Discrete IGBTs Silicon N-Channel IGBT

GT30J65MRB

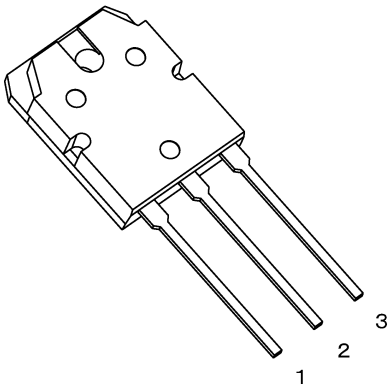
1. Applications

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

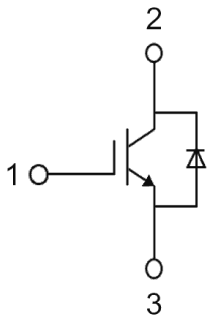
2. Features

(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 ns (typ.) (I_C = 15 A, R_G = 56 Ω)
(5) Low saturation voltage: $V_{CE(sat)}$ = 1.40 V (typ.) (I_C = 30 A)
(6) High junction temperature: T_j = 175 °C (max)

3. Packaging and Internal Circuit



TO-3P(N)



1: Gate
2: Collector (Heatsink)
3: Emitter

Start of commercial production
2022-12

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4. Absolute Maximum Ratings (Note) (T_a = 25 °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 °C)	60	A
		(T_c = 100 °C)	30	
Collector current (1 ms)	I_{CP}		120	A
Diode forward current (DC)	I_F	(T_c = 25 °C)	30	A
		(T_c = 100 °C)	15	
Diode forward current (100 μs)	I_{FP}		60	A
Collector power dissipation	P_C	(T_c = 25 °C)	200	W
Junction temperature (Note1)	T_j		175	°C
Storage temperature	T_{stg}		-55 to 175	°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 °C.

5. Thermal Characteristics

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

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6. Electrical Characteristics

6.1. Static Characteristics (T_a = 25 °C, unless otherwise specified)

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

6.2. Dynamic Characteristics (T_a = 25 °C, unless otherwise specified)

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

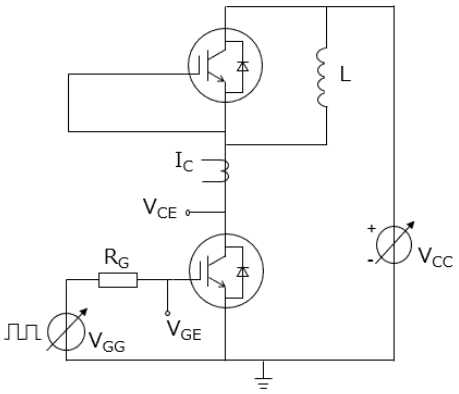


Fig. 6.2.1 Test Circuit

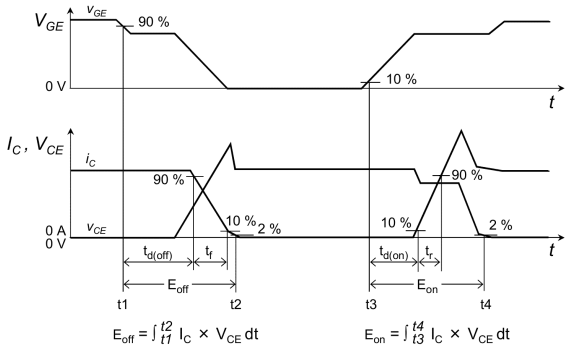


Fig. 6.2.2 Timing Chart

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6.3. Diode Electrical Characteristics

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

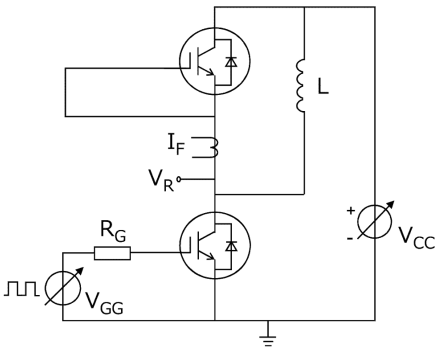


Fig. 6.3.1 Test Circuit

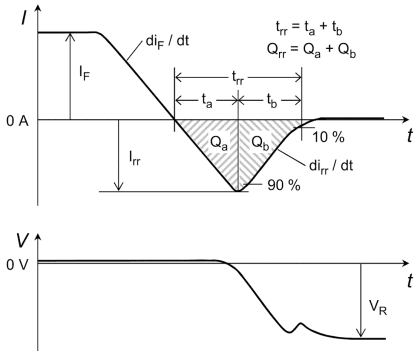


Fig. 6.3.2 Timing Chart

7. Marking (Note)

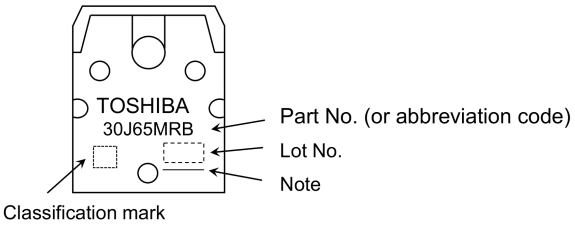


Fig. 7.1 Marking

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.

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8. Characteristics Curves (Note)

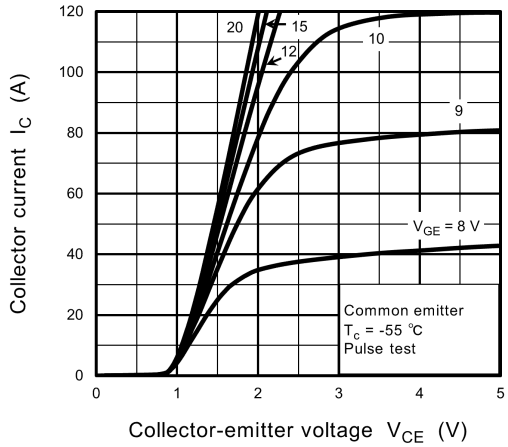


Fig. 8.1 I_C - V_{CE}

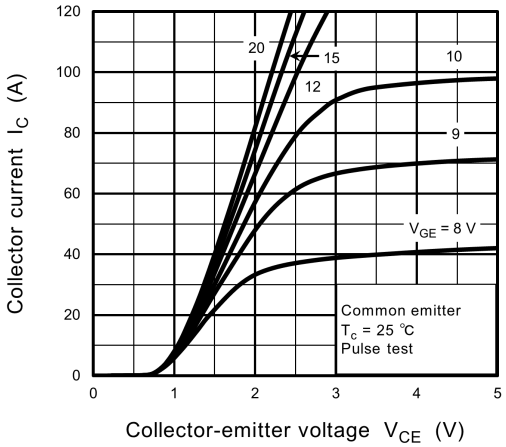


Fig. 8.2 I_C - V_{CE}

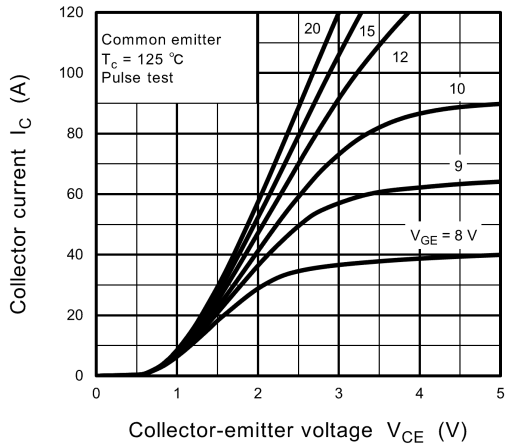


Fig. 8.3 I_C - V_{CE}

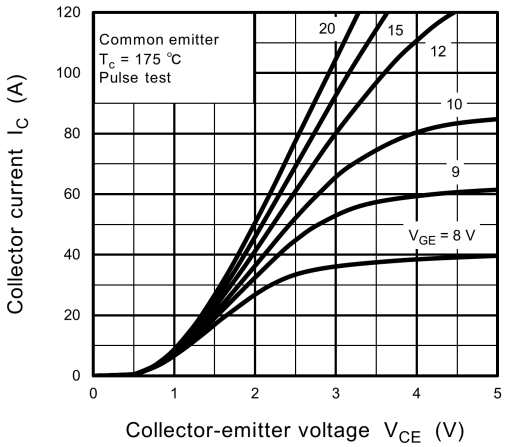


Fig. 8.4 I_C - V_{CE}

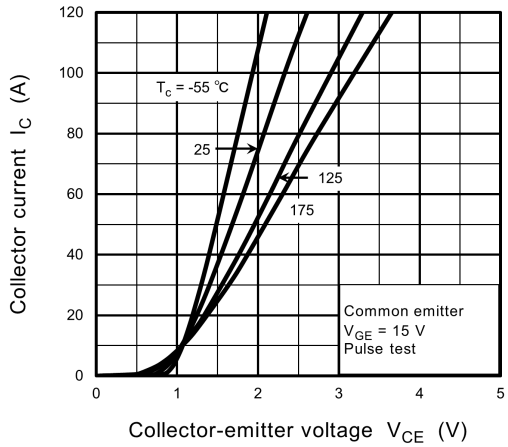


Fig. 8.5 I_C - V_{CE}

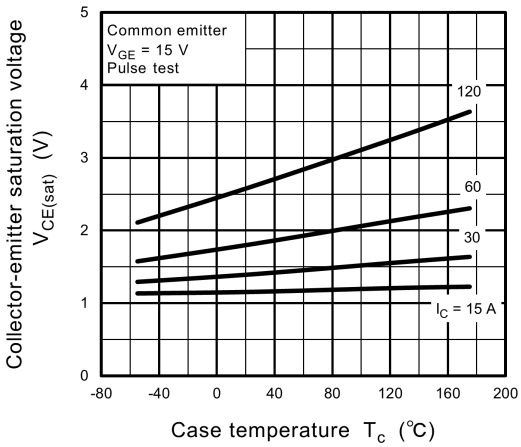


Fig. 8.6 $V_{CE(sat)}$ - T_c

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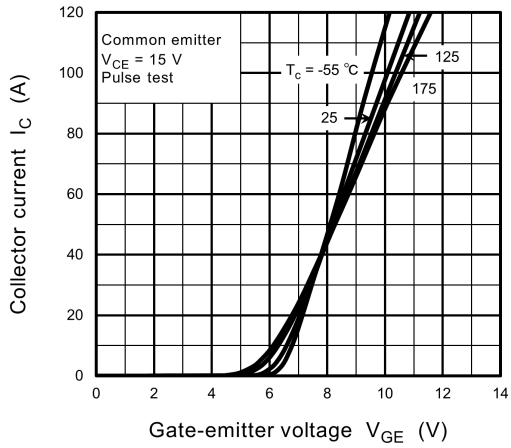


Fig. 8.7 I_C - V_{GE}

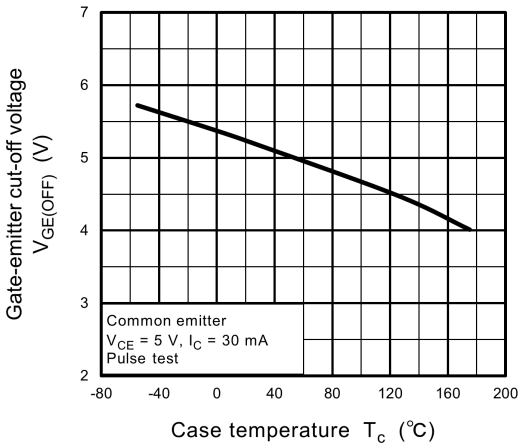


Fig. 8.8 $V_{GE(OFF)}$ - T_c

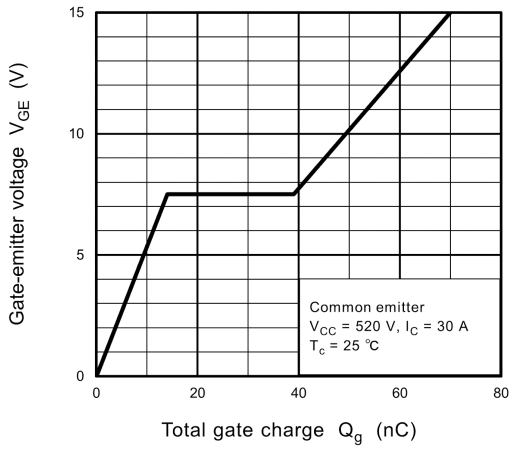


Fig. 8.9 V_{GE} - Q_g

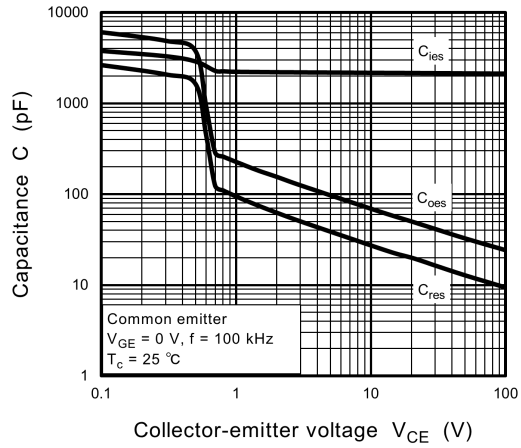


Fig. 8.10 C - V_{CE}

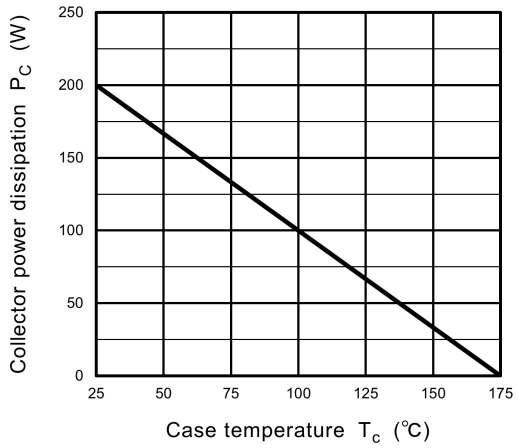


Fig. 8.11 P_C - T_c

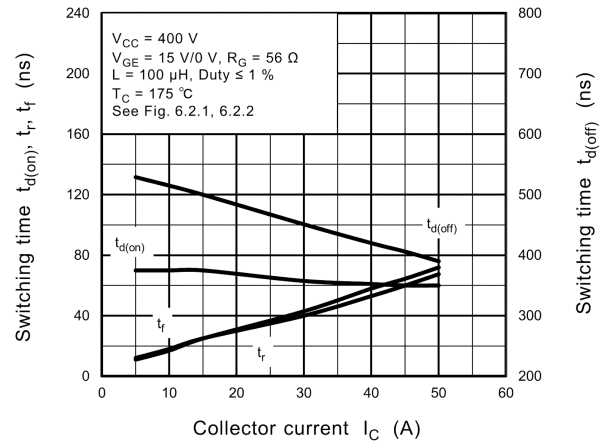


Fig. 8.12 Switching Time - I_C

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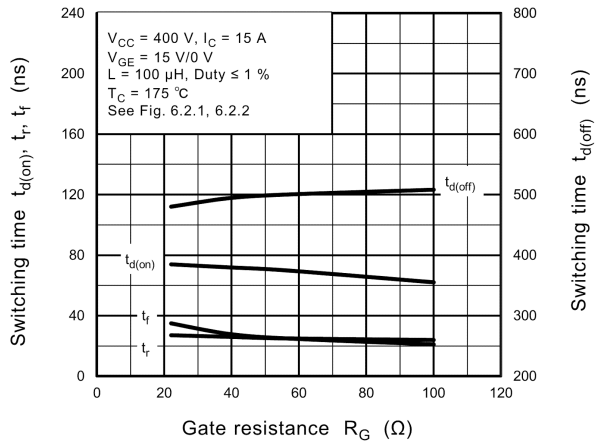


Fig. 8.13 Switching Time - R_G

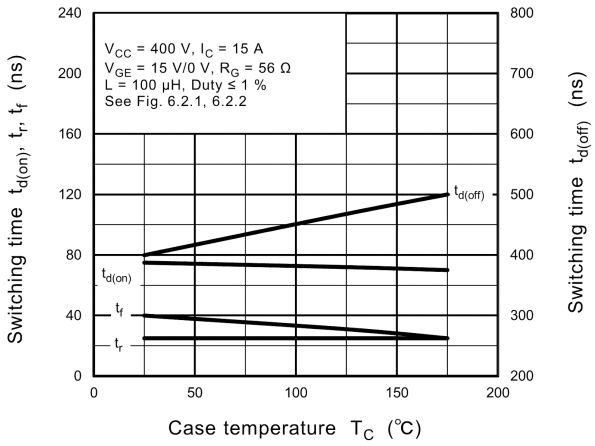


Fig. 8.14 Switching Time - T_c

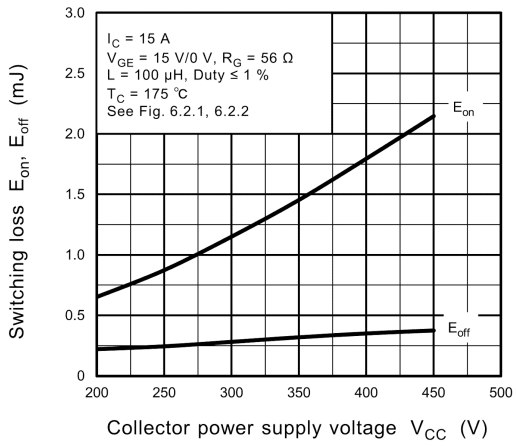


Fig. 8.15 Switching loss - V_{CE}

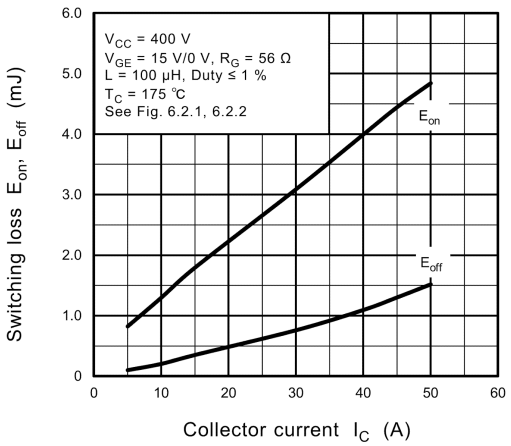


Fig. 8.16 Switching loss - I_C

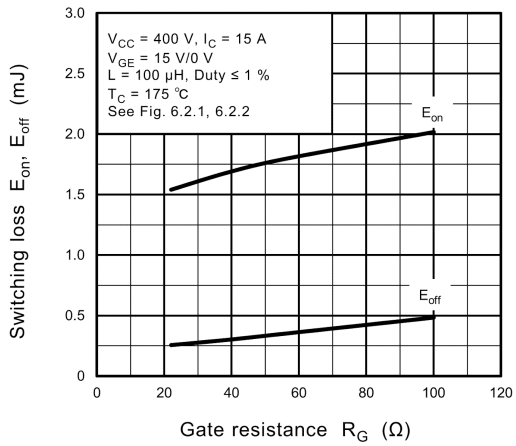


Fig. 8.17 Switching loss - R_G

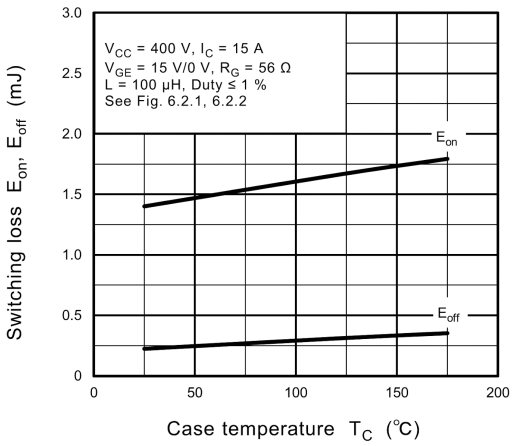


Fig. 8.18 Switching loss - T_c

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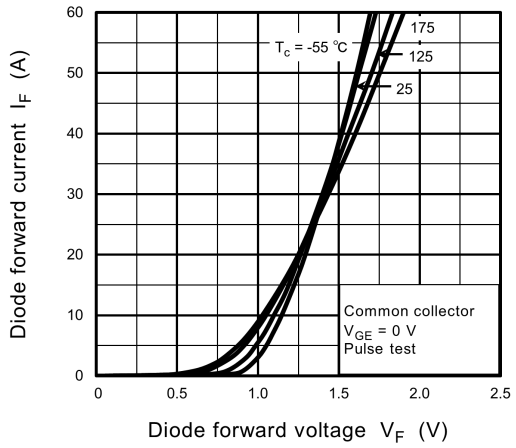


Fig. 8.19 I_F - V_F

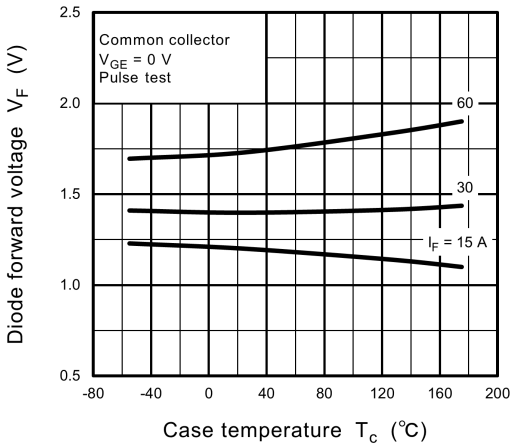


Fig. 8.20 V_F - T_c

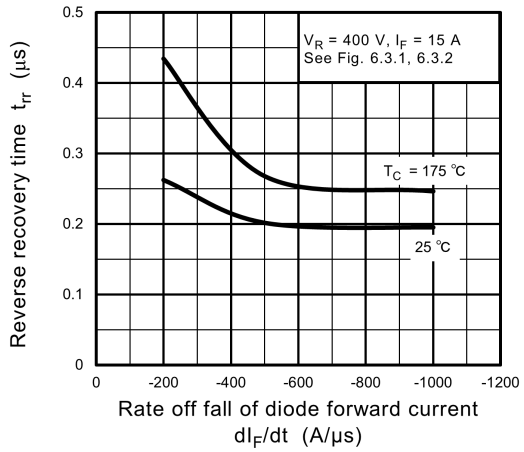


Fig. 8.21 t_{rr} - dI_F/dt

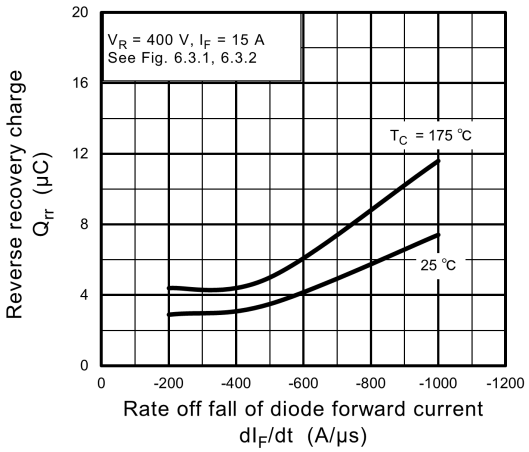


Fig. 8.22 Q_{rr} - dI_F/dt

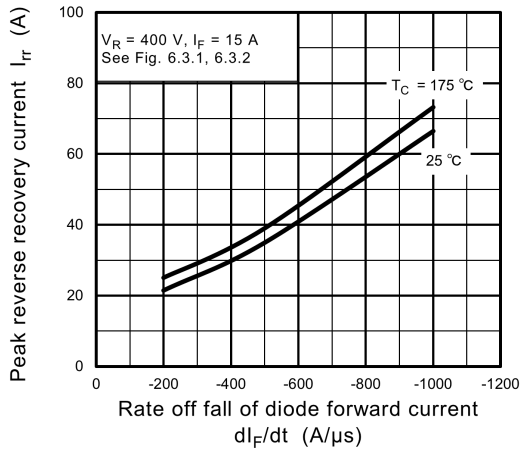


Fig. 8.23 I_{rr} - dI_F/dt

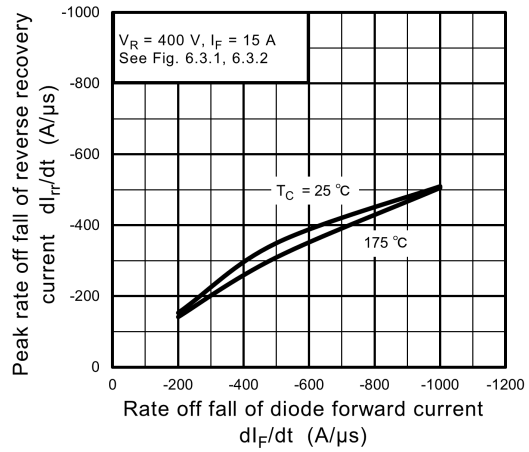


Fig. 8.24 dI_{rr}/dt - dI_F/dt

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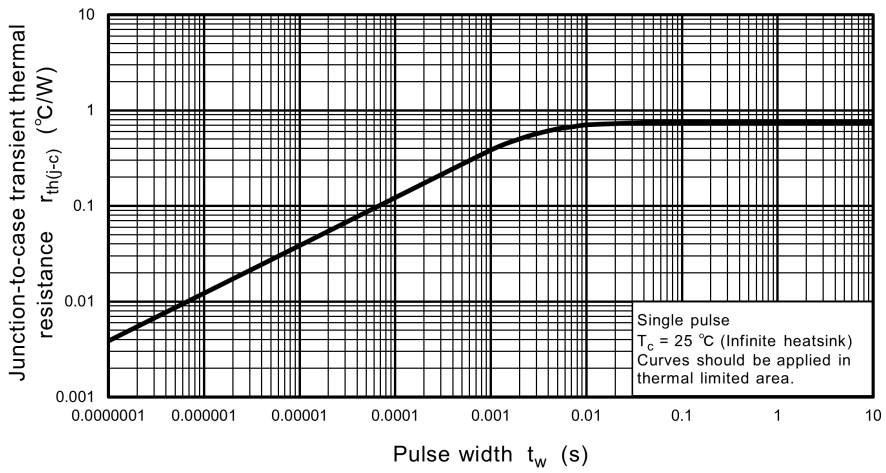


Fig. 8.25 $r_{th(j-c)}$ - t_w (Guaranteed Maximum)

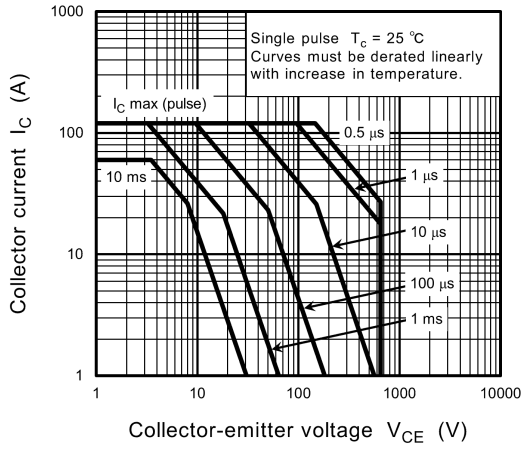
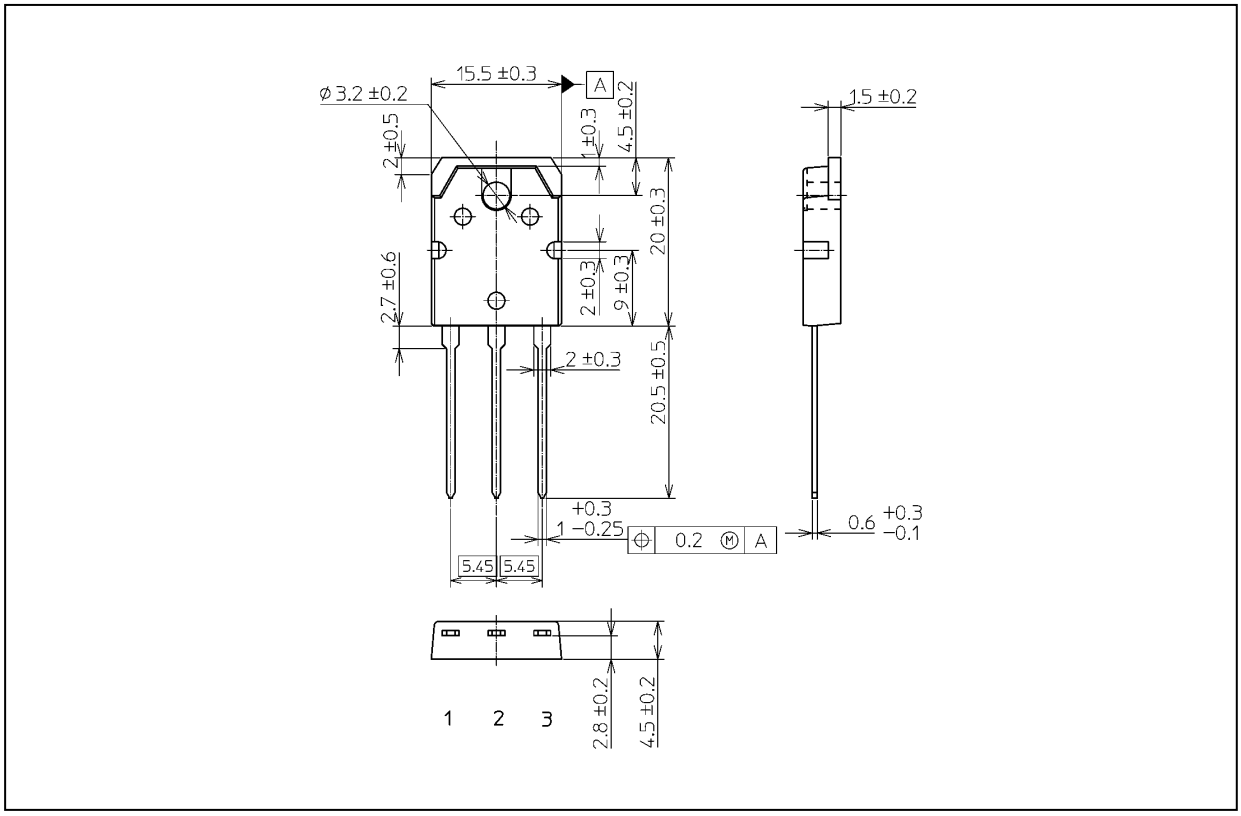


Fig. 8.26 Safe Operating Area (Guaranteed Maximum)

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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