

# 12MBI50VN-120-50

IGBT Modules

## IGBT MODULE (V series)

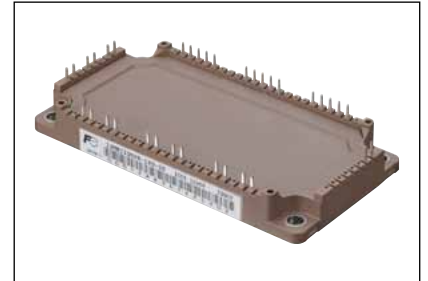
### 1200V / 50A / IGBT, RB-IGBT 12 in one package

#### ■ 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 Tc=25°C unless otherwise specified)

Items		Symbols	Conditions		Maximum ratings	Units	
T1, T2	Collector-Emitter voltage	$V_{CES}$			1200	V	
	Gate-Emitter voltage	$V_{GES}$			$\pm 20$	V	
	Collector current	IGBT	$I_C$	Continuous	$T_C=80^\circ\text{C}$	50	A
			$I_{cp}$	1ms	$T_C=80^\circ\text{C}$	100	
		FWD	$-I_C$			50	
			$-I_{C\ pulse}$	1ms		100	
Collector power dissipation	$P_C$	1 device		230	W		
T3, T4	Collector-Emitter voltage	$V_{CES}$			600	V	
	Repetitive peak reverse voltage	$V_{RRM}$			600	V	
	Gate-Emitter voltage	$V_{GES}$			$\pm 20$	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		235	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) between thermistor and others (*2)	$V_{iso}$	AC : 1min.		2500	VAC	
	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 Tj= 25°C unless otherwise specified)

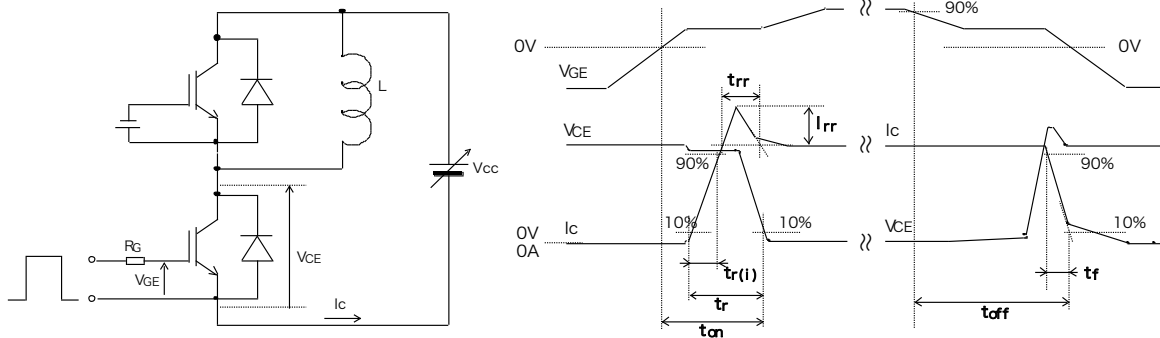
Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
T1, T2	Zero gate voltage collector current	$I_{CES}$	$V_{GE} = 0V, V_{CE} = 1200V$	-	-	1.0	mA	
	Gate-Emitter leakage current	$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	200	nA	
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 50mA$	6.0	6.5	7.0	V	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_c = 50A$	$T_j = 25^\circ C$	-	1.85	2.30	V
				$T_j = 125^\circ C$	-	2.20	-	
		$V_{CE(sat)}$ (P-U, V, W / U, V, W-N terminal)	$V_{GE} = 15V$ $I_c = 50A$	$T_j = 25^\circ C$	-	2.30	2.75	
				$T_j = 125^\circ C$	-	2.65	-	
	Internal gate resistance	$R_{g(int)}$	-	-	4.0	-	$\Omega$	
	Input capacitance	$C_{ies}$	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	4.2	-	nF	
	Turn-on time	$t_{on}$	SW mode : A $V_{CC} = 300V$ $I_c = 50A$ $V_{GE} = \pm 15V$ $R_G = 8.2\Omega$	-	0.20	1.20	$\mu s$	
		$t_r$		-	0.08	0.60		
		$t_{r(f)}$		-	0.03	-		
	Turn-off time	$t_{off}$	$V_{GE} = \pm 15V$ $R_G = 8.2\Omega$	-	0.29	1.00	$\mu s$	
		$t_f$		-	0.04	0.30		
Forward on voltage	$V_F$ (chip)	$I_F = 50A$	$T_j = 25^\circ C$	-	1.70	2.15	V	
			$T_j = 125^\circ C$	-	1.85	-		
	$V_F$ (P-U, V, W / U, V, W-N terminal)	$I_F = 50A$	$T_j = 25^\circ C$	-	2.15	2.60		
			$T_j = 125^\circ C$	-	2.30	-		
Reverse recovery time	$t_{rr}$	SW mode : B $V_{CC} = 300V$ $I_F = 50A$ $V_{GE} = \pm 15V$ $R_G = 6.8\Omega$	-	-	0.35	$\mu s$		
T3, T4	Zero gate voltage collector current	$I_{CES}$	$V_{GE} = 0V, V_{CE} = 600V$	-	-	1.0	mA	
	Gate-Emitter leakage current	$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	200	nA	
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 50mA$	5.5	6.5	7.5	V	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_c = 50A$	$T_j = 25^\circ C$	-	2.45	2.80	V
				$T_j = 125^\circ C$	-	2.60	-	
		$V_{CE(sat)}$ (M-U, V, W terminal)	$V_{GE} = 15V$ $I_c = 50A$	$T_j = 25^\circ C$	-	3.25	3.70	
				$T_j = 125^\circ C$	-	3.05	-	
	Internal gate resistance	$R_{g(int)}$	-	-	18.0	-	$\Omega$	
	Input capacitance	$C_{ies}$	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	3.3	-	nF	
	Turn-on time	$t_{on}$	SW mode : B $V_{CC} = 300V$ $I_c = 50A$ $V_{GE} = \pm 15V$ $R_G = 6.8\Omega$	-	0.28	1.20	$\mu s$	
		$t_r$		-	0.12	0.60		
		$t_{r(f)}$		-	0.05	-		
	Turn-off time	$t_{off}$	$V_{GE} = \pm 15V$ $R_G = 6.8\Omega$	-	0.18	1.00	$\mu s$	
		$t_f$		-	0.02	0.30		
Reverse recovery time	$t_{rr}$	SW mode : A $V_{CC} = 300V$ $I_c = 50A$ $V_{GE} = \pm 15V$ $R_G = 8.2\Omega$	-	-	0.35	$\mu s$		
Thermistor	Resistance	$T = 25^\circ C$	-	5000	-	$\Omega$		
		$T = 100^\circ C$	465	495	520			
	B value	B	$T = 25/50^\circ C$	3305	3375	3450	K	

● Thermal resistance characteristics

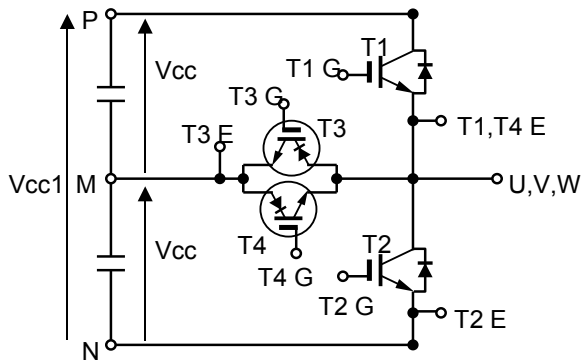
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	T1, T2 IGBT	-	-	0.54	$^\circ C/W$
		T1, T2 FWD	-	-	0.73	
		T3, T4 RB-IGBT	-	-	0.53	
Contact thermal resistance (1device) (*4)	$R_{th(c-f)}$	T1, T2 T3, T4 with Thermal Compound	-	0.05	-	

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



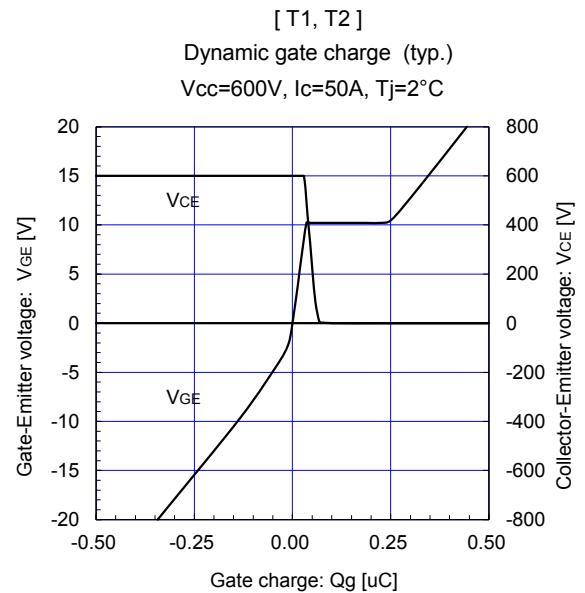
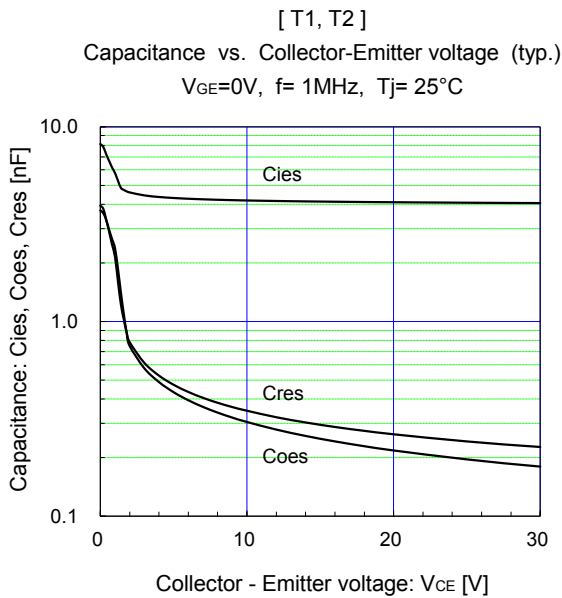
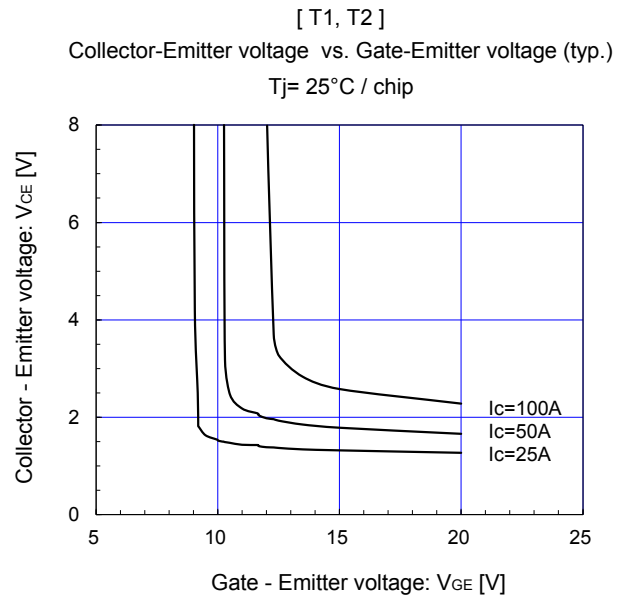
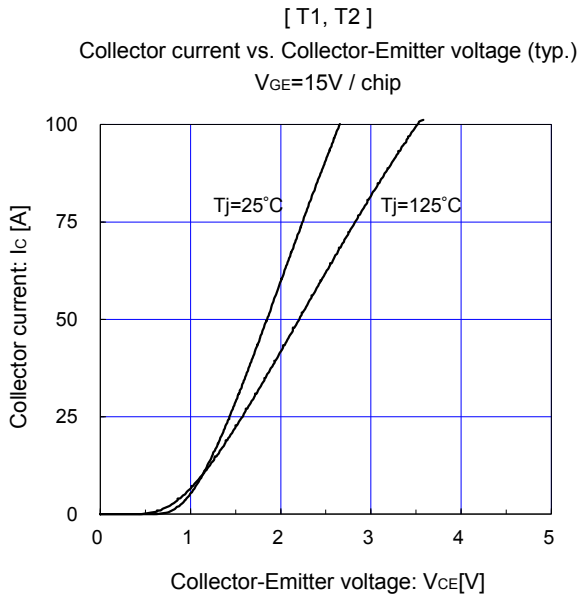
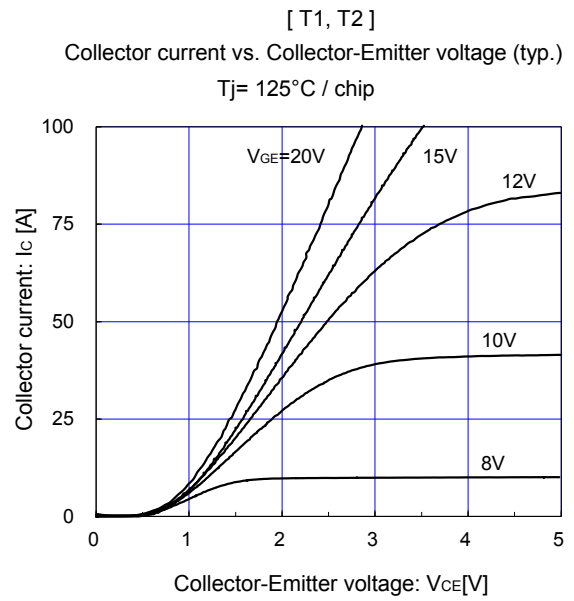
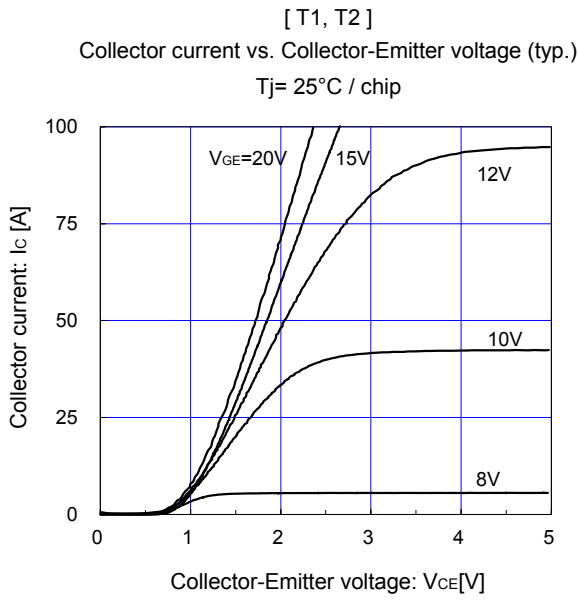
Definitions of switching mode

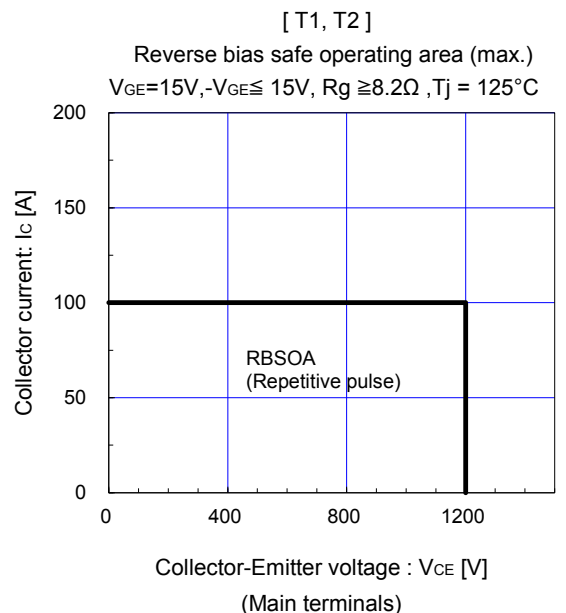
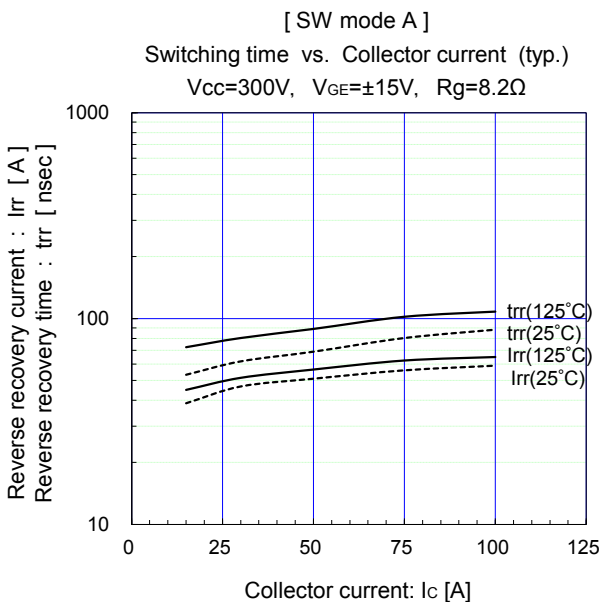
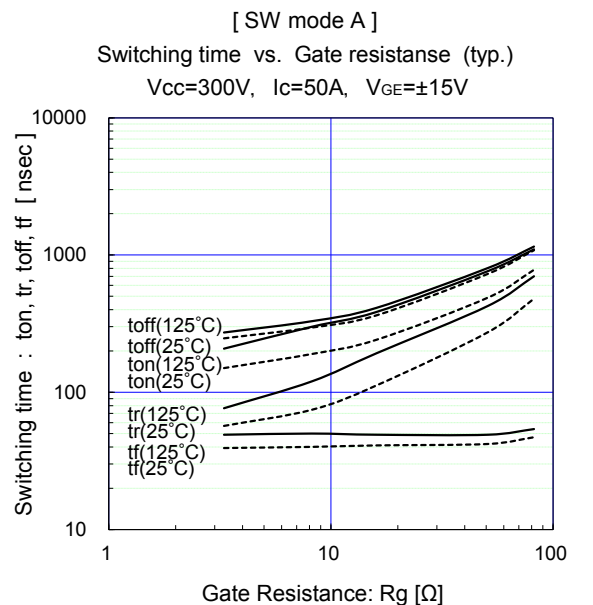
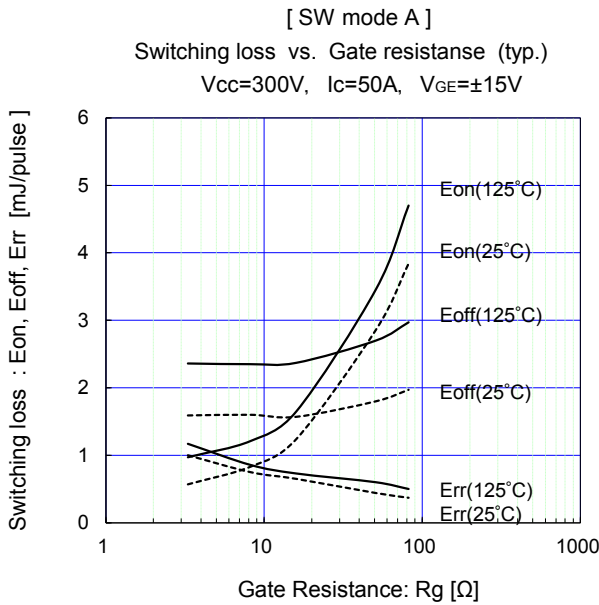
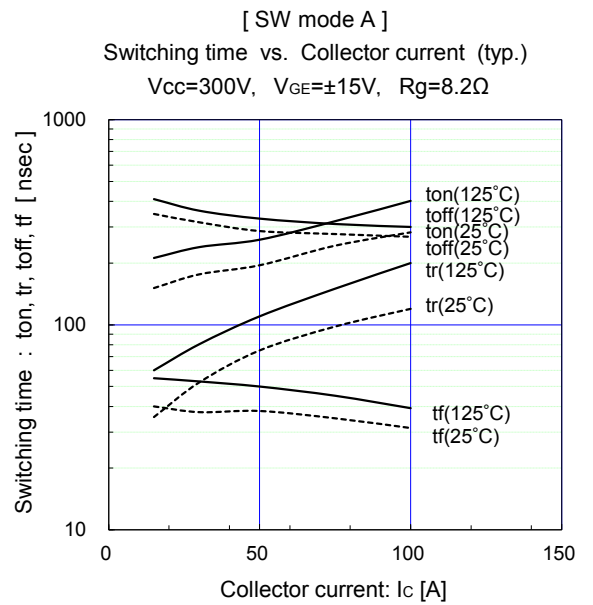
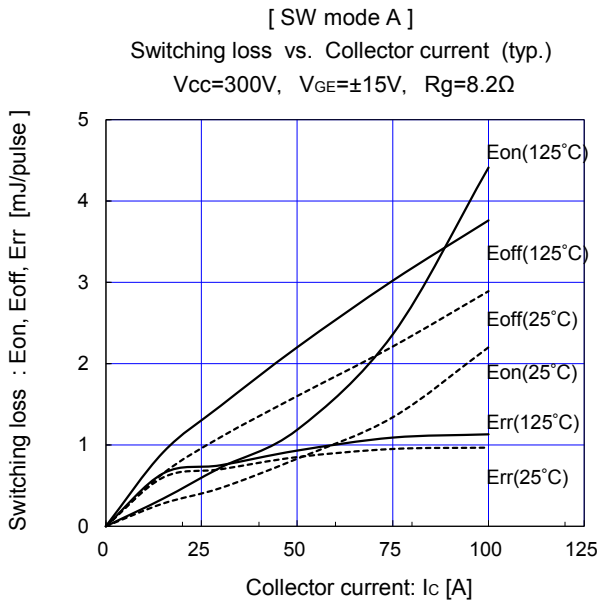


SW mode	Load L	State of switching device			
		T1	T2	T3	T4
A	M-U	SW	OFF	OFF	ON
	M-U	OFF	SW	ON	OFF
B	P-U	OFF	OFF	SW	ON
	U-N	OFF	OFF	ON	SW

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

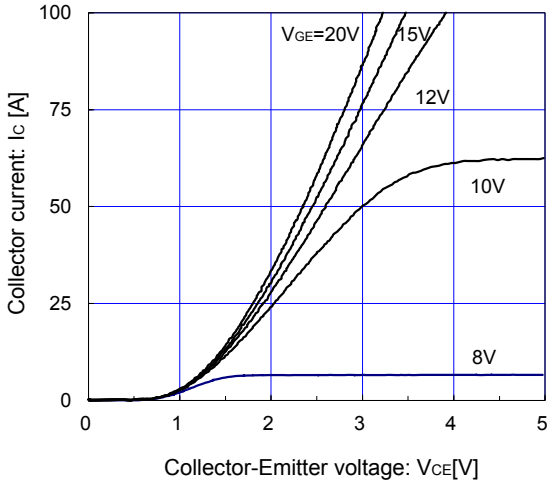
■ Characteristics (Representative)





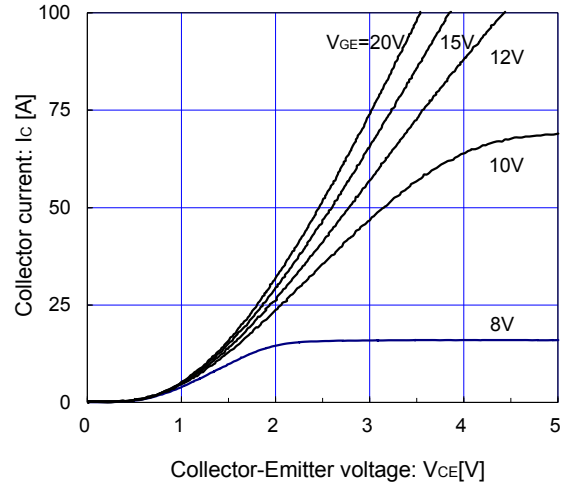
[ T3, T4 (RB-IGBT)]

Collector current vs. Collector-Emittor voltage (typ.)  
Tj= 25°C / chip



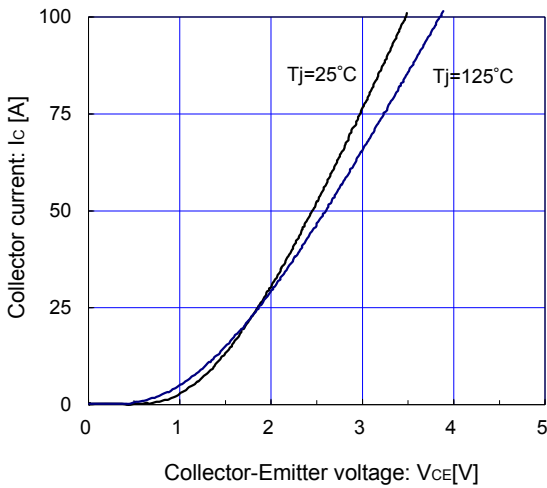
[ T3, T4 (RB-IGBT)]

Collector current vs. Collector-Emittor voltage (typ.)  
Tj= 125°C / chip



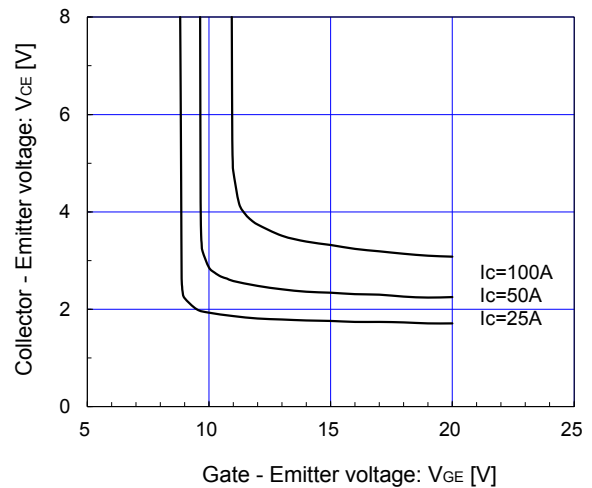
[ T3, T4 (RB-IGBT)]

Collector current vs. Collector-Emittor voltage (typ.)  
VGE=15V / chip



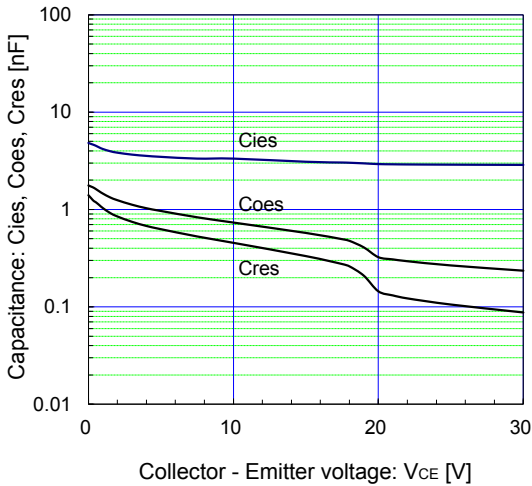
[ T3, T4 (RB-IGBT)]

Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)  
Tj= 25°C / chip



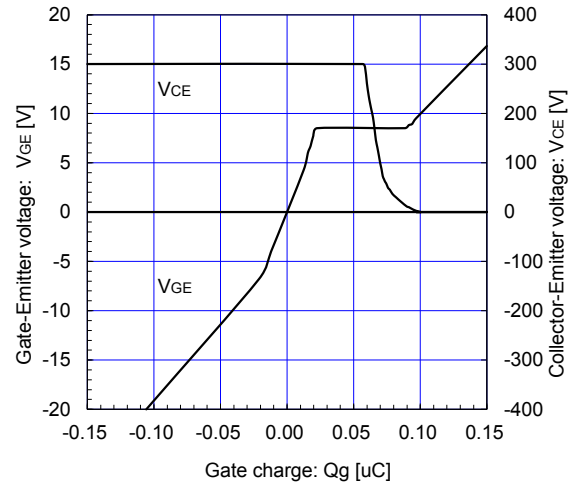
[ T3, T4 (RB-IGBT)]

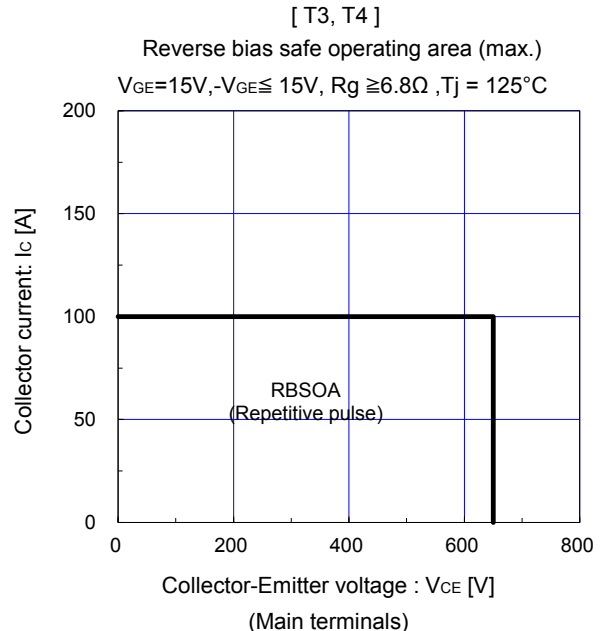
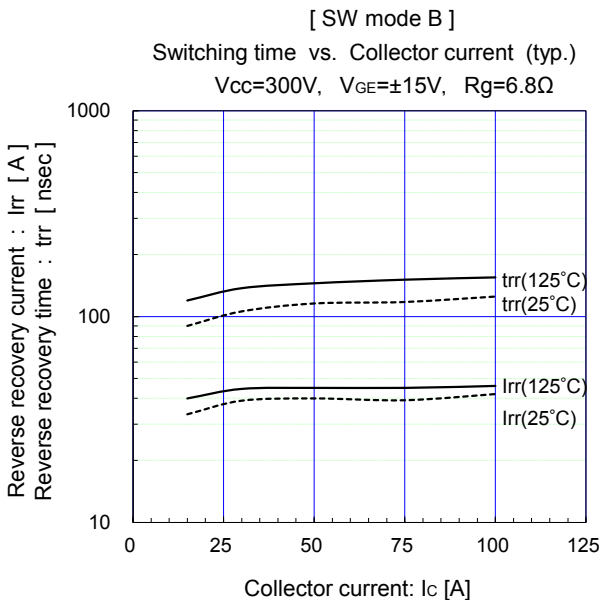
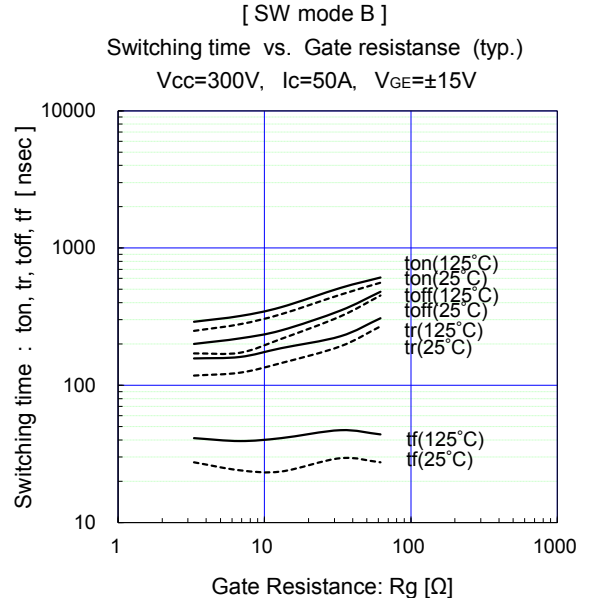
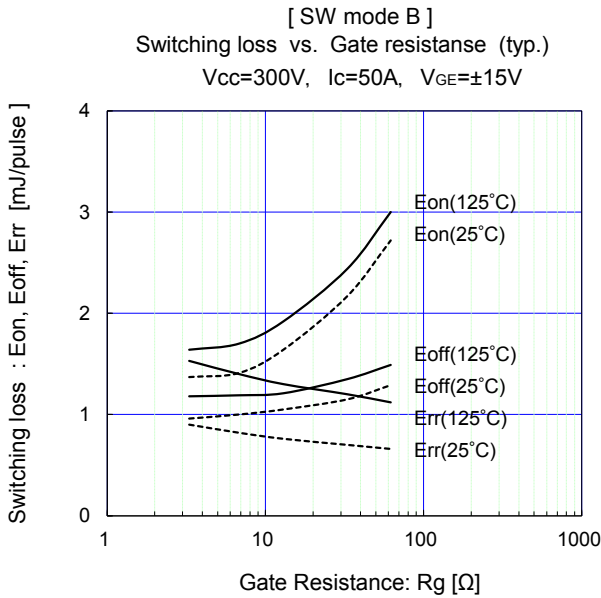
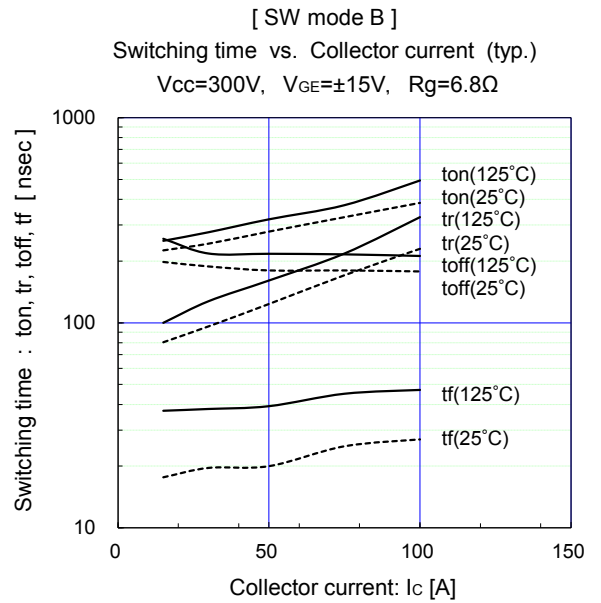
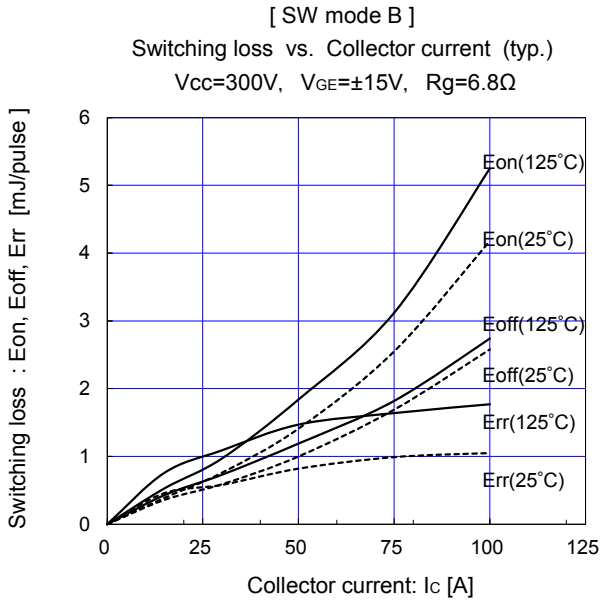
Capacitance vs. Collector-Emittor voltage (typ.)  
VGE=0V, f= 1MHz, Tj= 25°C

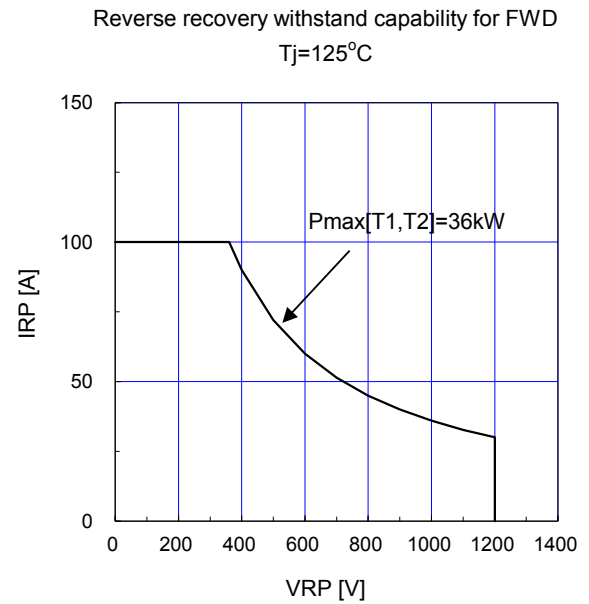
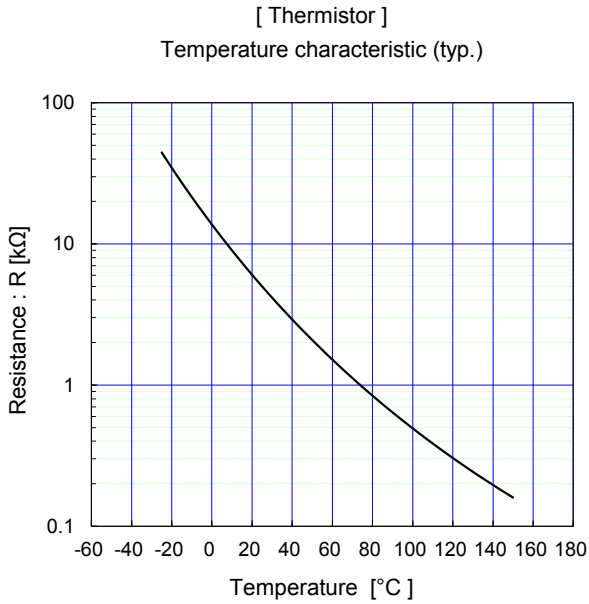
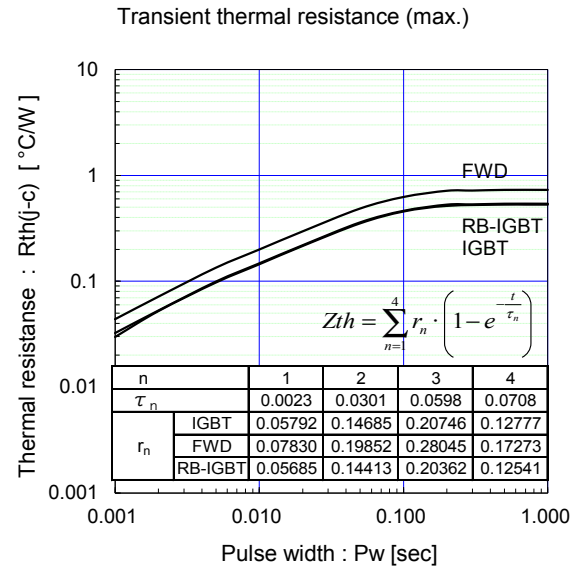
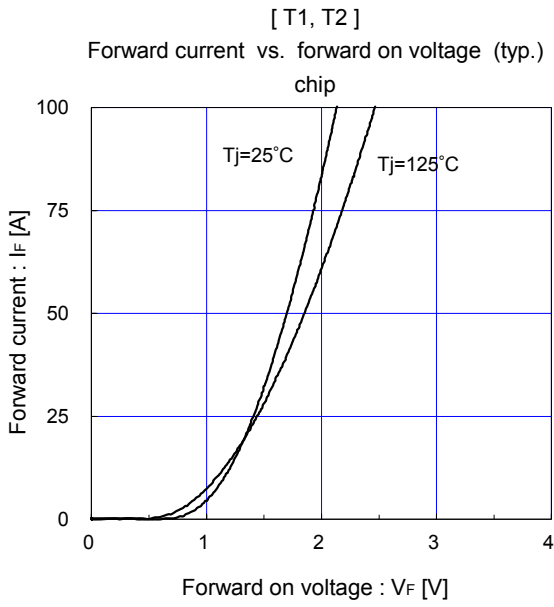


[ T3, T4 (RB-IGBT)]

Dynamic gate charge (typ.)  
Vcc=300V, Ic=50A, Tj=25°C



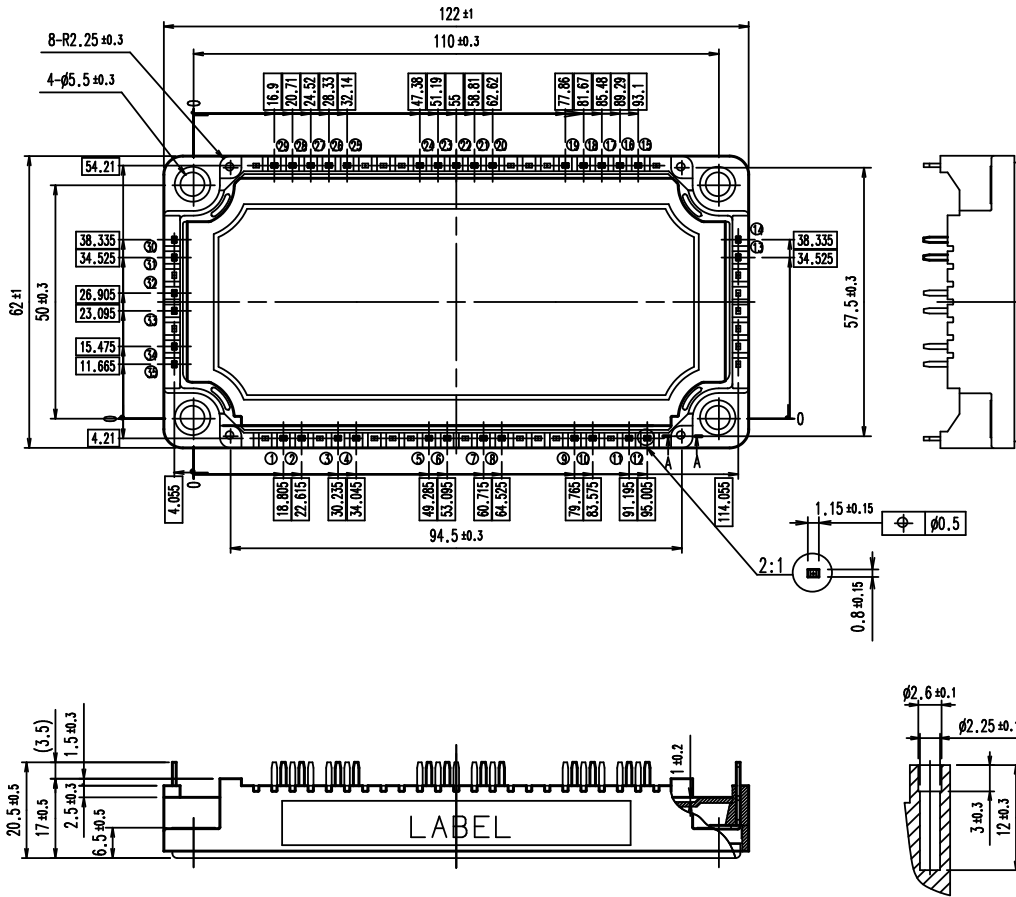






Outline Drawings, mm

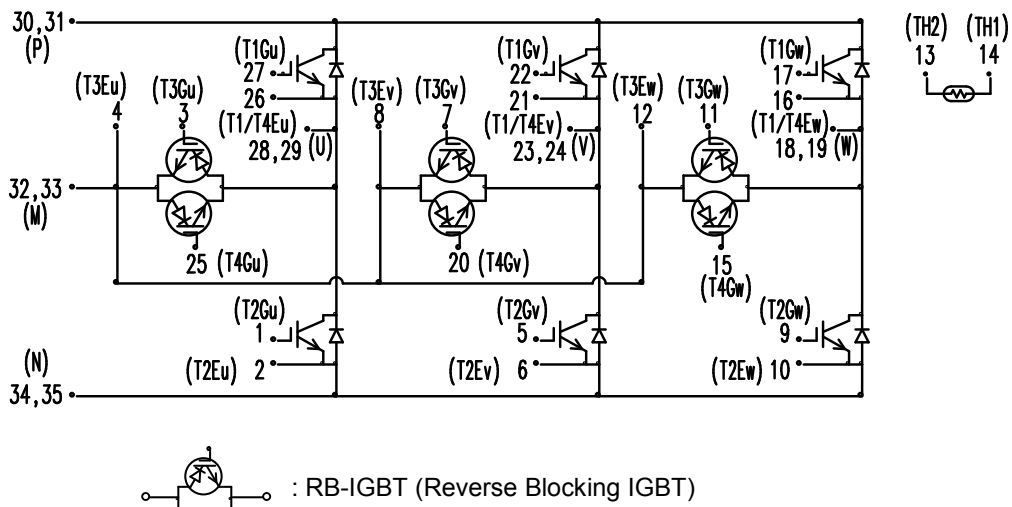
□ shows theoretical dimension.  
 ( ) shows reference dimension.



Section A-A

Weight: 302g (typ.)

Equivalent Circuit Schematic



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