

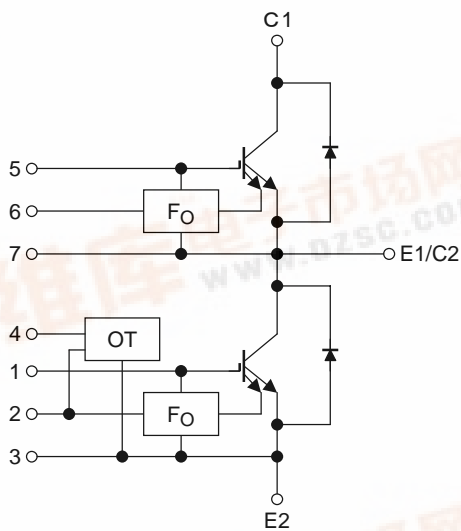
TOSHIBA IGBT Module Silicon N Channel IGBT

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

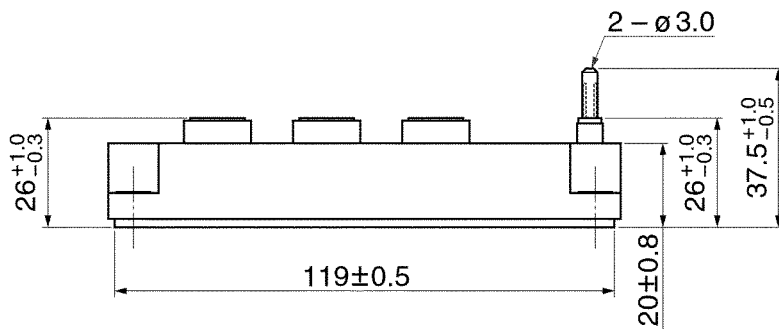
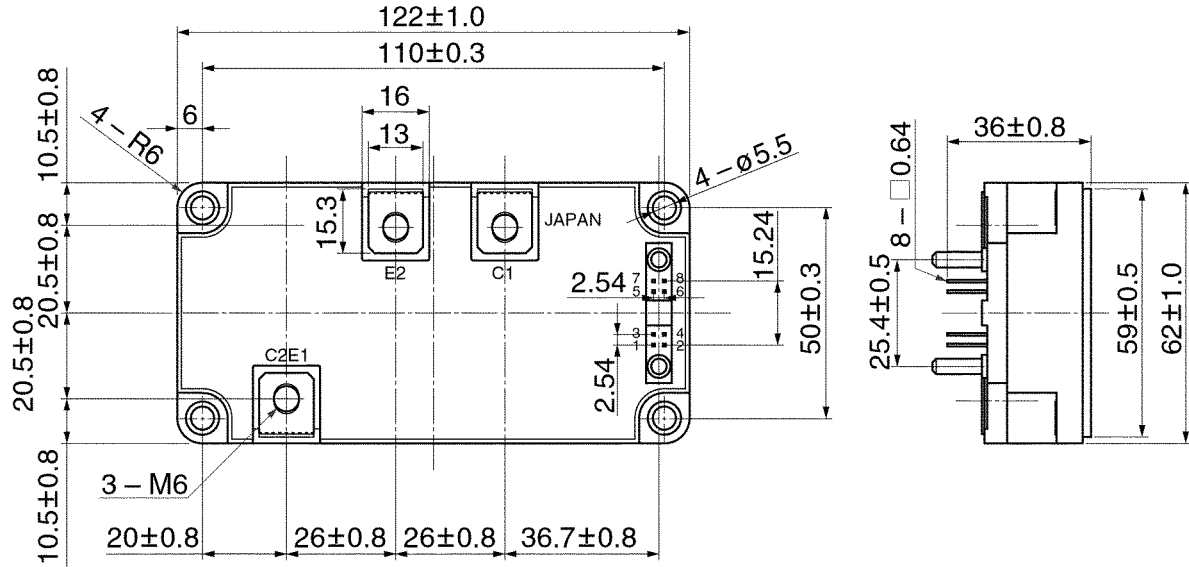


Signal terminal

- | | | | | | | | |
|----|-------|----|--------------------|----|-------|----|----------------|
| 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 |

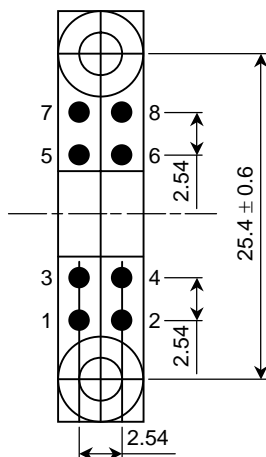
Package Dimensions: 2-123C1B

Unit: mm



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

Signal Terminal Layout



- | | |
|----|--------------------|
| 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 |

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 (T _c = 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 (T_j = 25°C)

1. Inverter stage

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I _{GES}	V _{GE} = ±20 V, V _{CE} = 0	—	—	+3/-4	mA	
		V _{GE} = +10 V, V _{CE} = 0	—	—	100	nA	
Collector cut-off current	I _{CES}	V _{CE} = 1200 V, V _{GE} = 0	—	—	1.0	mA	
Gate-emitter cut-off voltage	V _{GE (off)}	V _{CE} = 5 V, I _C = 400 mA	6.0	7.0	8.0	V	
Collector-emitter saturation voltage	V _{CE (sat)}	V _{GE} = 15 V, I _C = 400 A	T _j = 25°C	—	2.4	2.8	V
			T _j = 125°C	—	—	3.2	
Input capacitance	C _{ies}	V _{CE} = 10 V, V _{GE} = 0, f = 1 MHz	—	31000	—	pF	
Switching time	Turn-on delay time	t _{d (on)}	V _{CC} = 600 V, I _C = 400 A V _{GE} = ±15 V, R _G = 5.1 Ω (Note 1)	0.10	—	1.00	μs
	Turn-off time	t _{off}		—	—	2.00	
	Fall time	t _f		—	—	0.50	
Reverse recovery time	t _{rr}	(See page 4)	—	—	0.50		
Forward voltage	V _F	I _F = 400 A	—	2.4	2.8	V	

Note 1: Switching time test circuit & timing chart

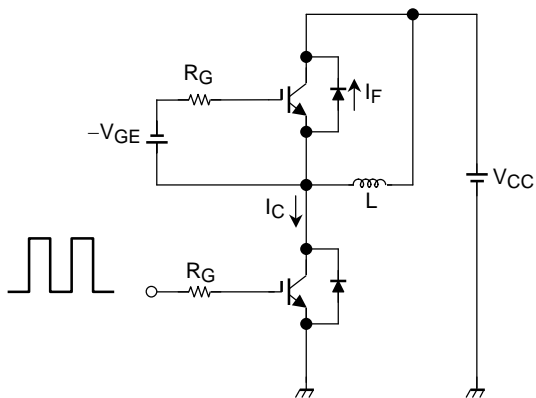
2. Control (T_c = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Fault output current	OC	V _{GE} = 15 V	480	—	—	A
Over temperature	OT	—	100	—	125	°C
Fault output delay time	t _{d (Fo)}	V _{CC} = 600 V, V _{GE} = ±15 V	—	—	8	μs

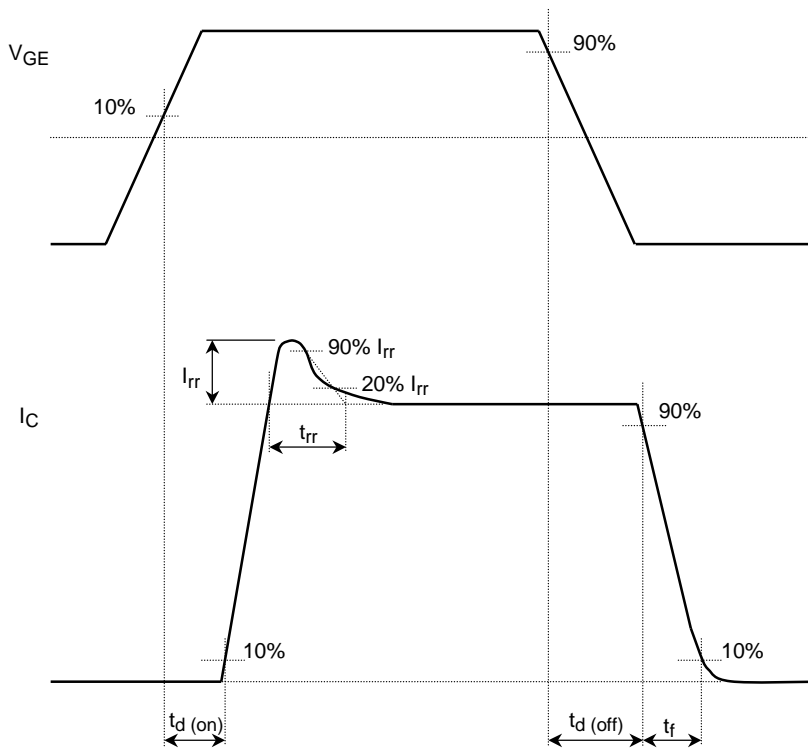
3. Module ($T_c = 25^\circ\text{C}$)

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

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

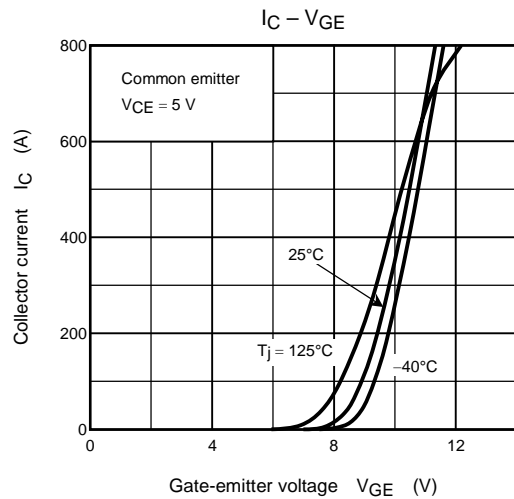
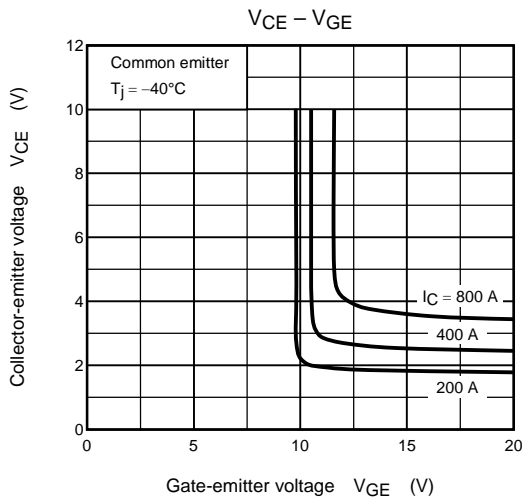
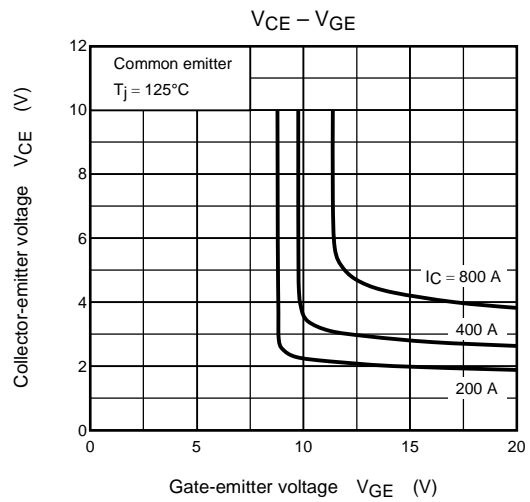
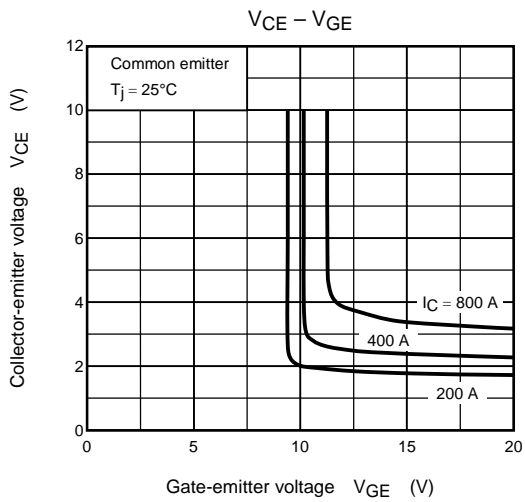
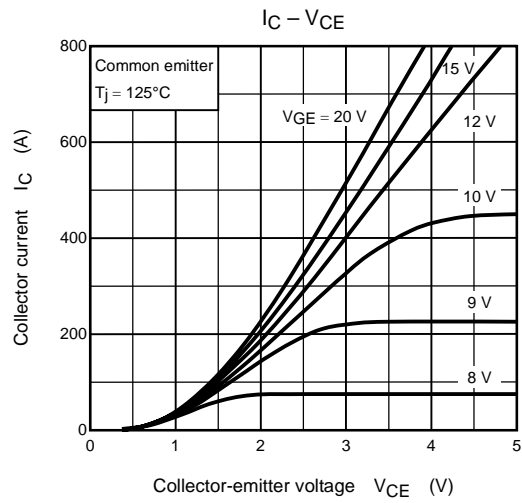
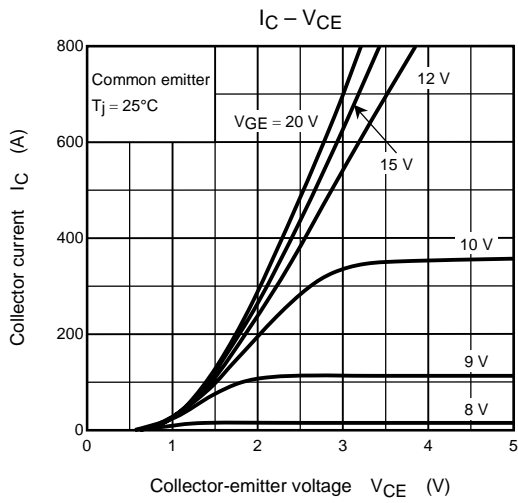
<Gate voltage >

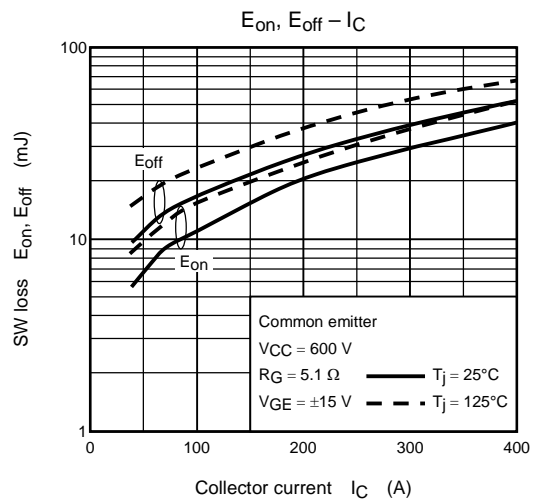
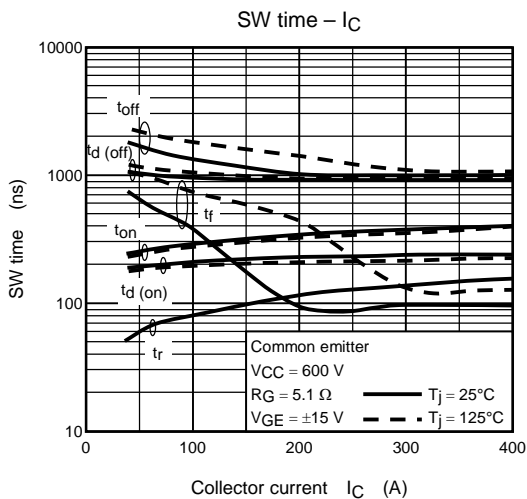
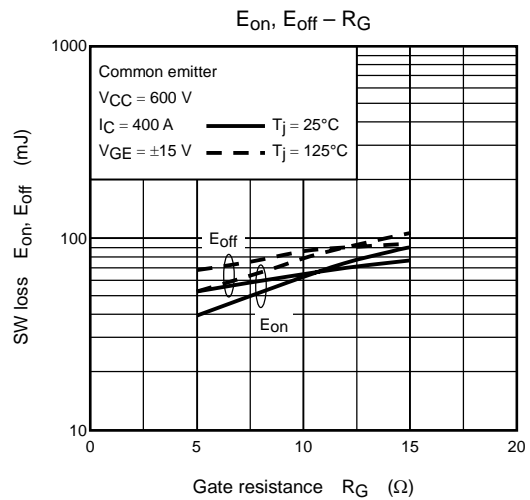
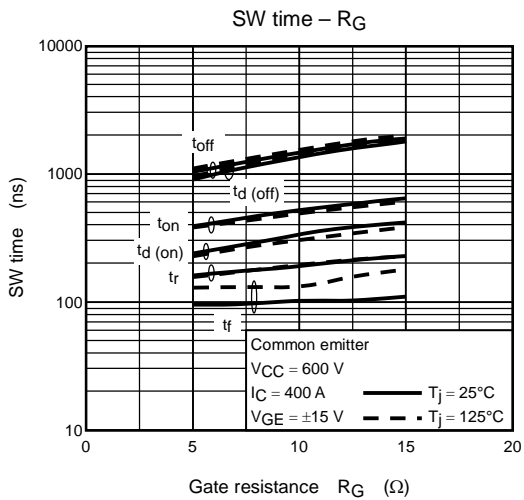
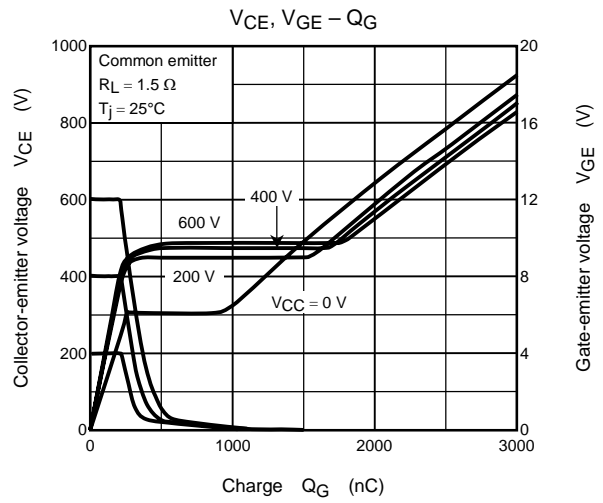
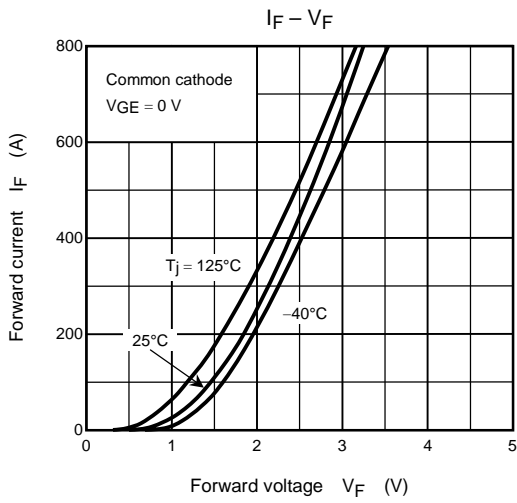
- To use this product, V_{GE} must be provided higher than 14.8 V
In case V_{GE} is less than 14.8 V, fault signal FO may not be output even under error conditions.

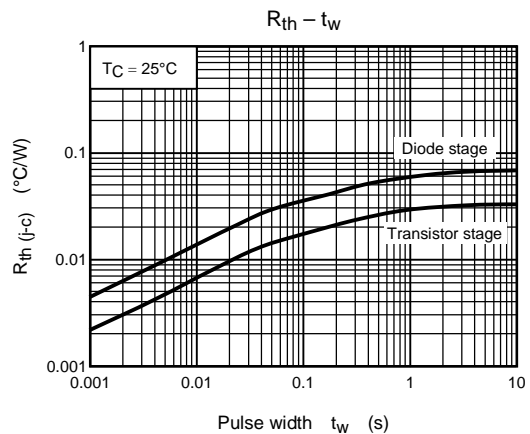
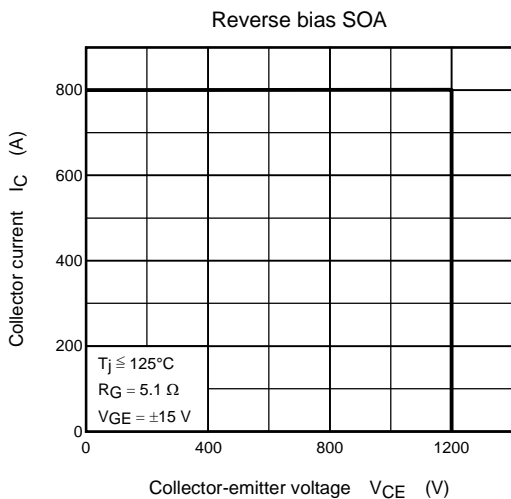
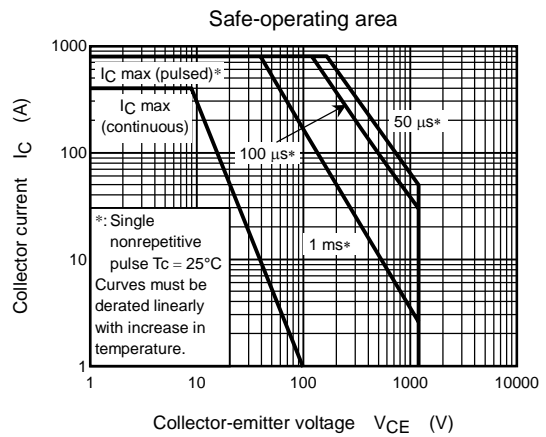
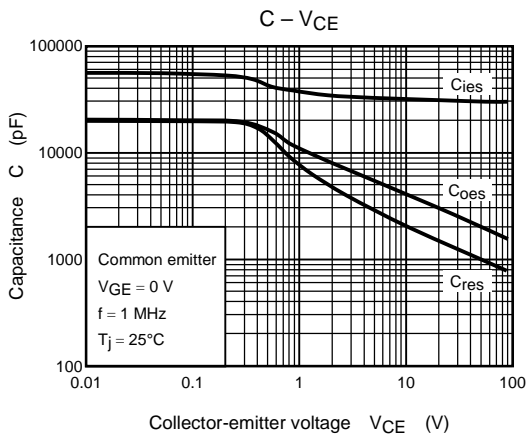
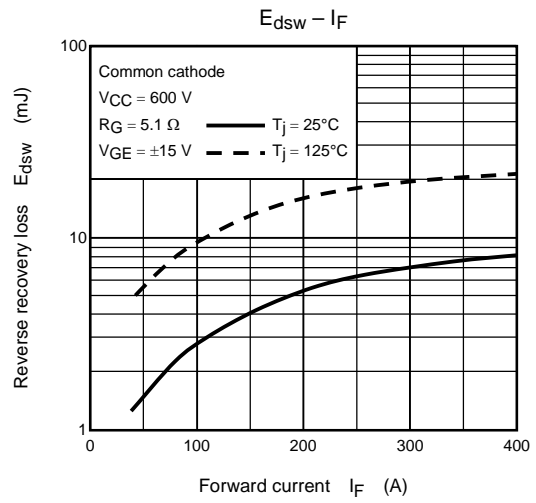
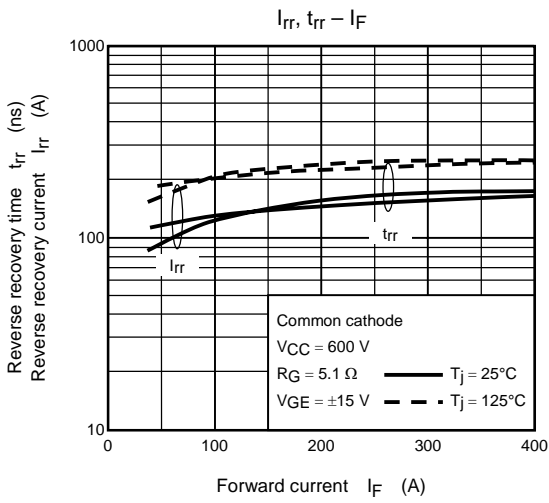
<For parallel use>

- 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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000707EAA

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