

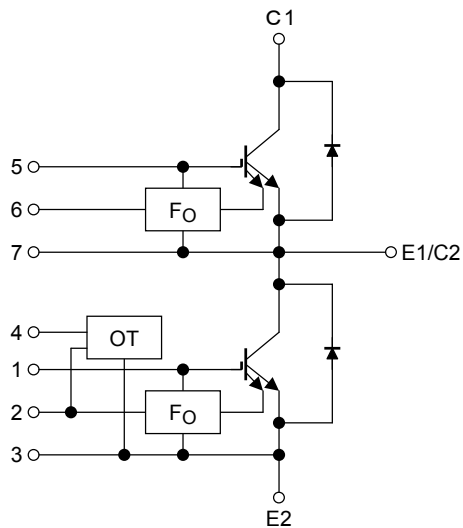
TOSHIBA IGBT Module Silicon N Channel IGBT

MG400Q2YS60A

High Power Switching Applications
 Motor Control Applications

- Integrates a complete half bridge power circuit and fault-signal output circuit in one package.
 (short circuit and over temperature)
- The electrodes are isolated from case.
- Low thermal resistance.
- $V_{CE(sat)} = 2.4\text{ V (typ.)}$

Equivalent Circuit

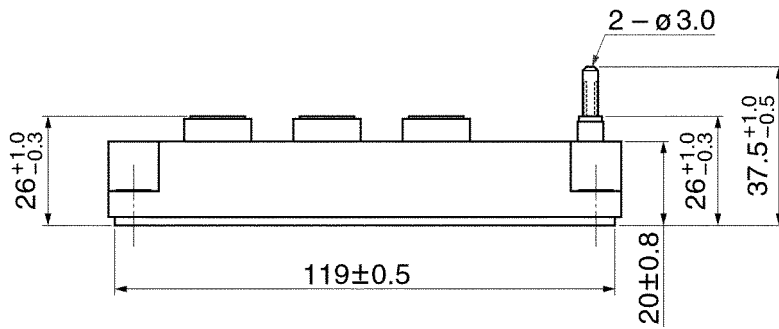
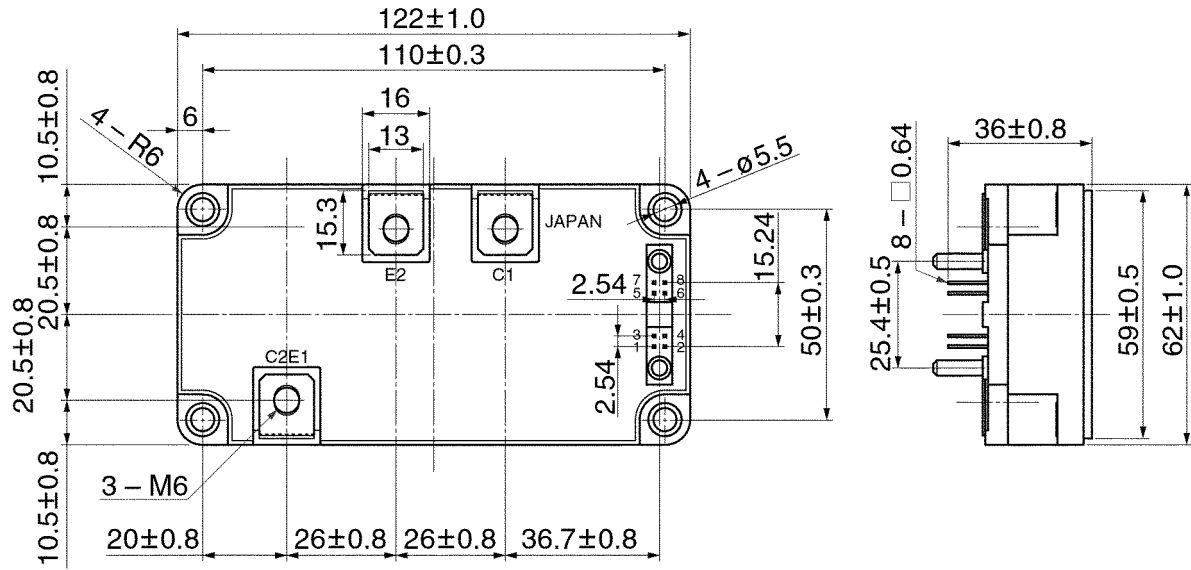


Signal terminal

1.	G (L)	2.	F _O (L)	3.	E (L)	4.	V _D
5.	G (H)	6.	F _O (H)	7.	E (H)	8.	Open

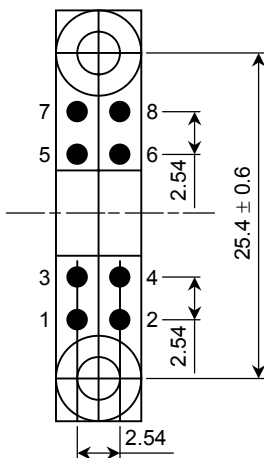
Package Dimensions: 2-123C1B

Unit: mm



- | | | | | | | | |
|----|-------|----|--------|----|-------|----|------|
| 1. | G (L) | 2. | FO (L) | 3. | E (L) | 4. | VD |
| 5. | G (H) | 6. | FO (H) | 7. | E (H) | 8. | Open |

Signal Terminal Layout



- | | |
|----|--------|
| 1. | G (L) |
| 2. | FO (L) |
| 3. | E (L) |
| 4. | VD |
| 5. | G (H) |
| 6. | FO (H) |
| 7. | E (H) |
| 8. | Open |

Weight: 375 g

Maximum Ratings (Ta = 25°C)

Stage	Characteristics	Symbol	Rating	Unit	
Inverter	Collector-emitter voltage	V_{CES}	1200	V	
	Gate-emitter voltage	V_{GES}	±20	V	
	Collector current	DC	I_C	400	A
		1 ms	I_{CP}	800	
	Forward current	DC	I_F	400	A
		1 ms	I_{FM}	800	
Collector power dissipation (Tc = 25°C)		P_C	3750	W	
Control	Control voltage (OT)	V_D	20	V	
	Fault input voltage	V_{FO}	20	V	
	Fault input current	I_{FO}	20	mA	
Module	Junction temperature	T_j	150	°C	
	Storage temperature range	T_{stg}	-40~125	°C	
	Operation temperature range	T_{ope}	-20~100	°C	
	Isolation voltage	V_{isol}	2500 (AC 1 min)	V	
	Screw torque	—	3 (M5)	N·m	

Electrical Characteristics (Tj = 25°C)

1. Inverter stage

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I_{GES}	$V_{GE} = \pm 20 \text{ V}, V_{CE} = 0$	—	—	+3/-4	mA	
		$V_{GE} = +10 \text{ V}, V_{CE} = 0$	—	—	100	nA	
Collector cut-off current	I_{CES}	$V_{CE} = 1200 \text{ V}, V_{GE} = 0$	—	—	1.0	mA	
Gate-emitter cut-off voltage	$V_{GE} \text{ (off)}$	$V_{CE} = 5 \text{ V}, I_C = 400 \text{ mA}$	6.0	7.0	8.0	V	
Collector-emitter saturation voltage	$V_{CE} \text{ (sat)}$	$V_{GE} = 15 \text{ V}, I_C = 400 \text{ A}$	$T_j = 25^\circ\text{C}$	—	2.4	2.8	V
			$T_j = 125^\circ\text{C}$	—	—	3.2	
Input capacitance	C_{ies}	$V_{CE} = 10 \text{ V}, V_{GE} = 0, f = 1 \text{ MHz}$	—	31000	—	pF	
Switching time	Turn-on delay time	$V_{CC} = 600 \text{ V}, I_C = 400 \text{ A}$ $V_{GE} = \pm 15 \text{ V}, R_G = 5.1 \Omega$ (See page 4) (Note 1)	0.10	—	1.00	μs	
	Turn-off time		—	—	2.00		
	Fall time		—	—	0.50		
Reverse recovery time	t_{rr}		—	—	0.50		
Forward voltage	V_F	$I_F = 400 \text{ A}$	—	2.4	2.8	V	

Note 1: Switching time test circuit & timing chart

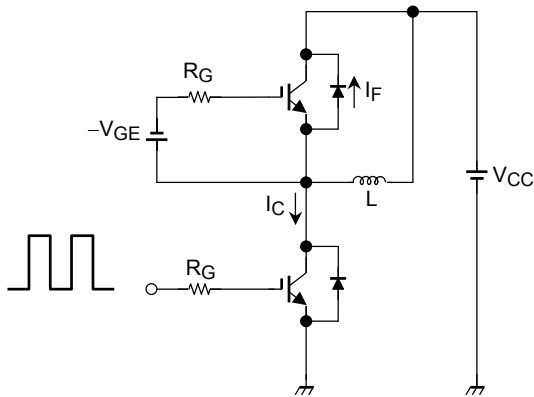
2. Control (Tc = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Fault output current	OC	$V_{GE} = 15 \text{ V}$	480	—	—	A
Over temperature	OT	—	100	—	125	°C
Fault output delay time	$t_d \text{ (Fo)}$	$V_{CC} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}$	—	—	8	μs

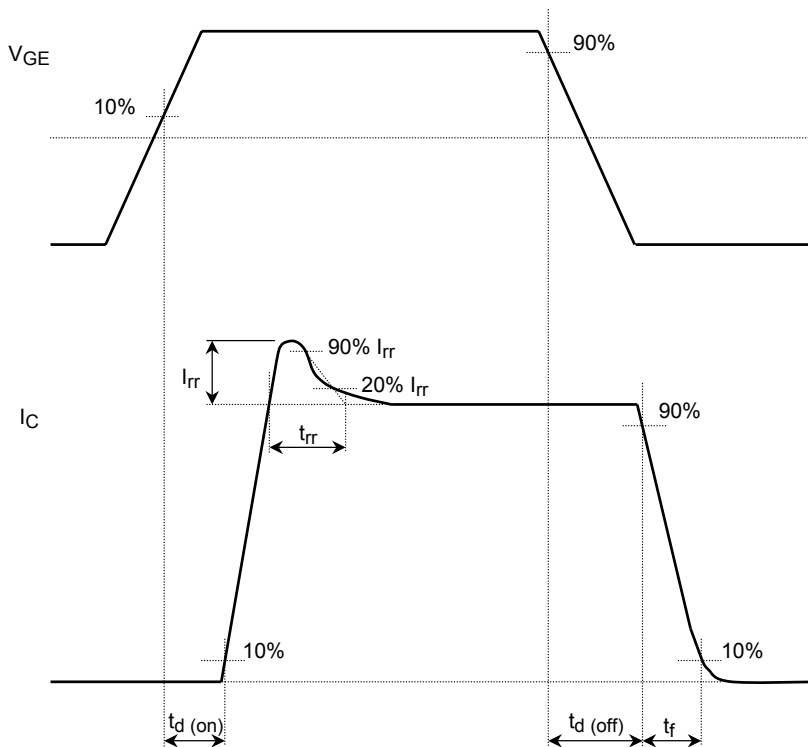
3. Module (Tc = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Junction to case thermal resistance	$R_{th(j-c)}$	Inverter IGBT stage	—	—	0.033	°C/W
		Inverter FRD stage	—	—	0.068	
Case to fin thermal resistance	$R_{th(c-f)}$	With silicon compound	—	0.013	—	°C/W

Switching Time Test Circuit



Timing Chart



Remark

<Short circuit capability condition >

- Short circuit capability is 6 μ s after fault output signal.
Please keep following condition to use fault output signal.
 - $V_{CC} \leq 750$ V
 - 14.8 V $\leq V_{GE} \leq 17.0$ V
 - $R_G \geq 5.1$ Ω
 - $T_j \leq 125^\circ$ C

<Gate voltage >

- To use this product, V_{GE} must be provided higher than 14.8 V
In case V_{GE} is less than 14.8 V, fault signal FO may not be output even under error conditions.

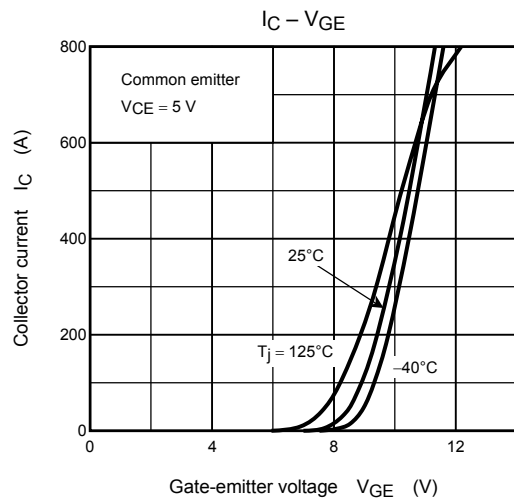
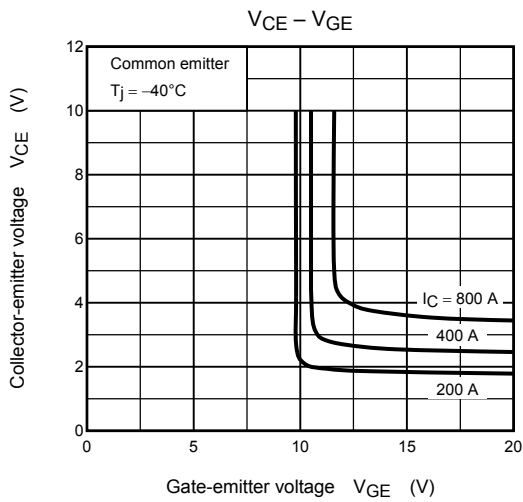
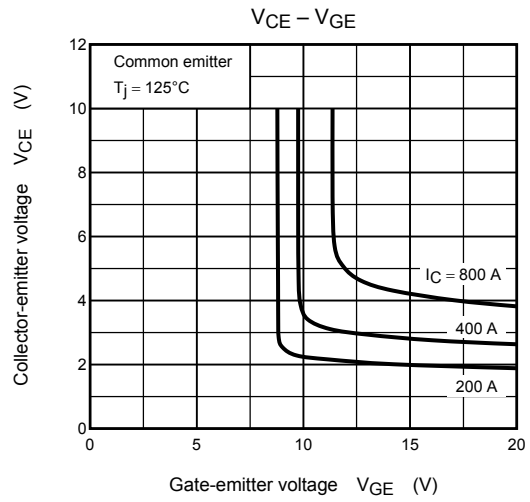
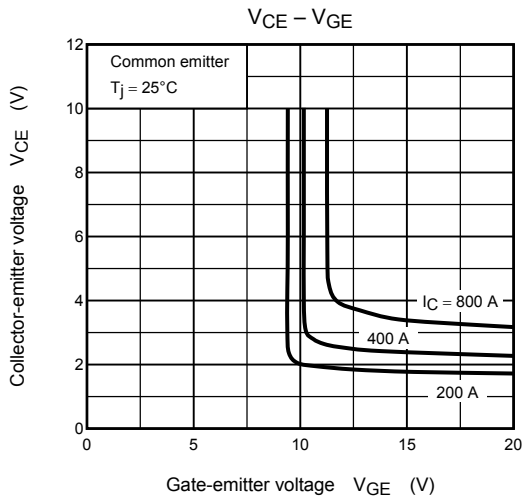
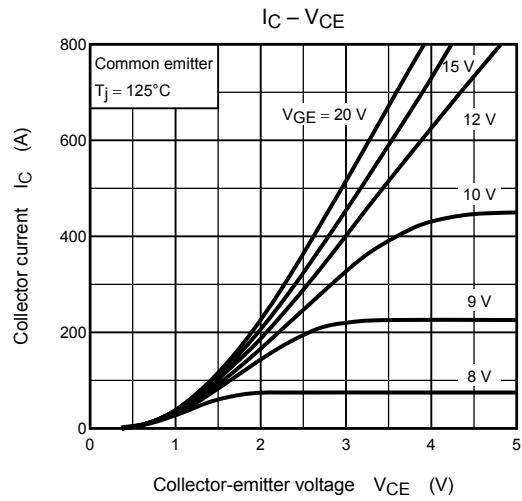
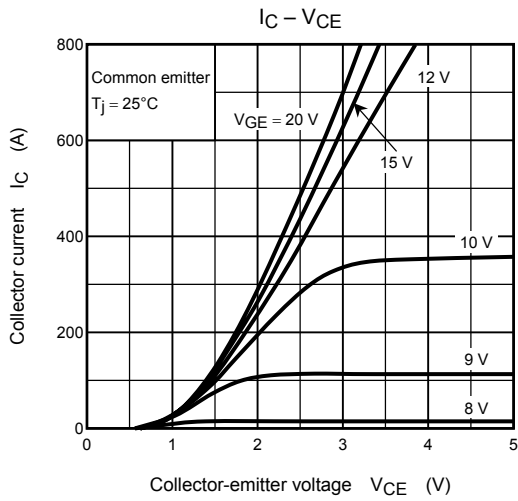
<Recommended conditions for application>

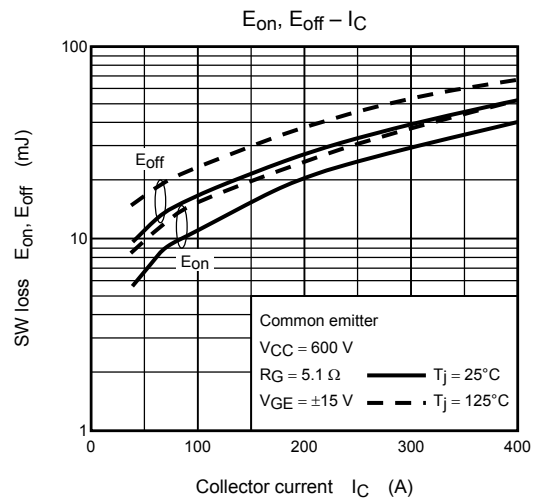
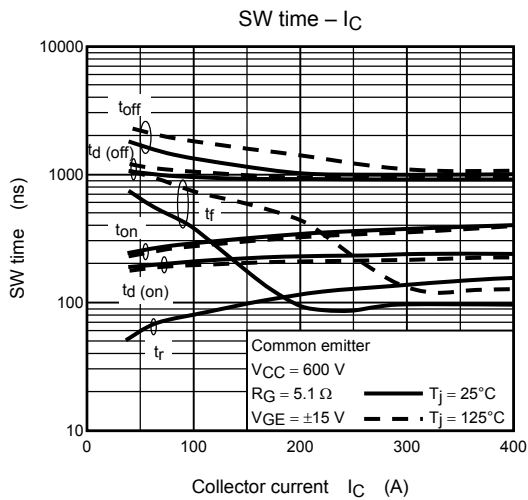
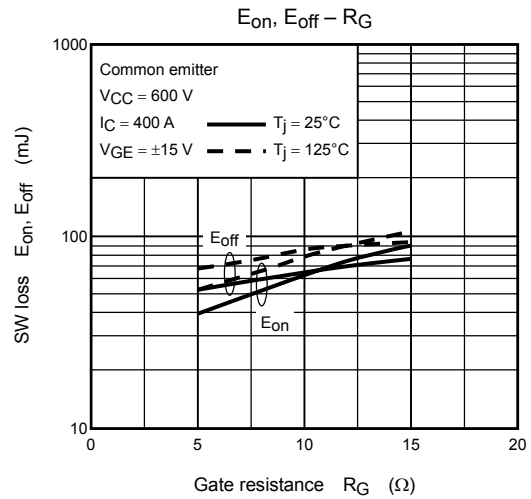
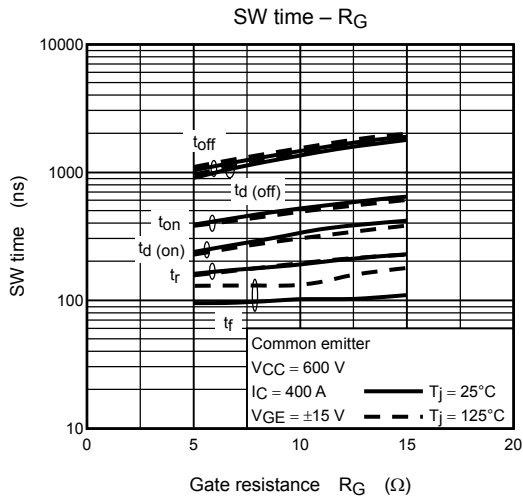
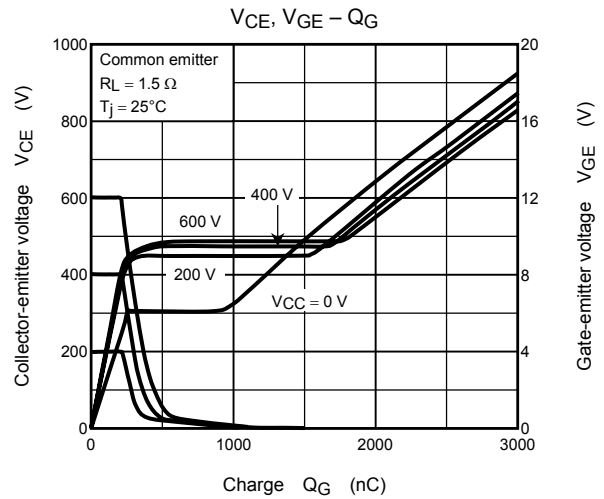
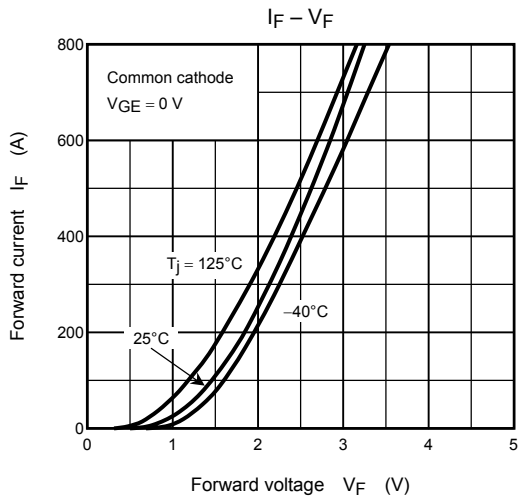
Characteristics	Symbol	Min	Typ.	Max	Unit
P-N power terminal supply voltage	V_{CC}	—	600	750	V
Gate voltage	V_{GE}	14.8	15	17	V
Gate resistance	R_G	5.1	—	—	Ω
Switching frequency	fc	—	—	20	kHz

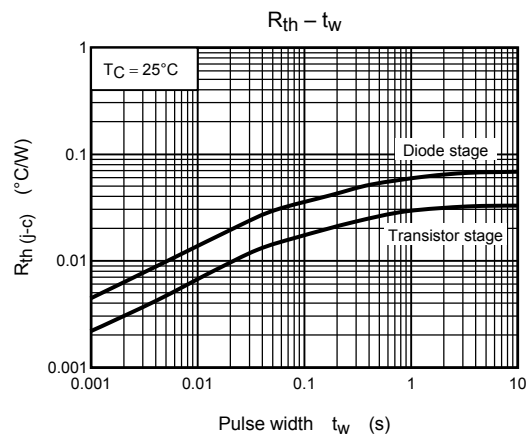
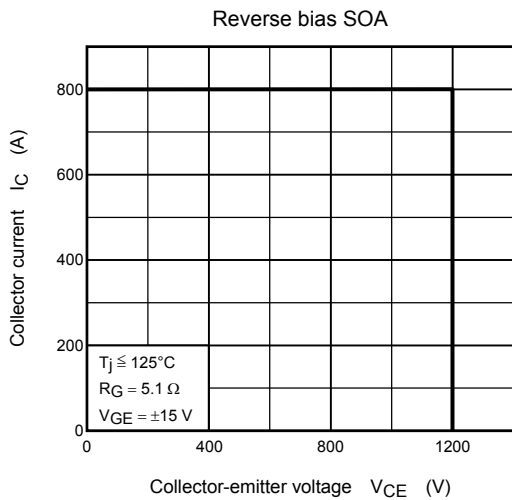
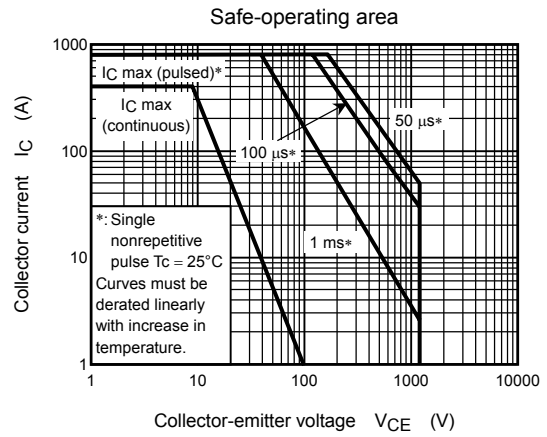
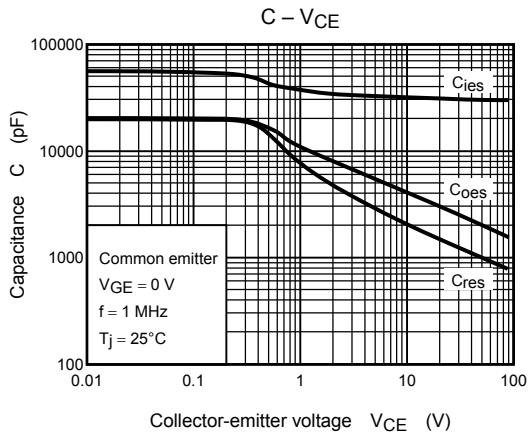
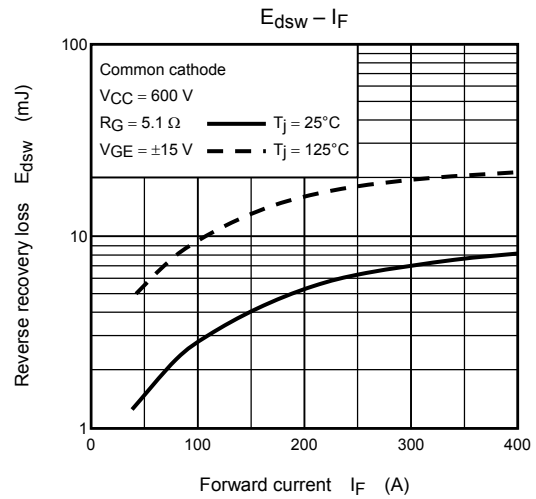
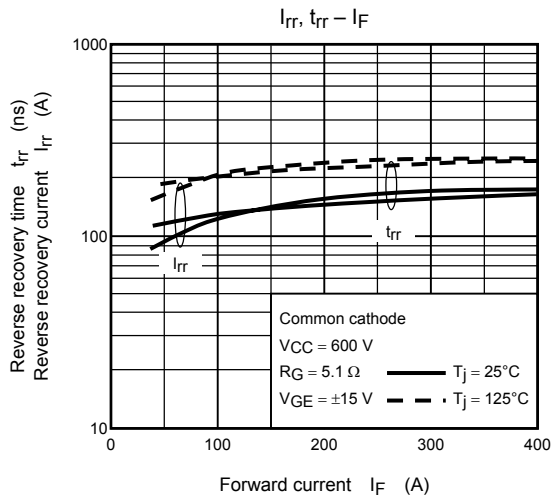
<For parallel use>

- For parallel use of this product, please use the same rank for both $V_{CE(sat)}$ and V_F among IGBT in parallel without fail.

$V_{CE(sat)}$	V_F	Min	Max
24	E	2.1	2.4
26	F	2.3	2.6
28	G	2.5	2.8







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