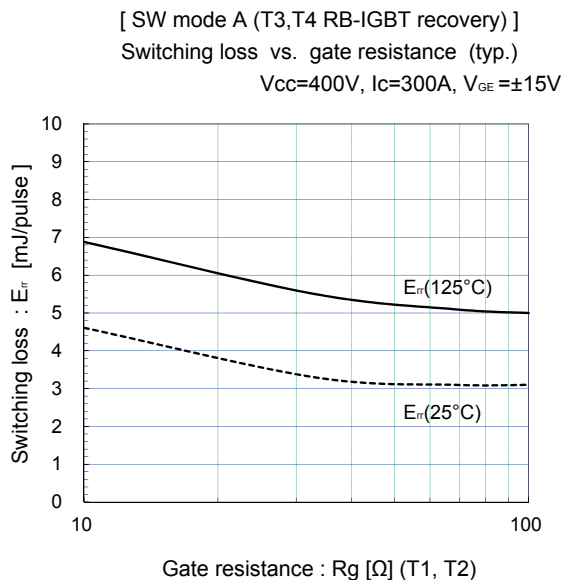
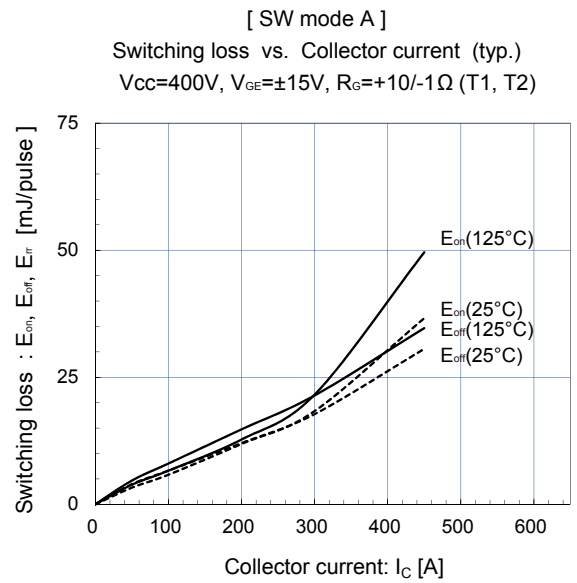
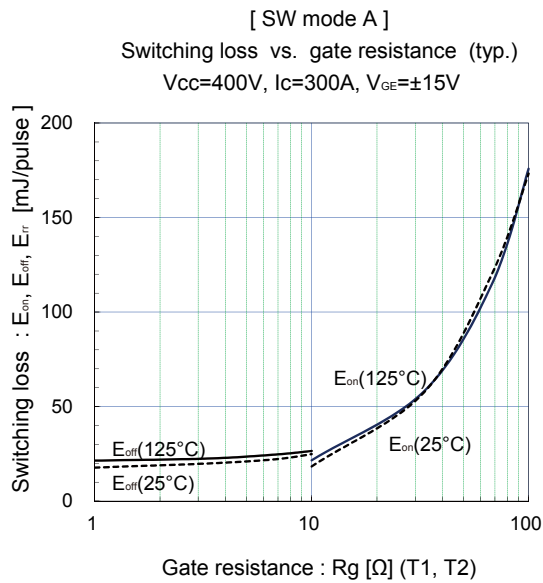
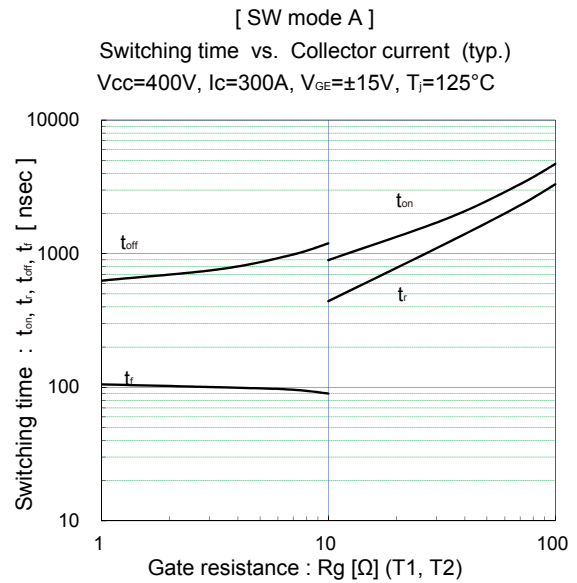
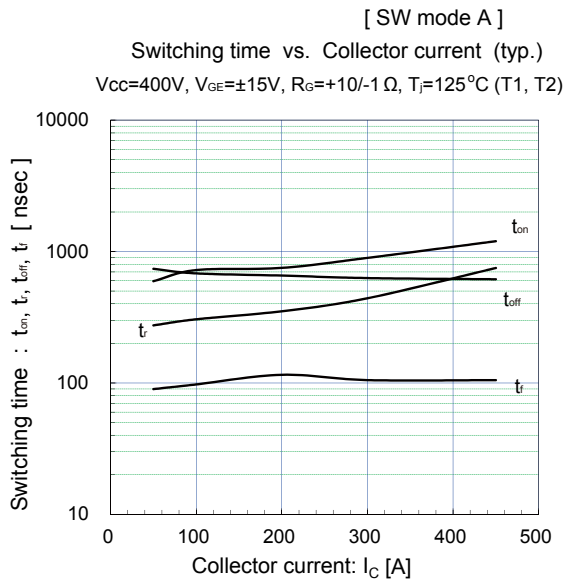
[T1, T2]

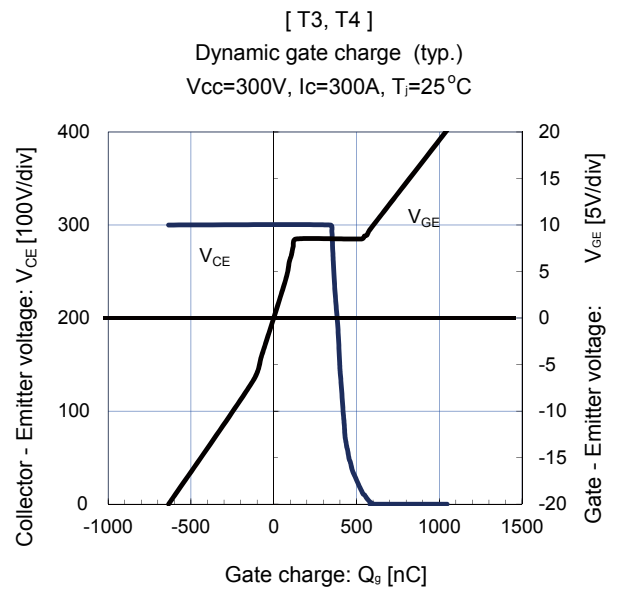
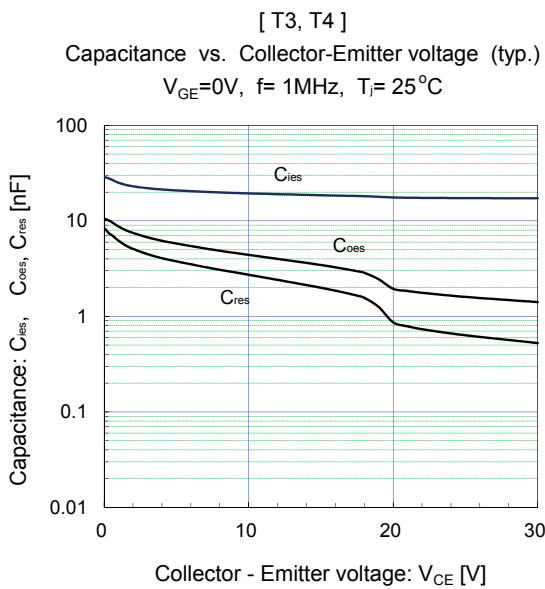
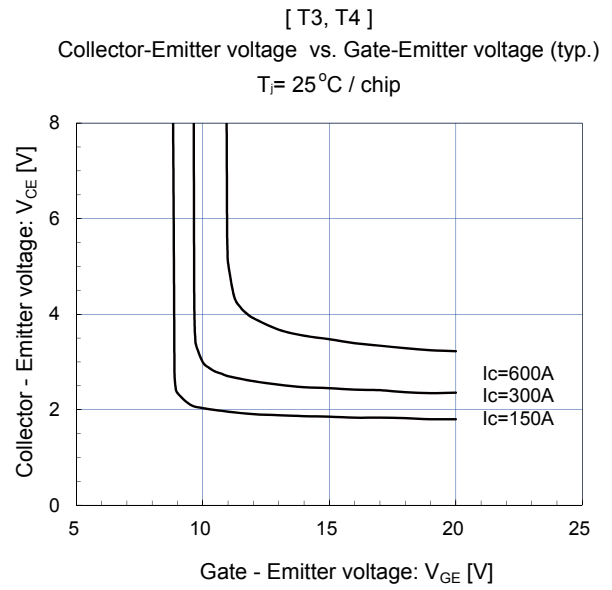
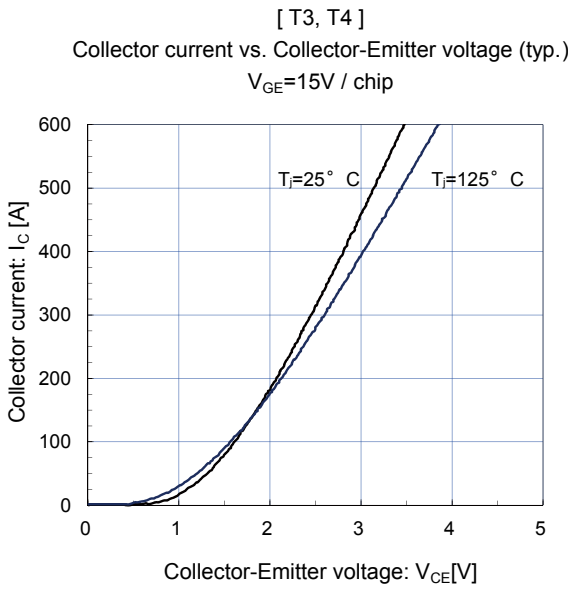
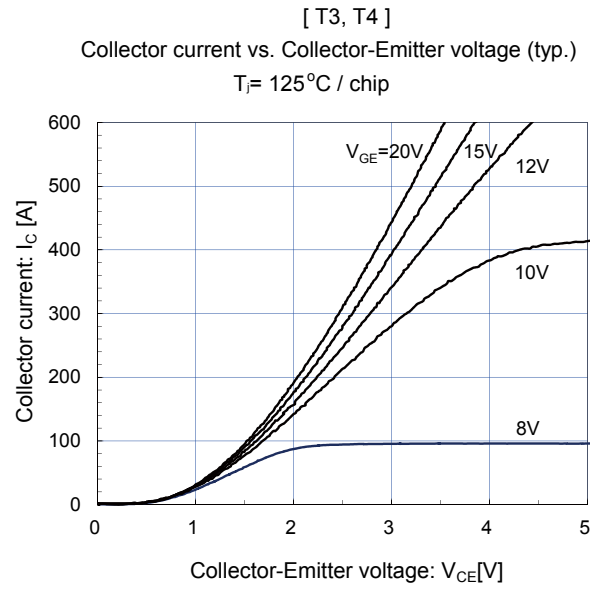
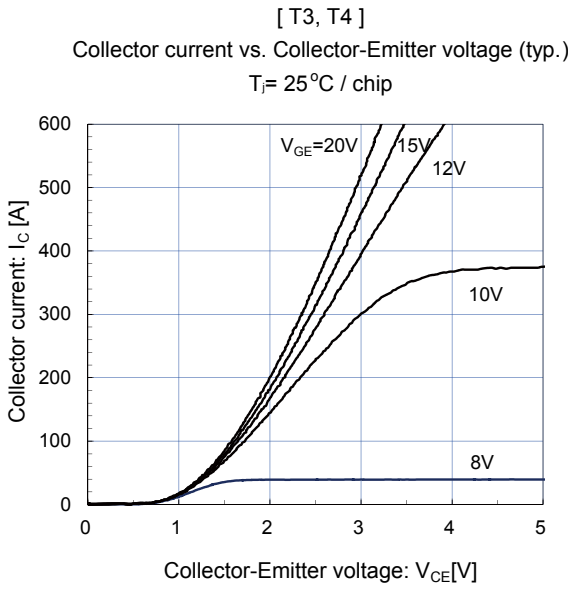
Dynamic gate charge (typ.)

$V_{CC} = 600\text{V}$, $I_c = 300\text{A}$, $T_j = 25^\circ\text{C}$





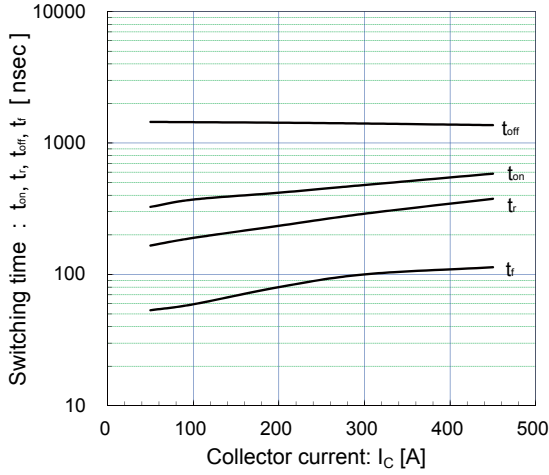




[SW mode B]

Switching time vs. Collector current (typ.)

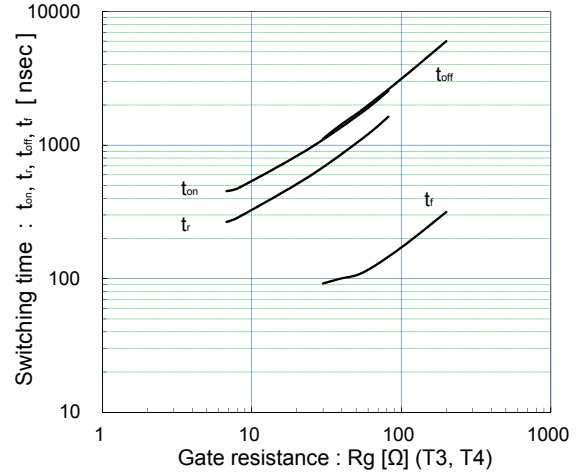
V_{CC}=400V, V_{GE}=±15V, R_G=+8.2/-39 Ω, T_J=125°C (T3, T4)



[SW mode B]

Switching time vs. Collector current (typ.)

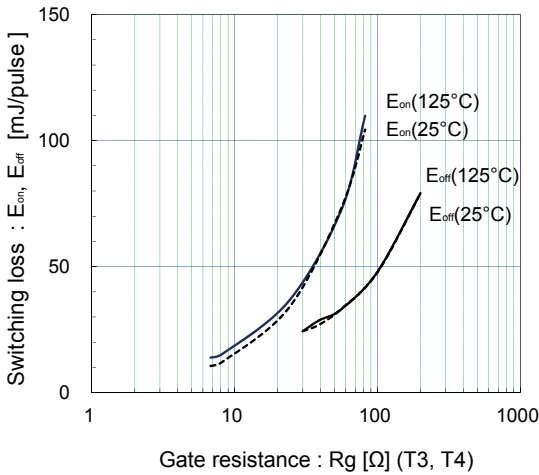
V_{CC}=400V, I_C=300A, V_{GE}=±15V, T_J=125°C



[SW mode B]

Switching loss vs. gate resistance (typ.)

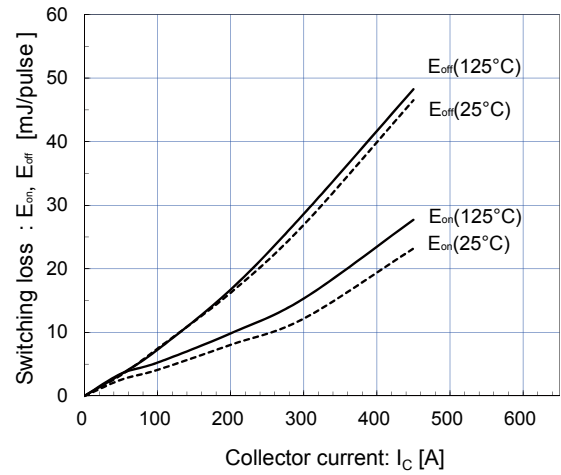
V_{CC}=400V, I_C=300A, V_{GE}=±15V



[SW mode B]

Switching loss vs. Collector current (typ.)

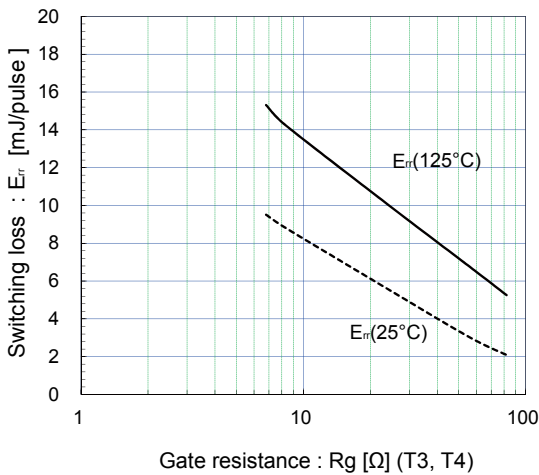
V_{CC}=400V, V_{GE}=±15V, R_G=+8.2/-39 Ω (T3, T4)



[SW mode B (T1,T2 FWD recovery)]

Switching loss vs. gate resistance (typ.)

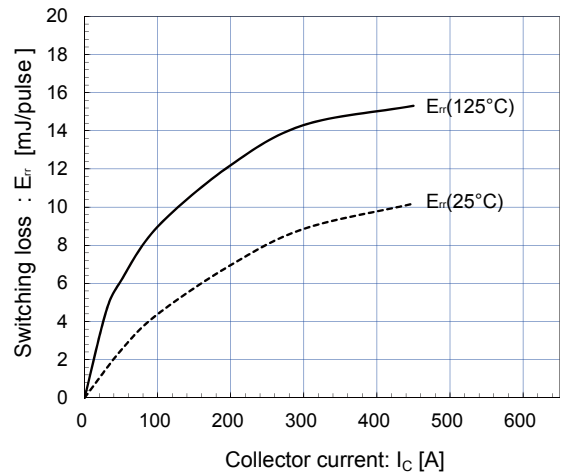
V_{CC}=400V, I_C=300A, V_{GE}=±15V



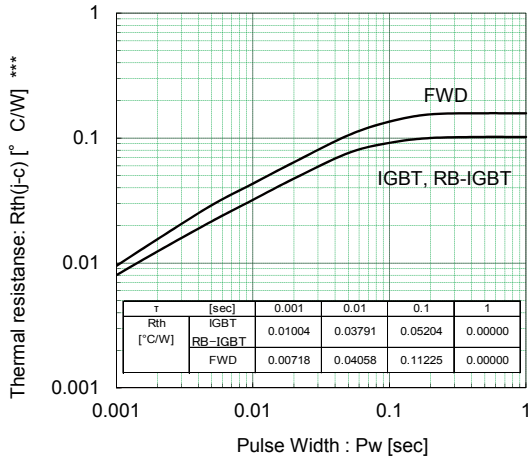
[SW mode B (T1,T2 FWD recovery)]

Switching loss vs. Collector current (typ.)

V_{CC}=400V, V_{GE}=±15V, R_G=+8.2/-39 Ω (T3, T4)



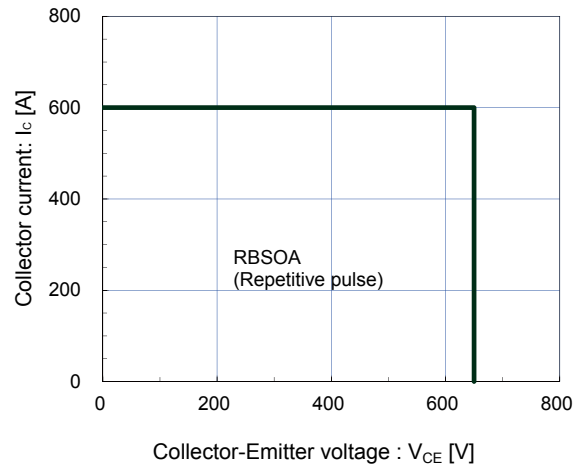
Transient Thermal Resistance (max.)



Reverse bias safe operating area (max.)

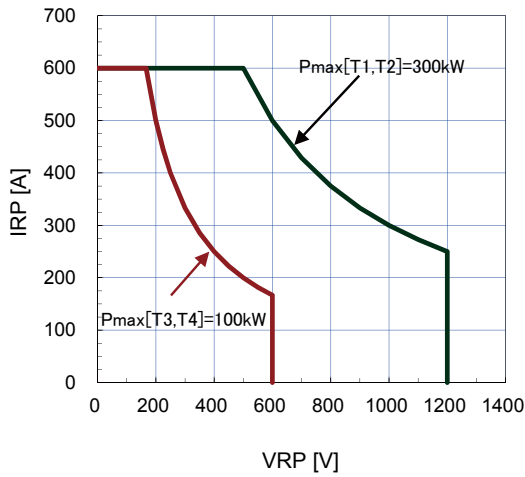
$V_{GE}=15V, -V_{GE} \leq 15V, R_{\theta} \geq +8.2/-39\Omega, T_j \leq 125^{\circ}C, L_s=46nH$ (T3, T4)

T3, T4 (Terminal)

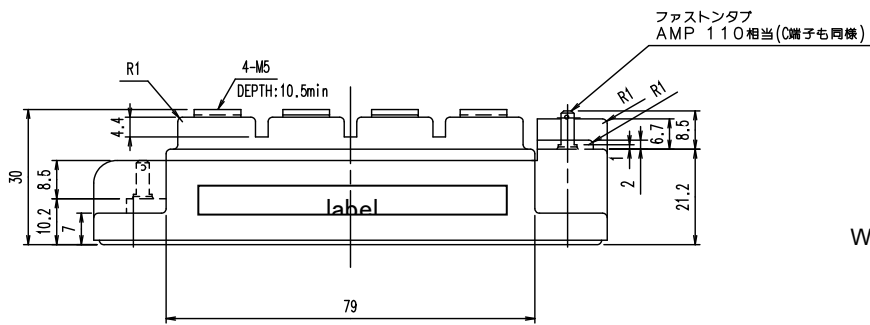
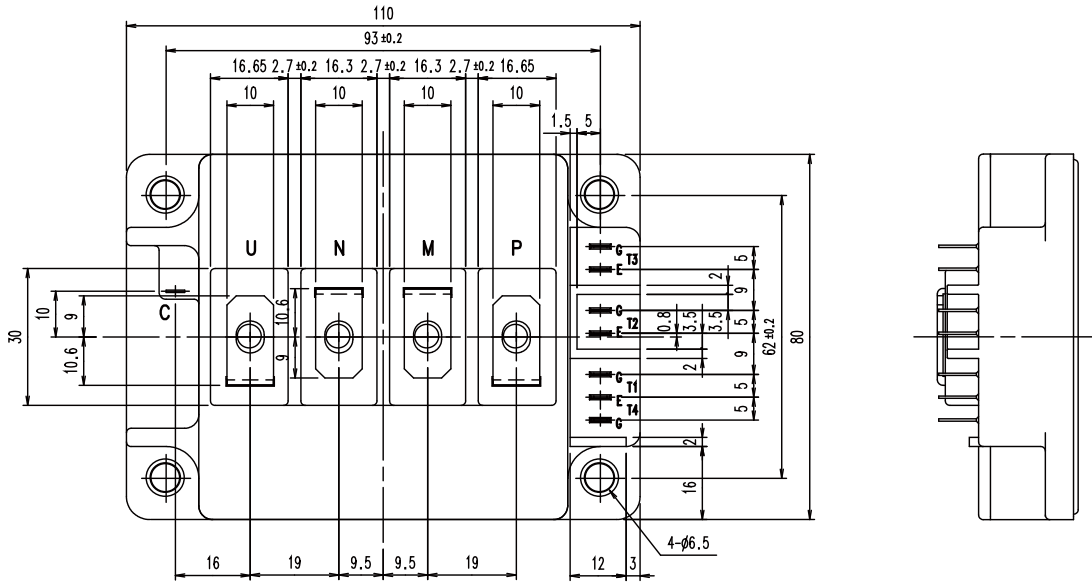


Reverse recovery withstand capability for FWD, RB-IGBT

$T_j=125^{\circ}C$

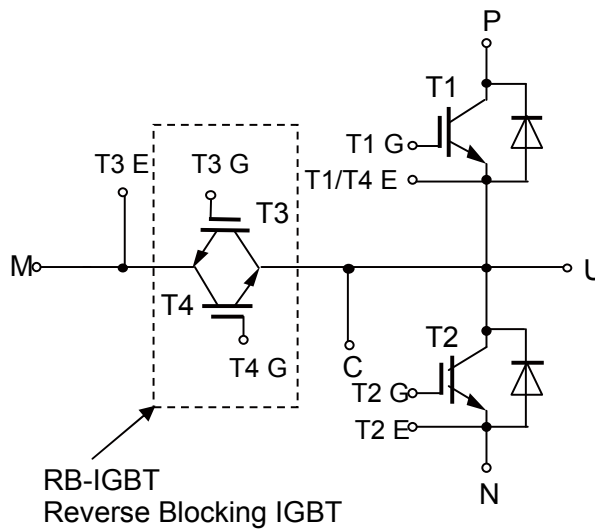


■ Outline Drawings, mm



Weight: 460g(typ.)

■ Equivalent Circuit Schematic



WARNING

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