TOSHIBA Insulated Gate Bipolar Transistor Silicon N Channel IGBT

GT60M324

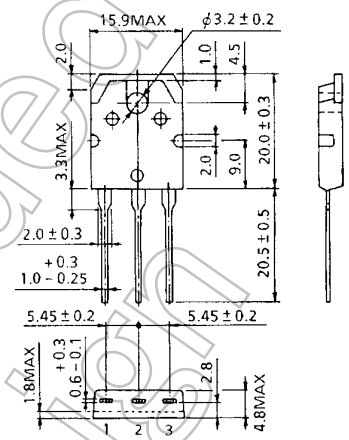
Consumer Application

Voltage Resonance Inverter Switching Application

Sixth Generation IGBT

- FRD included between emitter and collector
- Enhancement mode type
- High speed IGBT : t_f = 0.11μs (typ.) (I_C = 60A)
  FRD : t_{rr} = 0.8μs (typ.) (di/dt = −20 A/μs)
- Low saturation voltage: $V_{CE\ (sat)}$ =1.70V (typ.) (I_C = 60A)
- High Junction temperature : T_j = 175℃ (max)

Unit: mm



1. GATE
2. COLLECTOR (HEAT SINK)
3. EMITTER

JEDEC	—
JEITA	—
TOSHIBA	2-16C1C

Weight: 4.6 g (typ.)

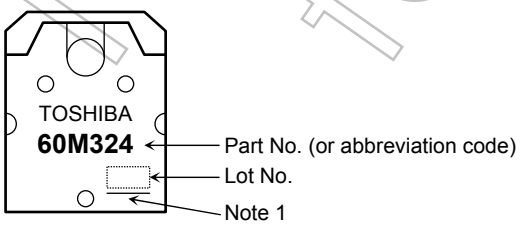
Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		V_{CES}	900	V
Gate-emitter voltage		V_{GES}	± 25	V
Collector current	DC	I_C	60	A
	1ms	I_{CP}	120	
Diode forward current	DC	I_F	15	A
	1ms	I_{FP}	120	
Collector power dissipation (Tc = 25°C)		P_C	254	W
Junction temperature		T_j	175	°C
Storage temperature		T_{stg}	−40 to 175	°C

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).

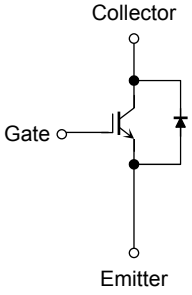
In general, loss of IGBT increases more when it has positive temperature coefficient and gets higher temperature. In case that the temperature rise due to loss of IGBT exceeds the heat release capacity of a device, it leads to thermorunaway and results in destruction. Therefore, please design heat release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

Marking



Note 1: A line under a Lot No. identifies the indication of product Labels.
[[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Equivalent Circuit



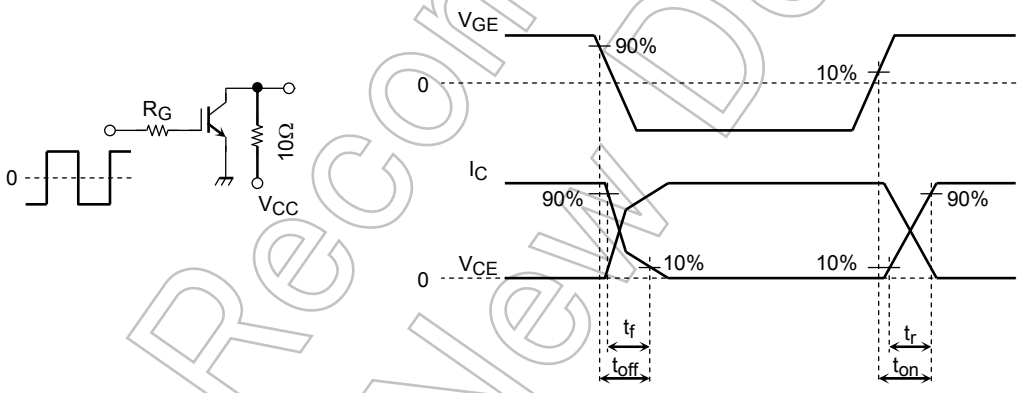
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product.
The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Start of commercial production
2011-05

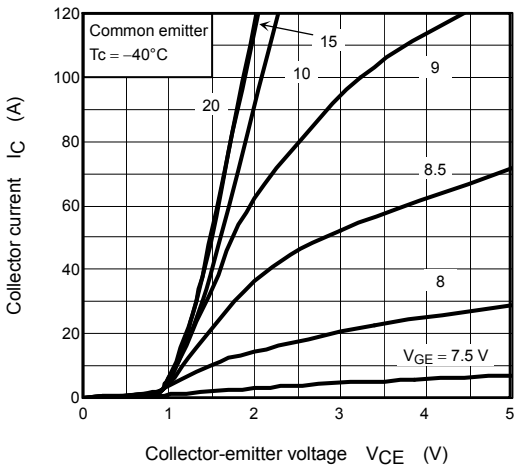
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GES}	V_{GE} = ±25 V, V_{CE} = 0	—	—	± 500	nA
Collector cut-off current		I_{CES}	V_{CE} = 900 V, V_{GE} = 0	—	—	1.0	mA
Gate-emitter cut-off voltage		$V_{GE\ (OFF)}$	I_C = 60 mA, V_{CE} = 5 V	4.5	—	7.5	V
Collector-emitter saturation voltage		$V_{CE\ (sat)}$	I_C = 10 A, V_{GE} = 15 V	—	1.10	1.60	V
			I_C = 30 A, V_{GE} = 15 V	—	1.40	1.85	
			I_C = 60 A, V_{GE} = 15 V	—	1.70	2.00	
Input capacitance		C_{ies}	V_{CE} = 10 V, V_{GE} = 0, f = 1 MHz	—	3600	—	pF
Switching time	Rise time	t_r	Resistive Load	—	0.19	—	μs
	Turn-on time	t_{on}	V_{CC} = 600 V, I_C = 60 A	—	0.31	—	
	Fall time	t_f	V_{GG} = ±15 V, R_G = 51 Ω	—	0.11	0.22	
	Turn-off time	t_{off}	(Note 2)	—	0.60	—	
Diode forward voltage		V_F	I_F = 15 A, V_{GE} = 0	—	1.3	1.9	V
Reverse recovery time		t_{rr}	I_F = 15 A, V_{GE} = 0, di/dt = − 20 A/μs	—	0.8	—	μs
Thermal Resistance (IGBT)		Rth(j-c)	—	—		0.59	°C/W
Thermal Resistance (Diode)		Rth(j-c)	—	—		4.0	°C/W

Note 2: Switching time measurement circuit and input/output waveforms



$I_C - V_{CE}$



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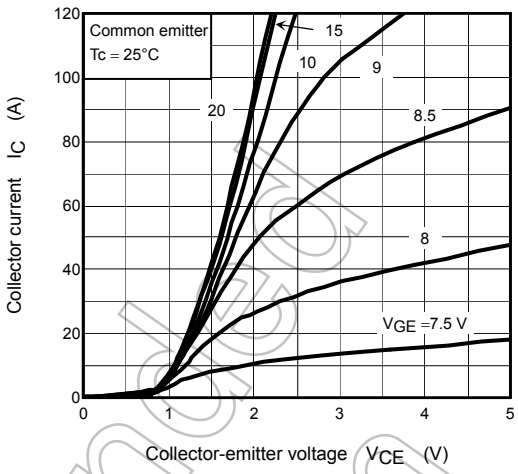

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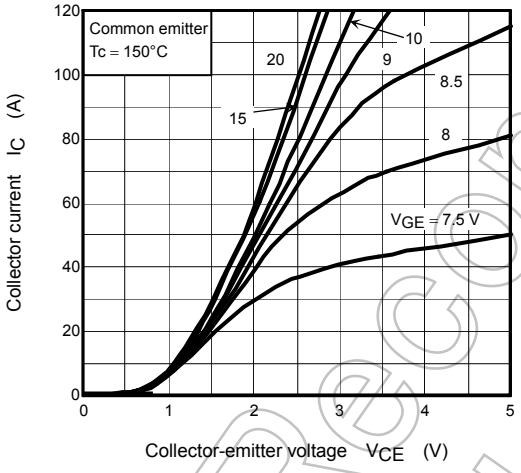
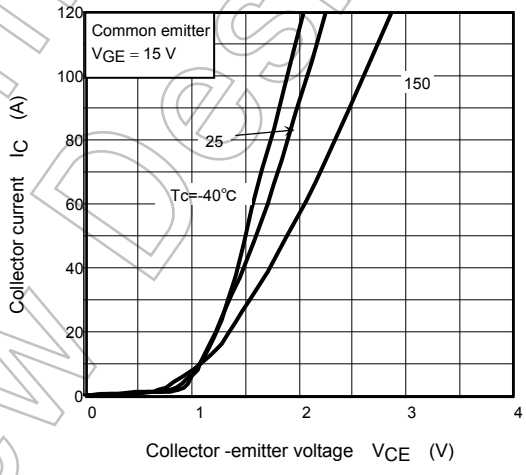
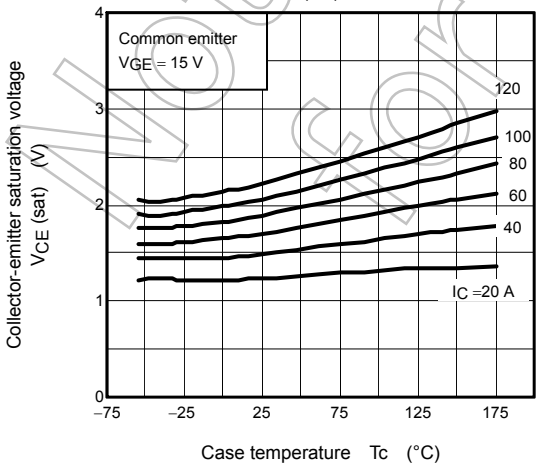


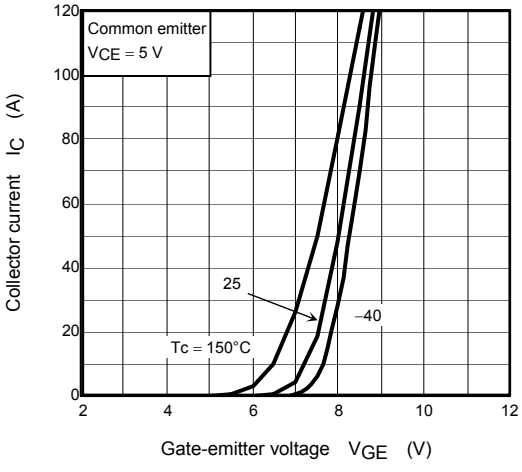
$I_C - V_{CE}$



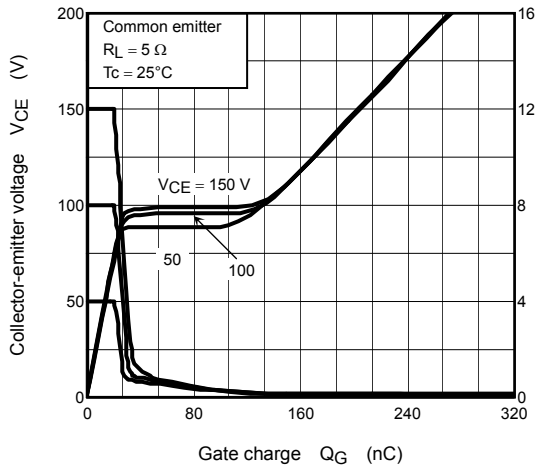
$V_{CE\ (sat)} - Tc$



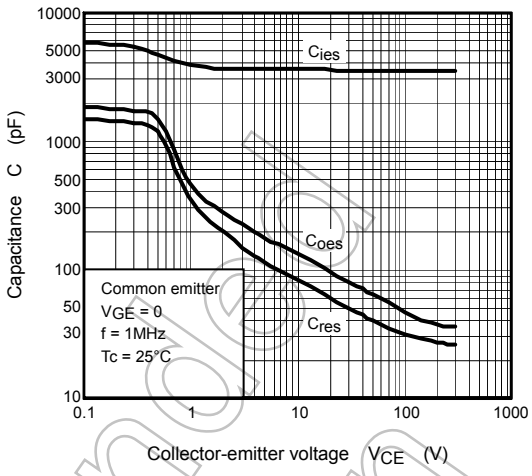
$I_C - V_{GE}$



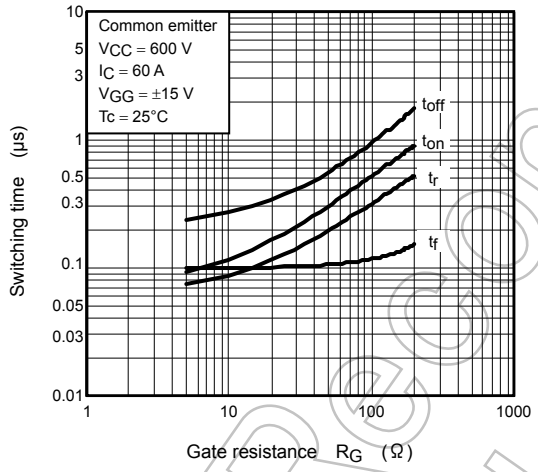
V_{CE}, V_{GE} – Q_G



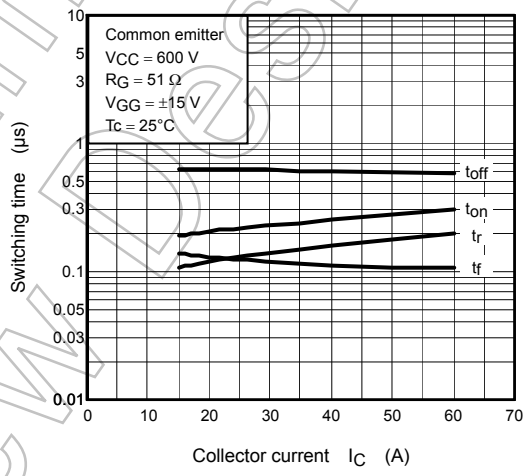
C – V_{CE}



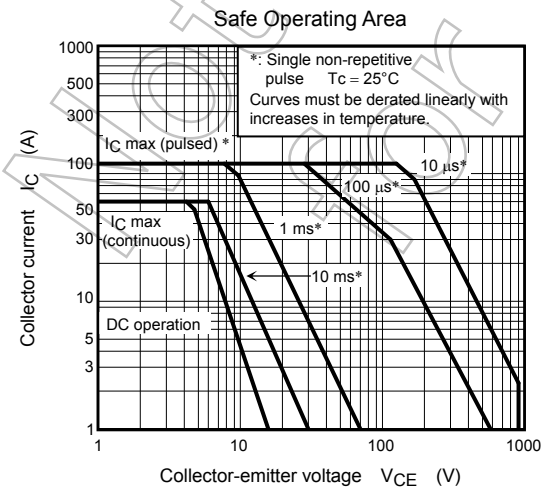
Switching Time – R_G



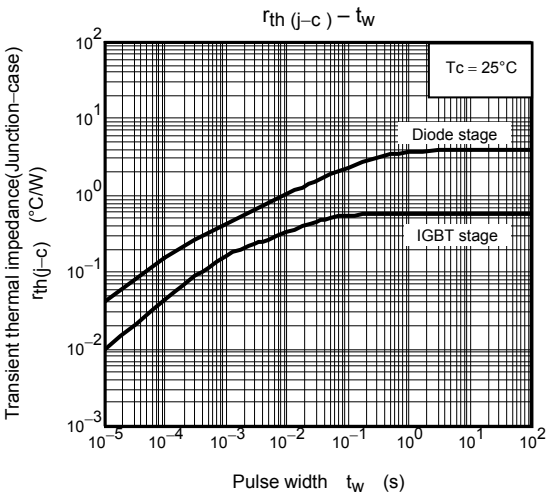
Switching Time – I_C



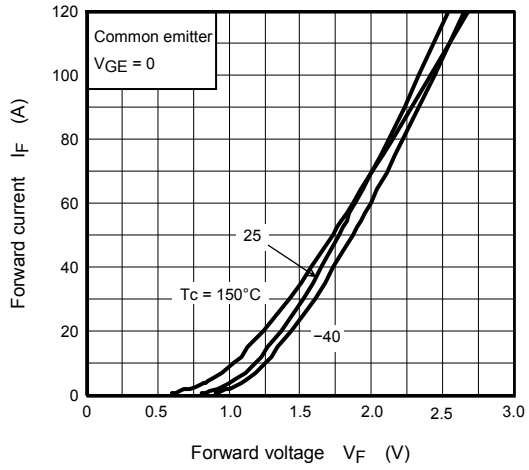
Safe Operating Area



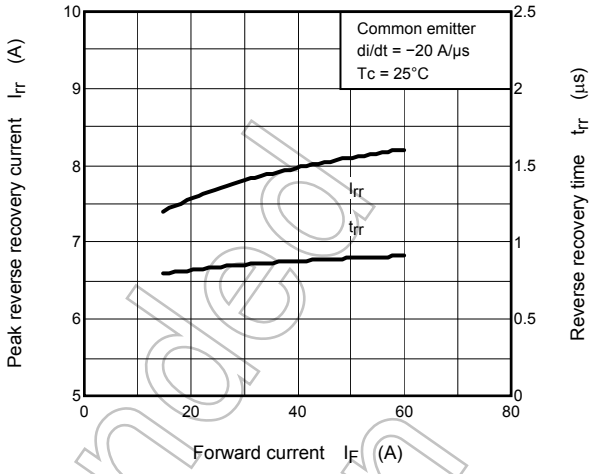
$r_{th\ (j-c)}$ – t_w



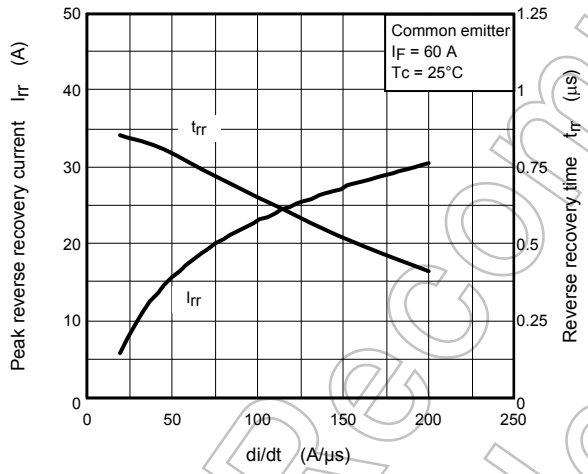
$I_F - V_F$



$I_{rr}, t_{rr} - I_F$



$I_{rr}, t_{rr} - di/dt$



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