

Discrete IGBTs Silicon N-Channel IGBT

GT30J65MRB

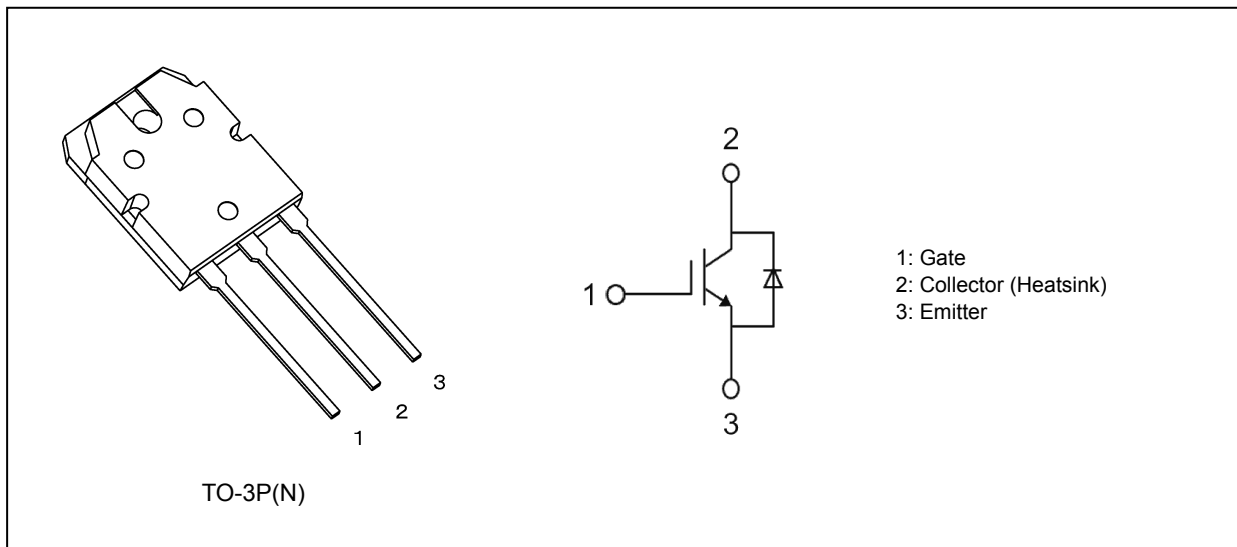
1. Applications

- Power Factor Correction (PFC)
- Current-Resonant Inverter Switching
- Welding

2. Features

- (1) 7th generation
- (2) The RC-IGBT consists of a freewheeling diode (FWD) monolithically integrated in an IGBT chip.
- (3) Enhancement mode
- (4) High-speed switching: $t_f = 40 \text{ ns}$ (typ.) ($I_C = 15 \text{ A}$, $R_G = 56 \Omega$)
- (5) Low saturation voltage: $V_{CE(sat)} = 1.40 \text{ V}$ (typ.) ($I_C = 30 \text{ A}$)
- (6) High junction temperature: $T_j = 175 \text{ }^\circ\text{C}$ (max)

3. Packaging and Internal Circuit



Start of commercial production
2022-12

4. Absolute Maximum Ratings (Note) ($T_a = 25\text{ °C}$, unless otherwise specified)

Characteristics	Symbol	Test Condition	Rating	Unit
Collector-emitter voltage (Note1)	V_{CES}		650	V
Gate-emitter voltage	V_{GES}		± 25	V
Collector current (DC)	I_C	($T_c = 25\text{ °C}$)	60	A
		($T_c = 100\text{ °C}$)	30	
Collector current (1 ms)	I_{CP}		120	A
Diode forward current (DC)	I_F	($T_c = 25\text{ °C}$)	30	A
		($T_c = 100\text{ °C}$)	15	
Diode forward current (100 μ s)	I_{FP}		60	A
Collector power dissipation	P_C	($T_c = 25\text{ °C}$)	200	W
Junction temperature (Note1)	T_j		175	$^{\circ}\text{C}$
Storage temperature	T_{stg}		-55 to 175	$^{\circ}\text{C}$
Mounting torque	TOR		0.8	N · m

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note1: To perform derating ensures the device reliability.

In operation, the collector emitter voltage(V_{CES}) should be below 550 V, as well as junction temperature(T_j) should be below 140 $^{\circ}\text{C}$.

5. Thermal Characteristics

Characteristics	Symbol	Max	Unit
Junction-to-case thermal resistance	$R_{th(j-c)}$	0.75	$^{\circ}\text{C}/\text{W}$

6. Electrical Characteristics

6.1. Static Characteristics ($T_a = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I_{GES}	$V_{GE} = \pm 25\text{ V}, V_{CE} = 0\text{ V}$	—	—	± 100	nA	
Collector cut-off current	I_{CES}	$V_{CE} = 650\text{ V}, V_{GE} = 0\text{ V}$	—	—	10	μA	
Gate-emitter cut-off voltage	$V_{GE(OFF)}$	$V_{CE} = 5\text{ V}, I_C = 30\text{ mA}$	4.2	—	6.2	V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 30\text{ A}, V_{GE} = 15\text{ V},$ (pulse test)	$T_c = 25\text{ }^\circ\text{C}$	—	1.40	1.80	V
			$T_c = 175\text{ }^\circ\text{C}$	—	1.65	—	

6.2. Dynamic Characteristics ($T_a = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Input capacitance	C_{ies}	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V},$ $f = 100\text{ kHz}$	—	2150	—	pF	
Reverse transfer capacitance	C_{res}		—	18	—		
Output capacitance	C_{oes}		—	45	—		
Total gate charge	Q_g	$V_{CC} = 520\text{ V}, V_{GE} = 15\text{ V},$ $I_C = 30\text{ A}$	—	70	—	nC	
Switching time (turn-on delay time)	$t_{d(on)}$	$V_{CC} = 400\text{ V}, I_C = 15\text{ A},$ $V_{GE} = 15\text{ V/0 V}, R_G = 56\ \Omega,$ $L = 100\ \mu\text{H}, \text{Duty} \leq 1\%$ See Fig. 6.2.1, 6.2.2	$T_c = 25\text{ }^\circ\text{C}$	—	75	—	ns
			$T_c = 175\text{ }^\circ\text{C}$	—	70	—	
Switching time (rise time)	t_r	$V_{CC} = 400\text{ V}, I_C = 15\text{ A},$ $V_{GE} = 15\text{ V/0 V}, R_G = 56\ \Omega,$ $L = 100\ \mu\text{H}, \text{Duty} \leq 1\%$ See Fig. 6.2.1, 6.2.2	$T_c = 25\text{ }^\circ\text{C}$	—	25	—	ns
			$T_c = 175\text{ }^\circ\text{C}$	—	25	—	
Switching time (turn-off delay time)	$t_{d(off)}$	$V_{CC} = 400\text{ V}, I_C = 15\text{ A},$ $V_{GE} = 15\text{ V/0 V}, R_G = 56\ \Omega,$ $L = 100\ \mu\text{H}, \text{Duty} \leq 1\%$ See Fig. 6.2.1, 6.2.2	$T_c = 25\text{ }^\circ\text{C}$	—	400	—	ns
			$T_c = 175\text{ }^\circ\text{C}$	—	500	—	
Switching time (fall time)	t_f	$V_{CC} = 400\text{ V}, I_C = 15\text{ A},$ $V_{GE} = 15\text{ V/0 V}, R_G = 56\ \Omega,$ $L = 100\ \mu\text{H}, \text{Duty} \leq 1\%$ See Fig. 6.2.1, 6.2.2	$T_c = 25\text{ }^\circ\text{C}$	—	40	—	ns
			$T_c = 175\text{ }^\circ\text{C}$	—	25	—	
Switching loss (turn-on switching loss)	E_{on}	$V_{CC} = 400\text{ V}, I_C = 15\text{ A},$ $V_{GE} = 15\text{ V/0 V}, R_G = 56\ \Omega,$ $L = 100\ \mu\text{H}, \text{Duty} \leq 1\%$ See Fig. 6.2.1, 6.2.2	$T_c = 25\text{ }^\circ\text{C}$	—	1.40	—	mJ
			$T_c = 175\text{ }^\circ\text{C}$	—	1.80	—	
Switching loss (turn-off switching loss)	E_{off}	$V_{CC} = 400\text{ V}, I_C = 15\text{ A},$ $V_{GE} = 15\text{ V/0 V}, R_G = 56\ \Omega,$ $L = 100\ \mu\text{H}, \text{Duty} \leq 1\%$ See Fig. 6.2.1, 6.2.2	$T_c = 25\text{ }^\circ\text{C}$	—	0.22	—	mJ
			$T_c = 175\text{ }^\circ\text{C}$	—	0.35	—	

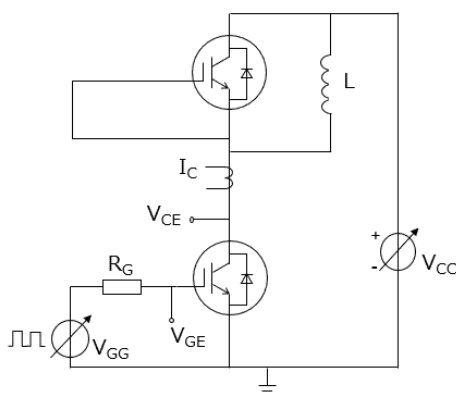


Fig. 6.2.1 Test Circuit

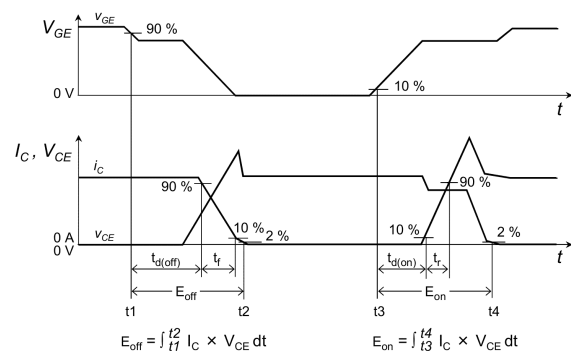


Fig. 6.2.2 Timing Chart

6.3. Diode Electrical Characteristics

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Diode forward voltage	V_F	$I_F = 15\text{ A}$, $V_{GE} = 0\text{ V}$ (pulse test)	$T_c = 25\text{ }^\circ\text{C}$	—	1.20	1.50	V
			$T_c = 175\text{ }^\circ\text{C}$	—	1.10	—	
Reverse recovery time	t_{rr}	$V_R = 400\text{ V}$, $I_F = 15\text{ A}$, $di_F/dt = -500\text{ A}/\mu\text{s}$ See Fig.6.3.1, 6.3.2	$T_c = 25\text{ }^\circ\text{C}$	—	0.20	—	μs
			$T_c = 175\text{ }^\circ\text{C}$	—	0.27	—	
Reverse recovery charge	Q_{rr}	$V_R = 400\text{ V}$, $I_F = 15\text{ A}$, $di_F/dt = -500\text{ A}/\mu\text{s}$ See Fig.6.3.1, 6.3.2	$T_c = 25\text{ }^\circ\text{C}$	—	3.5	—	μC
			$T_c = 175\text{ }^\circ\text{C}$	—	5.0	—	
Peak reverse recovery current	I_{rr}	$V_R = 400\text{ V}$, $I_F = 15\text{ A}$, $di_F/dt = -500\text{ A}/\mu\text{s}$ See Fig.6.3.1, 6.3.2	$T_c = 25\text{ }^\circ\text{C}$	—	35	—	A
			$T_c = 175\text{ }^\circ\text{C}$	—	39	—	
Peak rate off fall of reverse recovery current	di_{rr}/dt	$V_R = 400\text{ V}$, $I_F = 15\text{ A}$, $di_F/dt = -500\text{ A}/\mu\text{s}$ See Fig.6.3.1, 6.3.2	$T_c = 25\text{ }^\circ\text{C}$	—	-350	—	$\text{A}/\mu\text{s}$
			$T_c = 175\text{ }^\circ\text{C}$	—	-310	—	

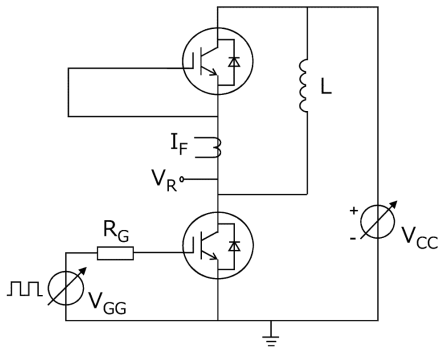


Fig. 6.3.1 Test Circuit

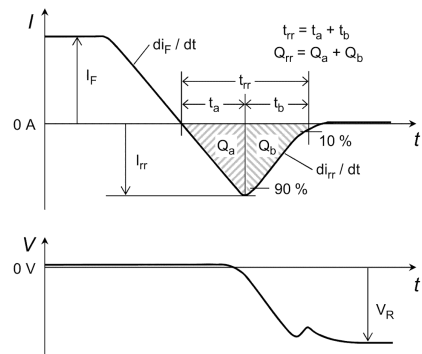


Fig. 6.3.2 Timing Chart

7. Marking (Note)

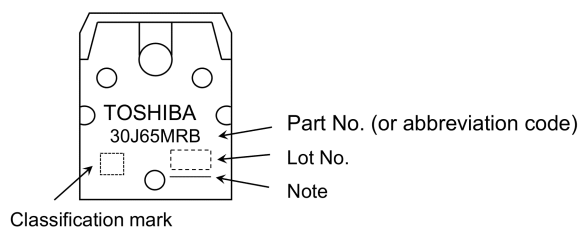


Fig. 7.1 Marking

Note: A line under a Lot No. identifies the indication of product Labels.

[[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product.

The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

8. Characteristics Curves (Note)

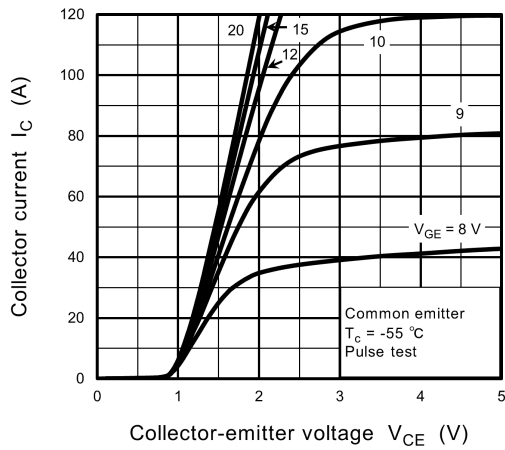


Fig. 8.1 $I_C - V_{CE}$

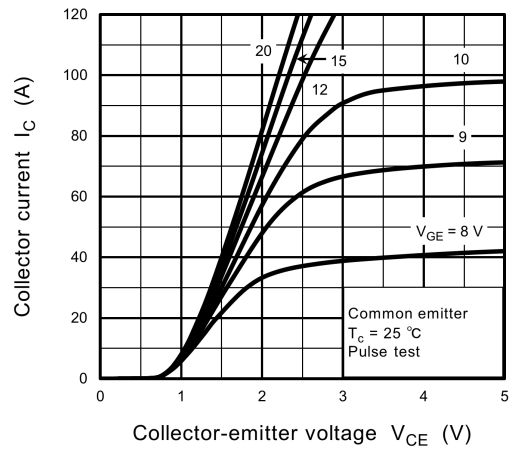


Fig. 8.2 $I_C - V_{CE}$

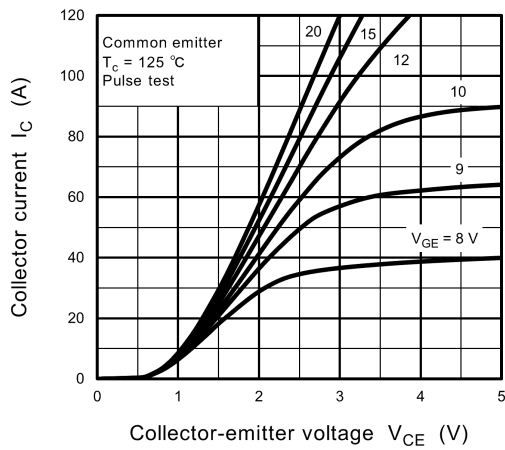


Fig. 8.3 $I_C - V_{CE}$

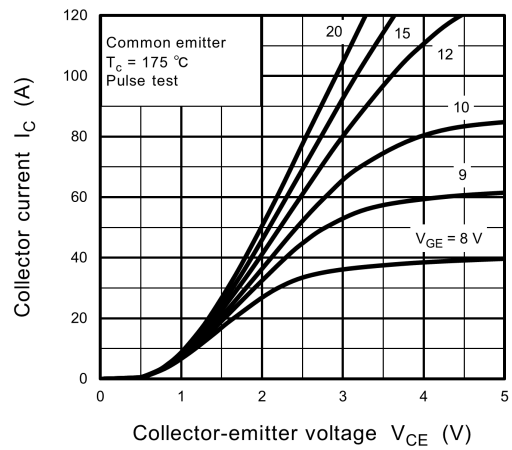


Fig. 8.4 $I_C - V_{CE}$

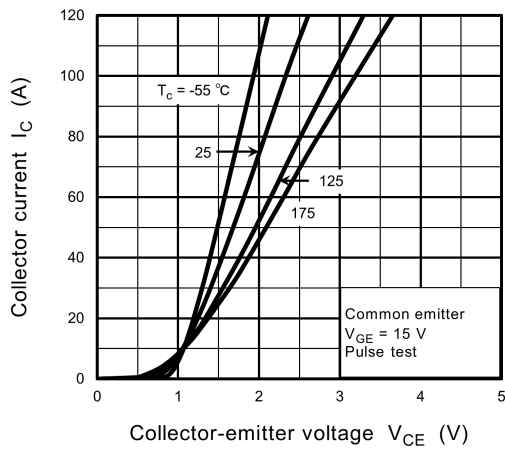


Fig. 8.5 $I_C - V_{CE}$

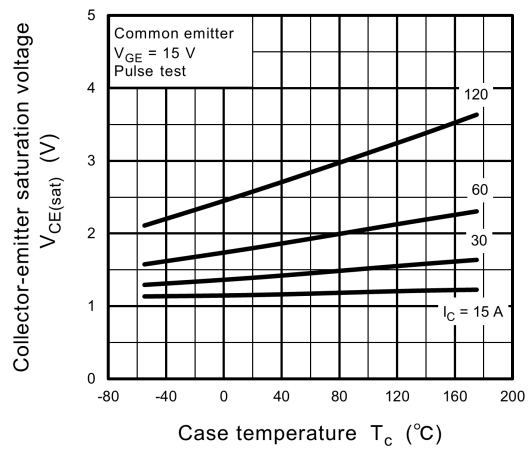


Fig. 8.6 $V_{CE(sat)} - T_C$

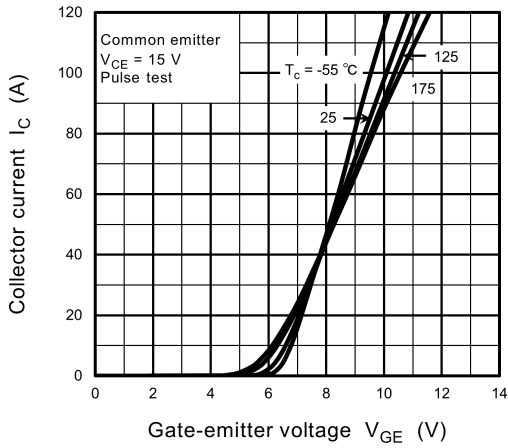


Fig. 8.7 $I_C - V_{GE}$

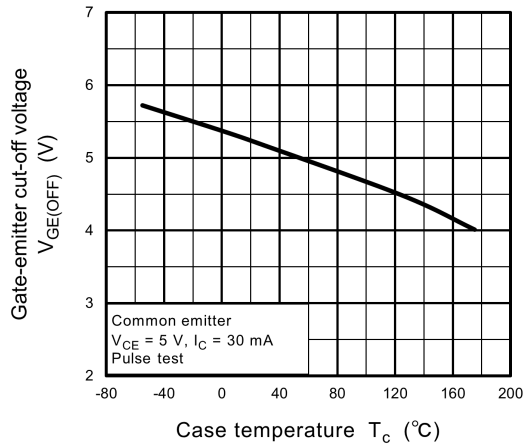


Fig. 8.8 $V_{GE(OFF)} - T_c$

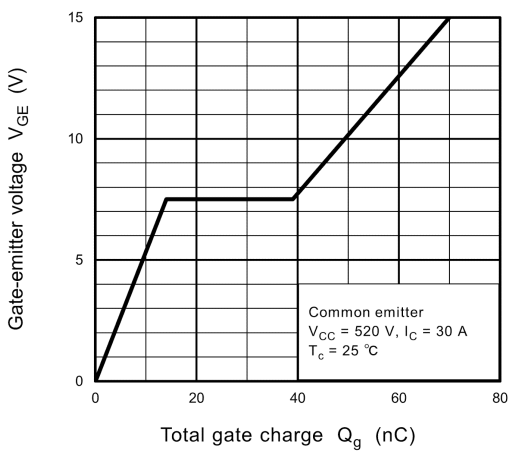


Fig. 8.9 $V_{GE} - Q_g$

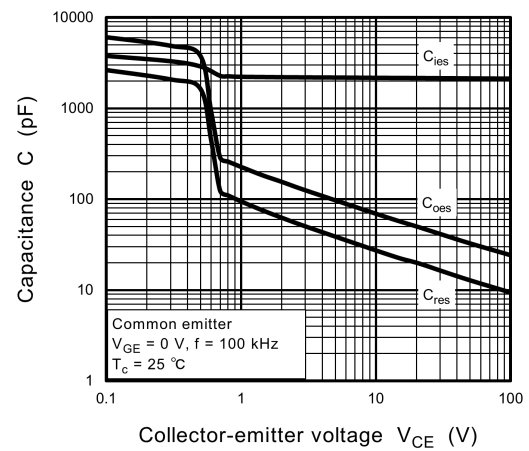


Fig. 8.10 $C - V_{CE}$

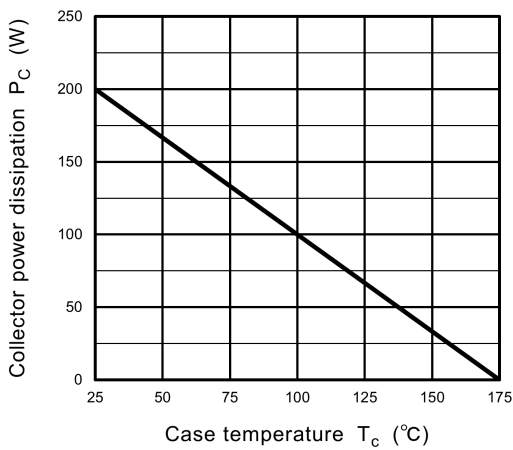


Fig. 8.11 $P_C - T_c$

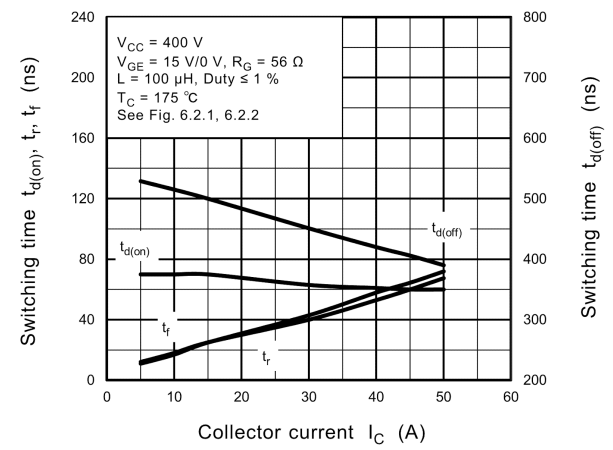


Fig. 8.12 Switching Time - I_C

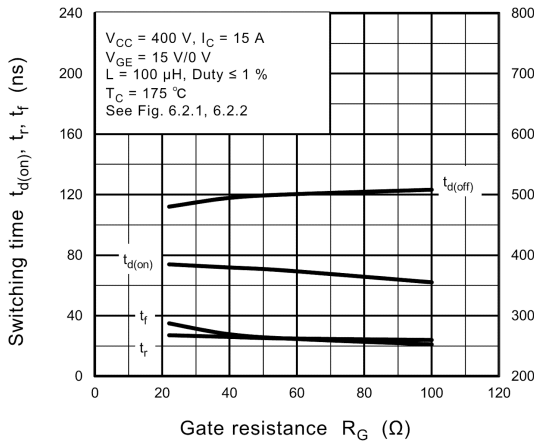


Fig. 8.13 Switching Time - R_G

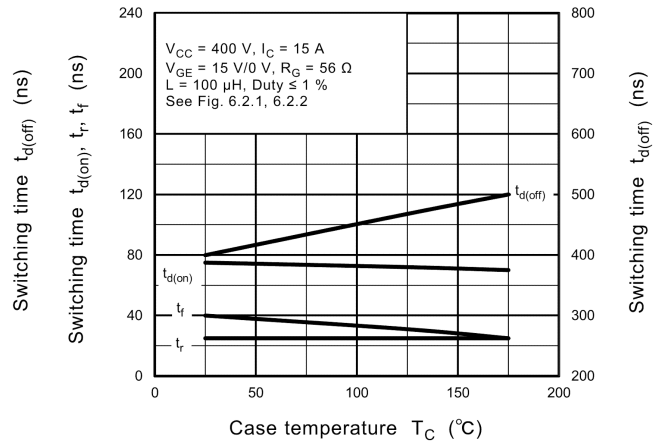


Fig. 8.14 Switching Time - T_C

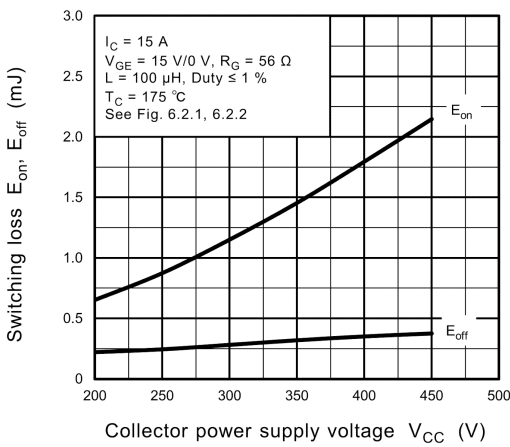


Fig. 8.15 Switching loss - V_{CE}

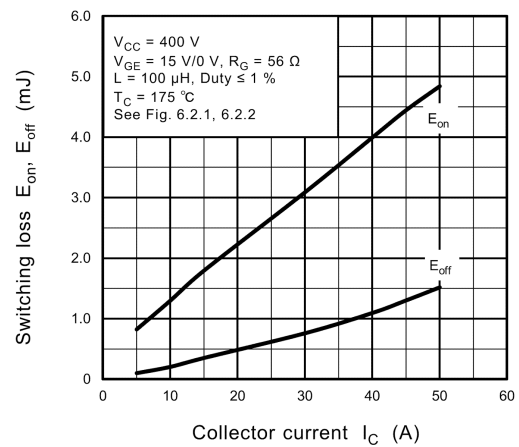


Fig. 8.16 Switching loss - I_C

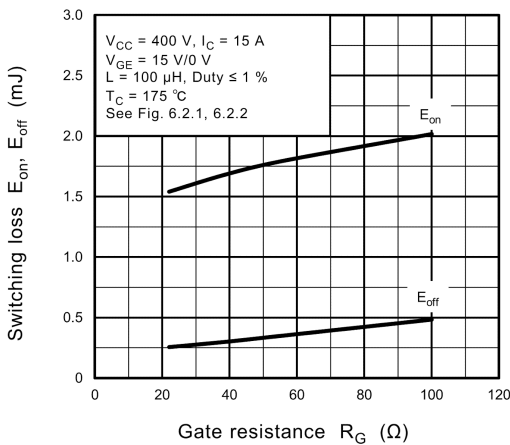


Fig. 8.17 Switching loss - R_G

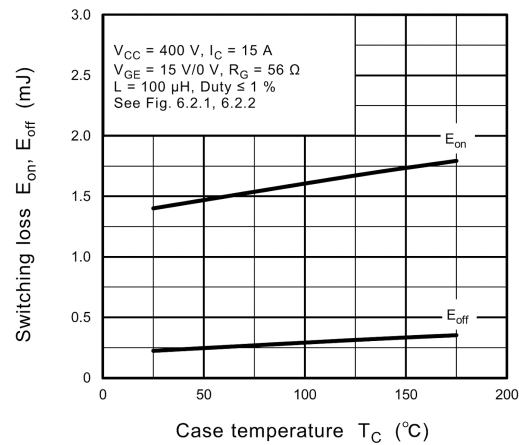


Fig. 8.18 Switching loss - T_C

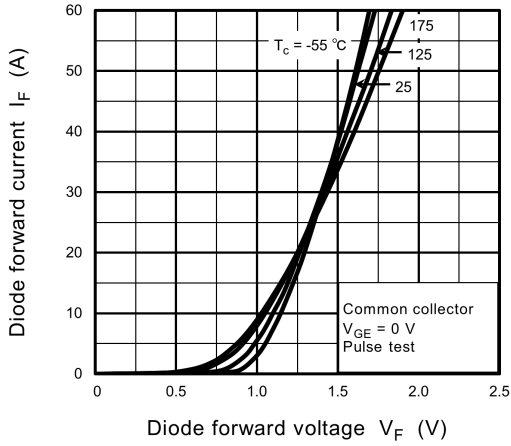


Fig. 8.19 $I_F - V_F$

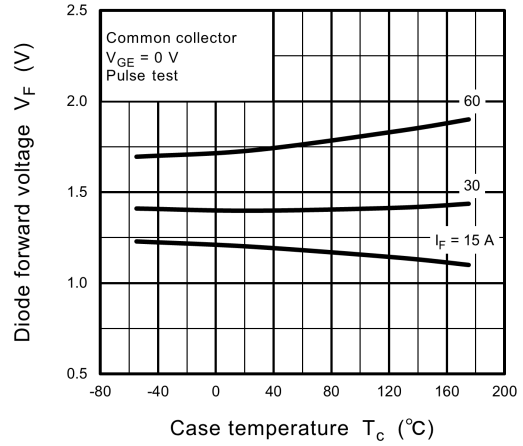


Fig. 8.20 $V_F - T_C$

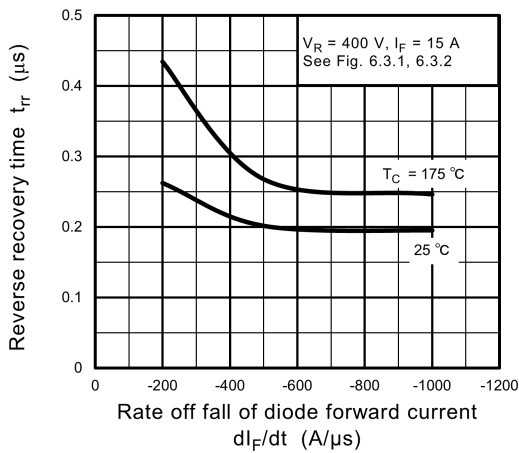


Fig. 8.21 $t_{rr} - dI_F/dt$

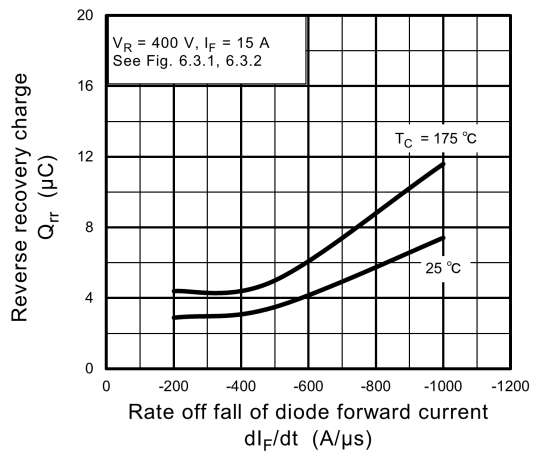


Fig. 8.22 $Q_{rr} - dI_F/dt$

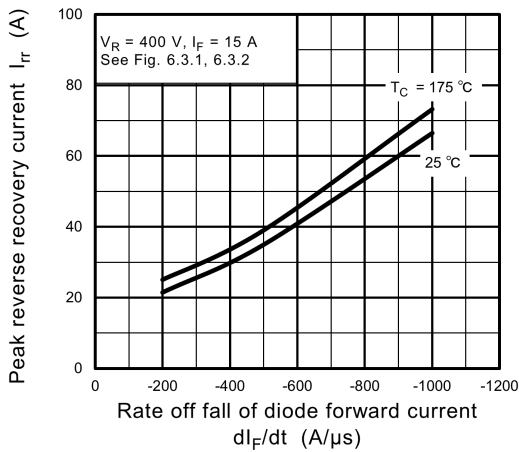


Fig. 8.23 $I_{rr} - dI_F/dt$

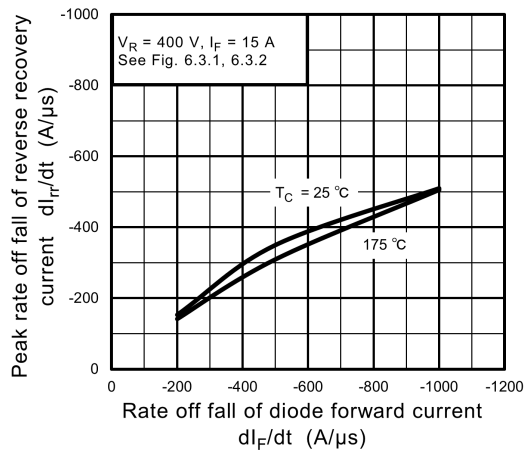


Fig. 8.24 $dI_{rr}/dt - dI_F/dt$

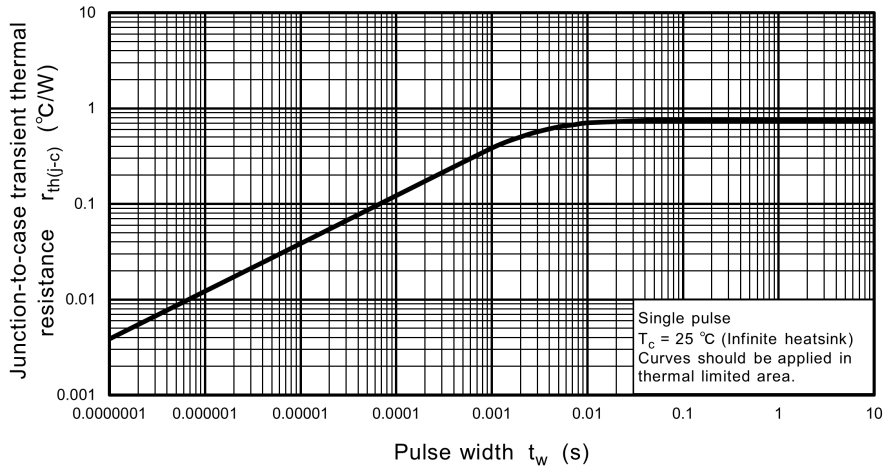


Fig. 8.25 $r_{th(j-c)} - t_w$ (Guaranteed Maximum)

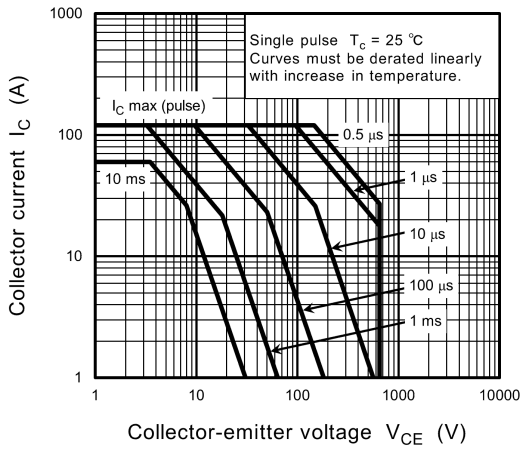
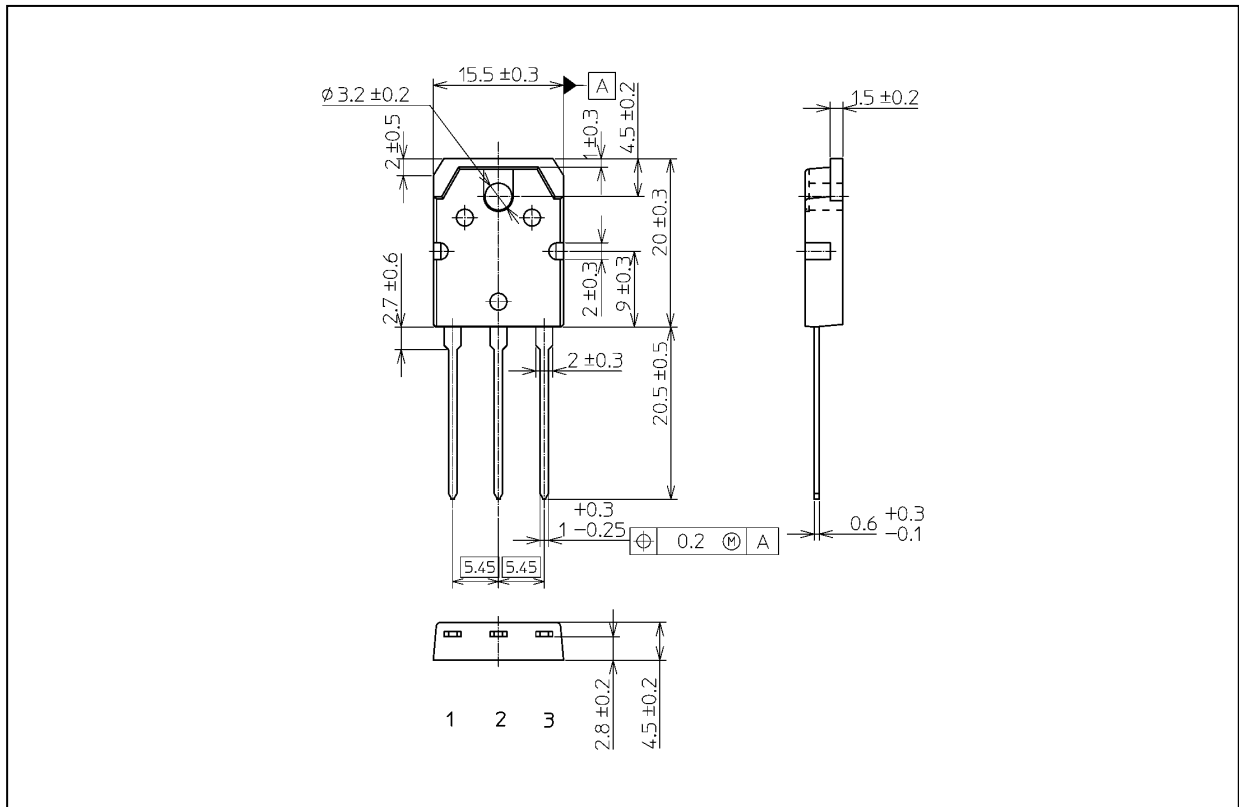


Fig. 8.26 Safe Operating Area (Guaranteed Maximum)

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Package Dimensions

Unit: mm



Weight: 4.6 g (typ.)

Package Name(s)
TOSHIBA: 2-16C1S
Nickname: TO-3P(N)

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