Discrete IGBTs　Silicon N-Channel IGBT

GT50J123

1. Applications

- Hard Switching
- High-Speed Switching
- Power Factor Correction (PFC)

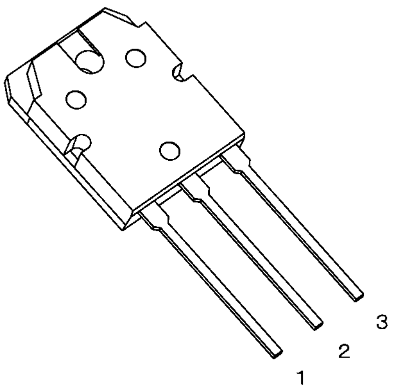
2. Features

(1) Sixth generation

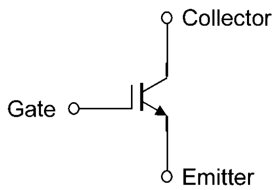
(2) Low saturation voltage: $V_{CE(sat)}$ = 1.9 V (typ.) (I_C = 50 A, T_a = 25 °C)

(3) 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
2018-10

4. Absolute Maximum Ratings (Note) (T_a = 25°C, unless otherwise specified)

Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		V_{CES}	600	V
Gate-emitter voltage		V_{GES}	±25	
Collector current (DC)	(T_c = 25°C)	I_C	59	A
Collector current (DC)	(T_c = 100°C)	I_C	33	
Collector current (1 ms)		I_{CP}	120	
Short circuit withstand time	(Note 1)	t_{sc}	5	μs
Collector power dissipation	(T_c = 25°C)	P_C	230	W
Junction temperature	(Note 2)	T_j	175	°C
Storage temperature		T_{stg}	-55 to 175	
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).

In general, loss of IGBT increases more when it has positive temperature coefficient and gets higher temperature.
In case that the temperature rise due to loss of IGBT exceeds the heat release capacity of a device, it leads to thermorunaway and results in destruction.
Therefore, please design heat release of a device with due consideration to the temperature rise of IGBT.

Note 1: V_{CC} = 300 V, V_{GG} = +15 V/0 V, R_G = 24 Ω, $T_j \leq$ 150°C

Note 2: Ensure that the junction temperature does not exceed 175 °C.

5. Thermal Characteristics

Characteristics	Symbol	Max	Unit
Junction-to-case thermal resistance	$R_{th(j-c)}$	0.65	°C/W

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} = 600 V, V_{GE} = 0 V	—	—	100	μA
Gate-emitter cut-off voltage	$V_{GE(OFF)}$	I_C = 3 mA, V_{CE} = 5 V	4.5	5.5	6.5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 50 A, V_{GE} = 15 V, T_c = 25°C	—	1.9	2.5	
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 50 A, V_{GE} = 15 V, T_c = 150°C	—	2.5	—	

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} = 10 V, V_{GE} = 0 V, f = 100 kHz	—	2900	—	pF
Switching time (turn-on delay time)	$t_{d(on)}$	Inductive load V_{CC} = 300 V, I_C = 30 A, V_{GG} = +15 V/0 V, R_G = 24 Ω T_c = 25°C, See Fig. 6.2.1, 6.2.2, 6.2.3	—	0.08	—	μs
Switching time (rise time)	t_r		—	0.06	—	
Switching time (turn-on time)	t_{on}		—	0.2	—	
Switching time (turn-off delay time)	$t_{d(off)}$		—	0.28	—	
Switching time (fall time)	t_f		—	0.04	—	
Switching time (turn-off time)	t_{off}		—	0.38	—	
Switching loss (turn-on switching loss)	E_{on}		—	0.8	—	mJ
Switching loss (turn-off switching loss)	E_{off}		—	0.6	—	
Switching time (turn-on delay time)	$t_{d(on)}$	Inductive load V_{CC} = 300 V, I_C = 30 A, V_{GG} = +15 V/0 V, R_G = 24 Ω T_c = 150°C, See Fig. 6.2.1, 6.2.2, 6.2.3	—	0.08	—	μs
Switching time (rise time)	t_r		—	0.08	—	
Switching time (turn-on time)	t_{on}		—	0.25	—	
Switching time (turn-off delay time)	$t_{d(off)}$		—	0.3	—	
Switching time (fall time)	t_f		—	0.06	—	
Switching time (turn-off time)	t_{off}		—	0.4	—	
Switching loss (turn-on switching loss)	E_{on}		—	1.2	—	mJ
Switching loss (turn-off switching loss)	E_{off}		—	0.8	—	

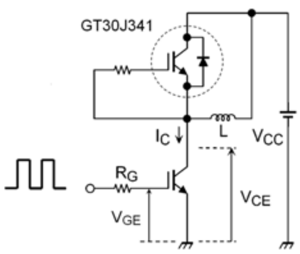


Fig. 6.2.1 Test Circuit of Switching Time

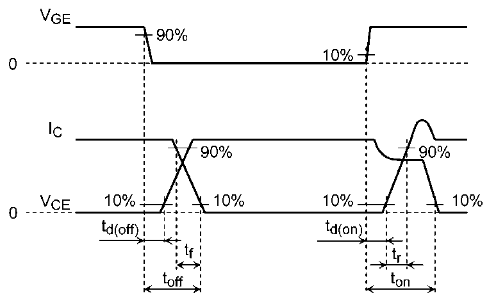


Fig. 6.2.2 Timing Chart of Switching Time

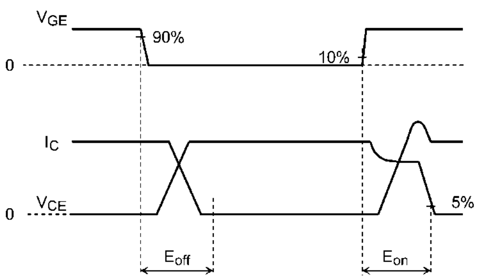


Fig. 6.2.3 Timing Chart of Switching Loss

7. Marking (Note)

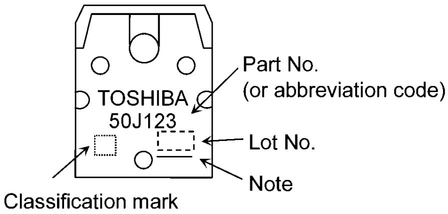


Fig. 7.1 Marking

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)

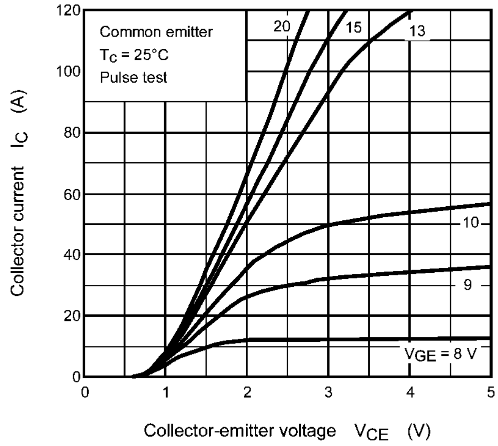


Fig. 8.1 I_C - V_{CE}

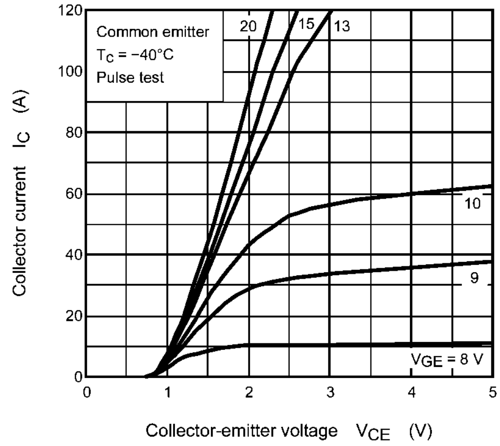


Fig. 8.2 I_C - V_{CE}

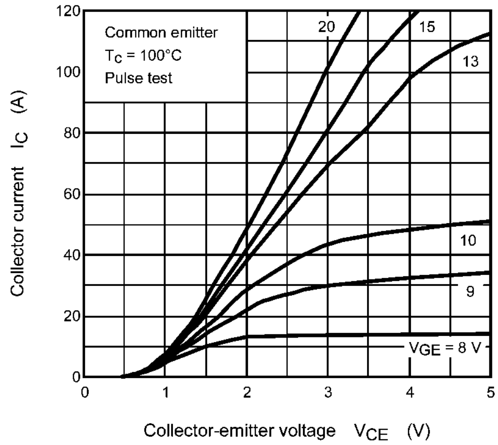


Fig. 8.3 I_C - V_{CE}

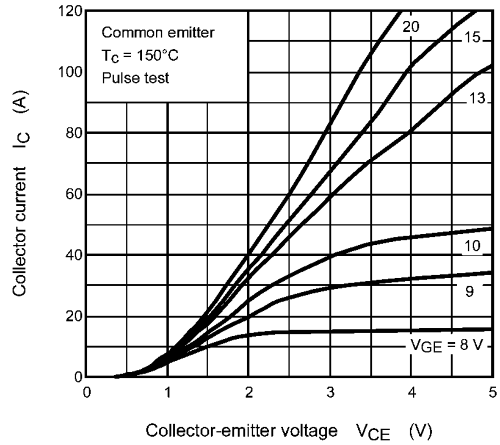


Fig. 8.4 I_C - V_{CE}

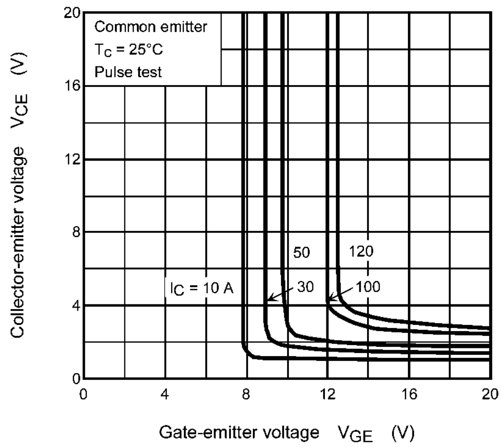


Fig. 8.5 V_{CE} - V_{GE}

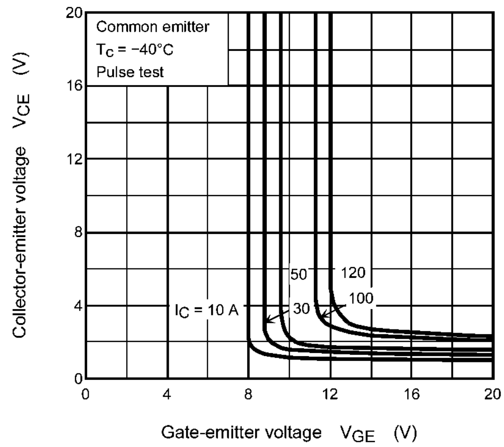


Fig. 8.6 V_{CE} - V_{GE}

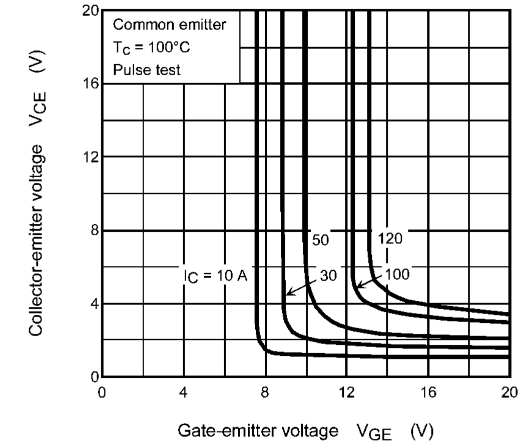


Fig. 8.7 V_{CE} - V_{GE}

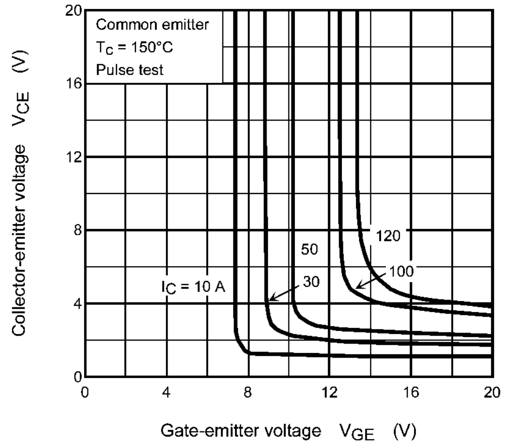


Fig. 8.8 V_{CE} - V_{GE}

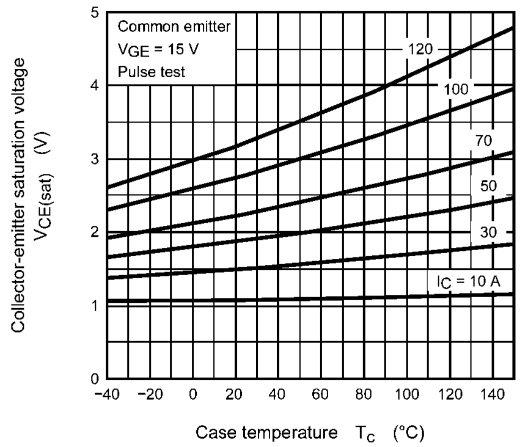


Fig. 8.9 $V_{CE(sat)}$ - T_c

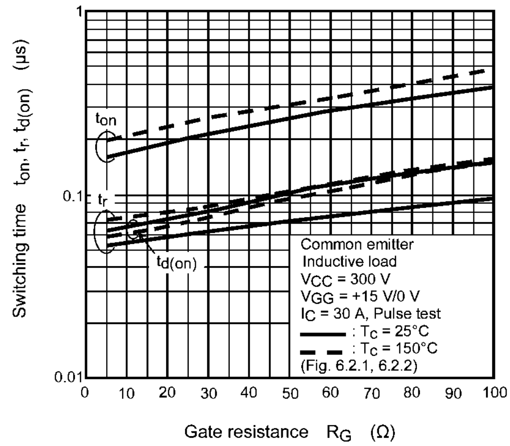


Fig. 8.10 t_{on}, t_r, $t_{d(on)}$ - R_G

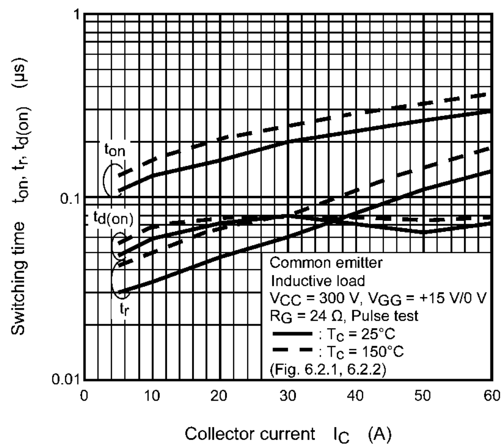


Fig. 8.11 t_{on}, t_r, $t_{d(on)}$ - I_C

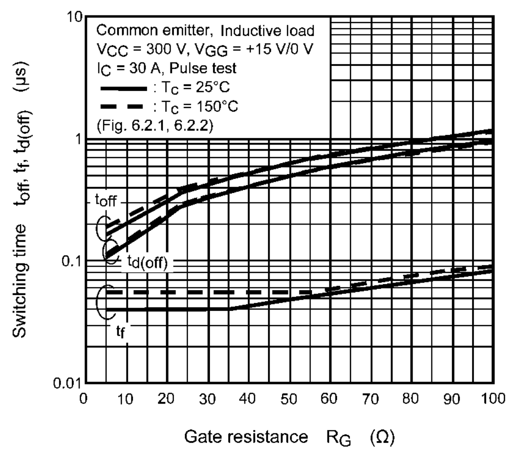


Fig. 8.12 t_{off}, t_f, $t_{d(off)}$ - R_G

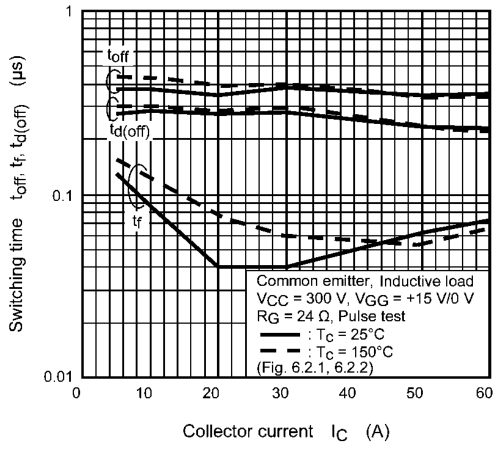


Fig. 8.13 t_{off}, t_f, $t_{d(off)}$ - I_C

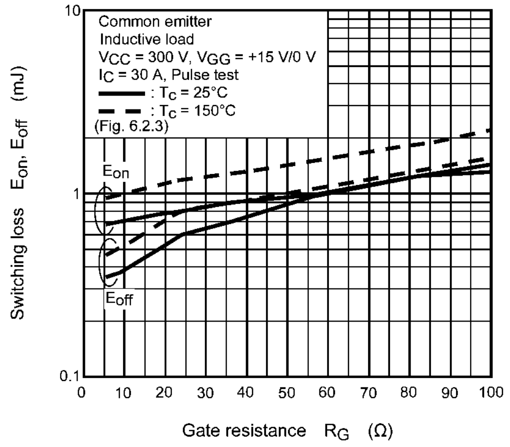


Fig. 8.14 E_{on}, E_{off} - R_G

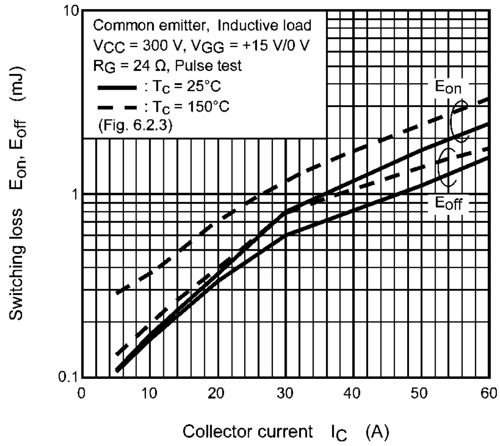


Fig. 8.15 E_{on}, E_{off} - I_C

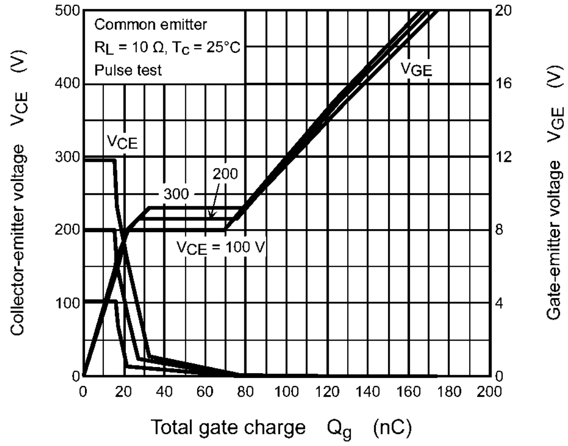


Fig. 8.16 V_{CE}, V_{GE} - Q_g

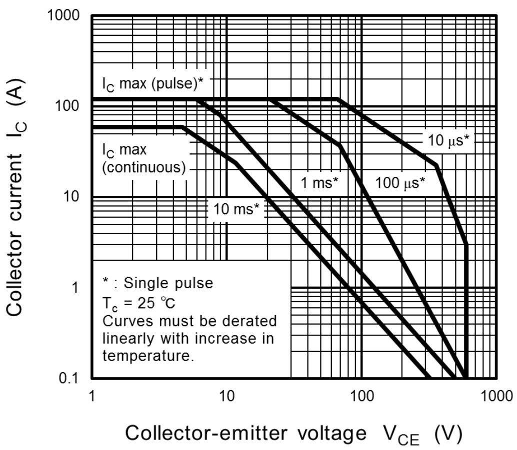


Fig. 8.17 Safe Operating Area
(Guaranteed Maximum)

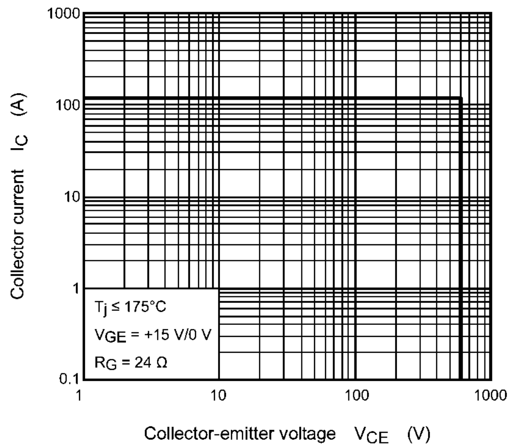


Fig. 8.18 Reverse Bias SOA
(Guaranteed Maximum)

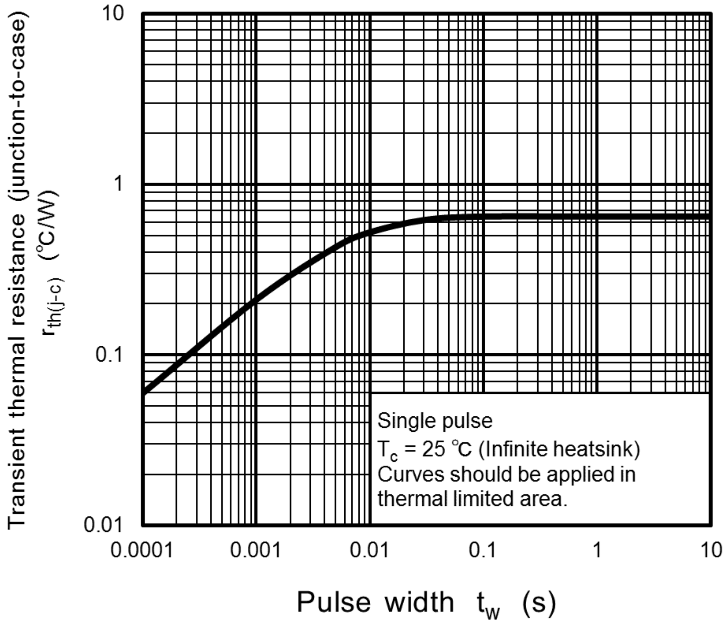
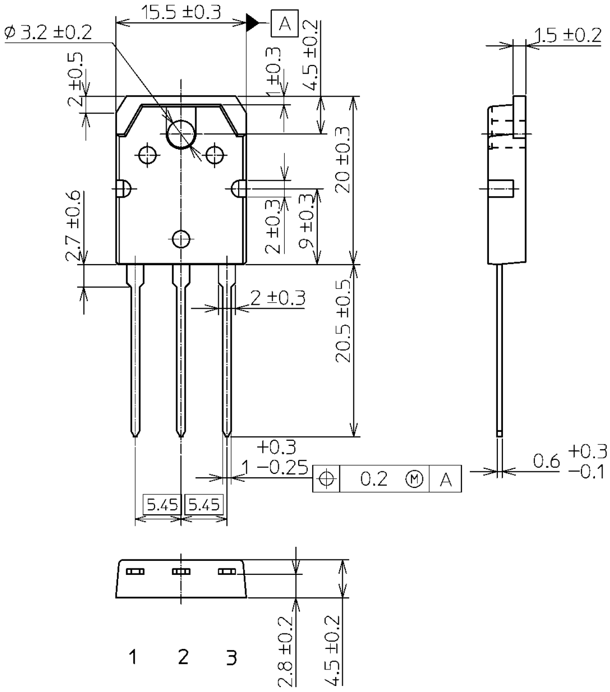


Fig. 8.19 $r_{th(j-c)}$ - t_w
(Guaranteed Maximum)

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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