

# GT60M324

## Consumer Application

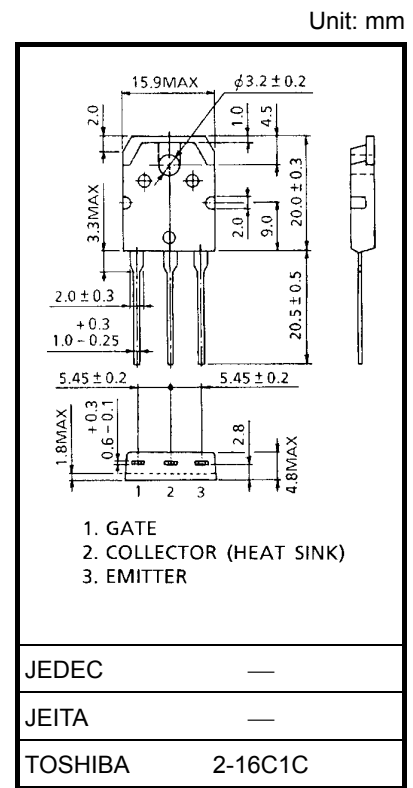
## Voltage Resonance Inverter Switching Application

## Sixth Generation IGBT

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

## Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-emitter voltage	$V_{CES}$	900	V
Gate-emitter voltage	$V_{GES}$	$\pm 25$	V
Collector current	DC	$I_C$	60
	1ms	$I_{CP}$	120
Diode forward current	DC	$I_F$	15
	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

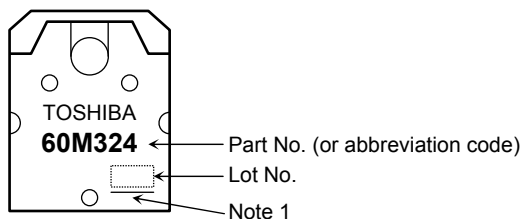


Weight: 4.6 g (typ.)

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.

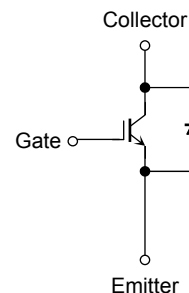
## Marking



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

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

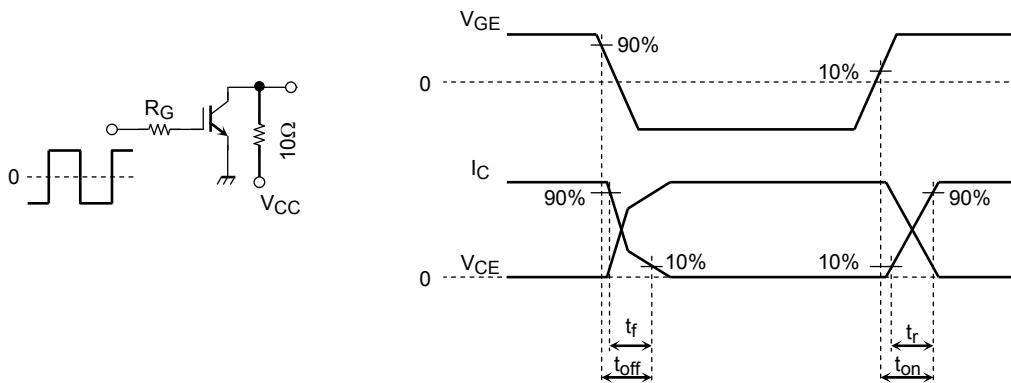
## Equivalent Circuit

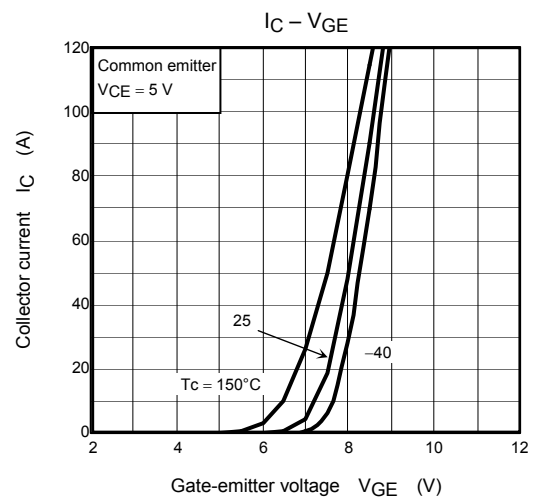
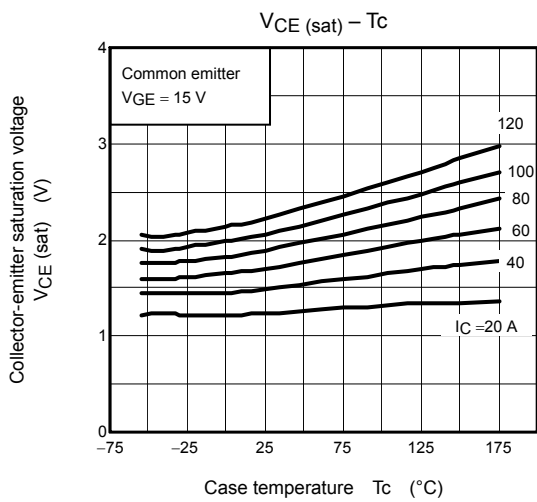
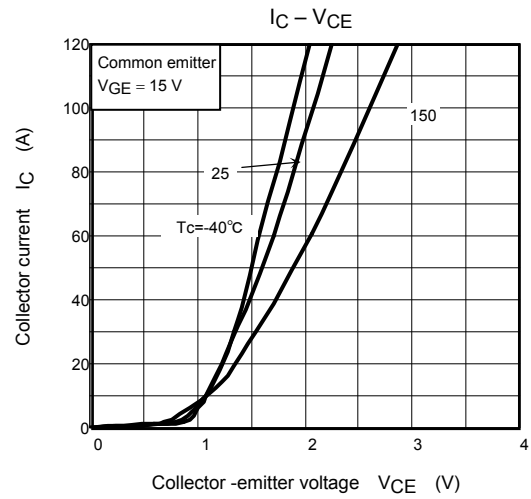
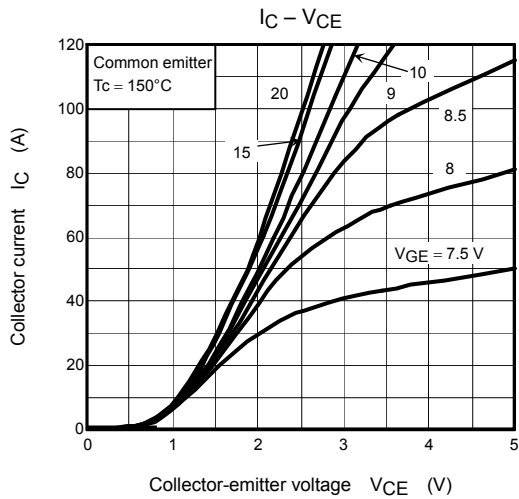
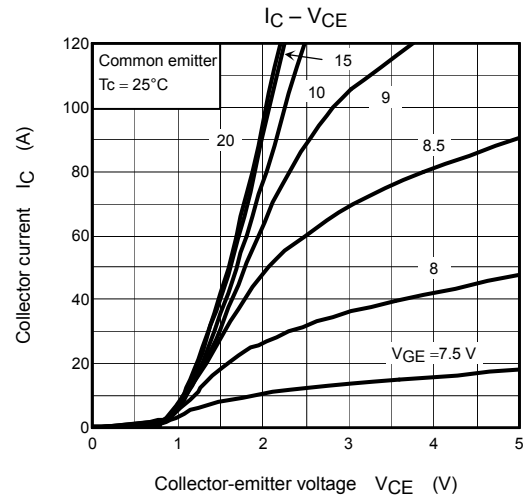
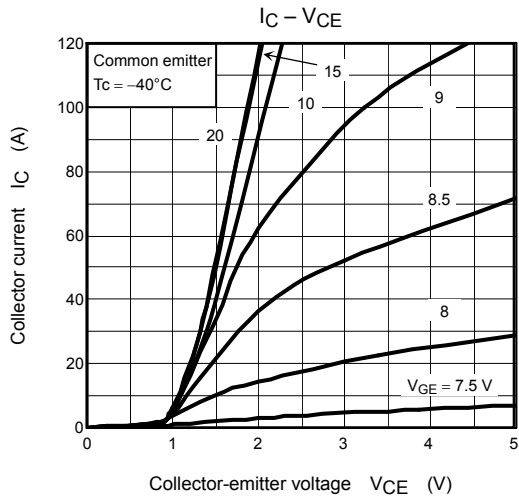


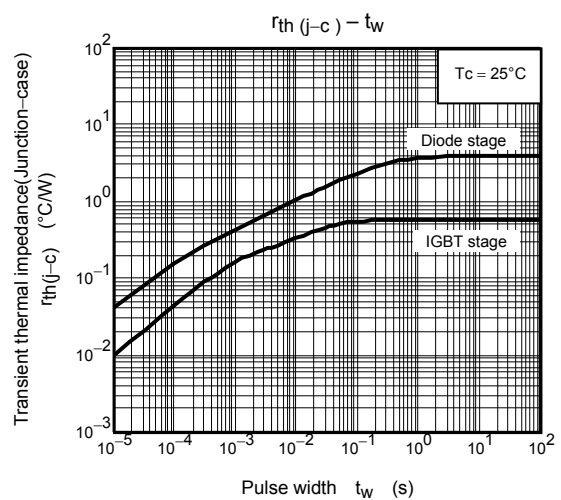
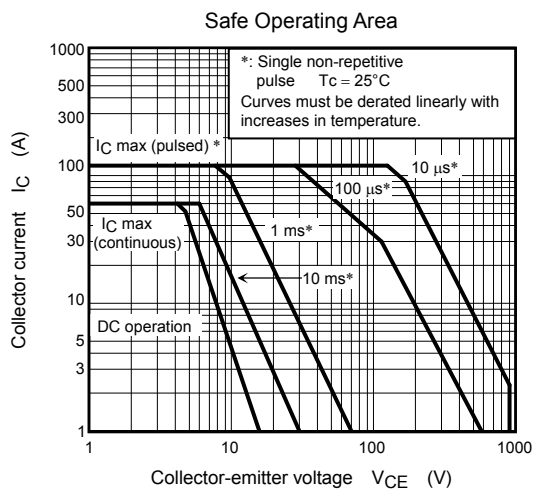
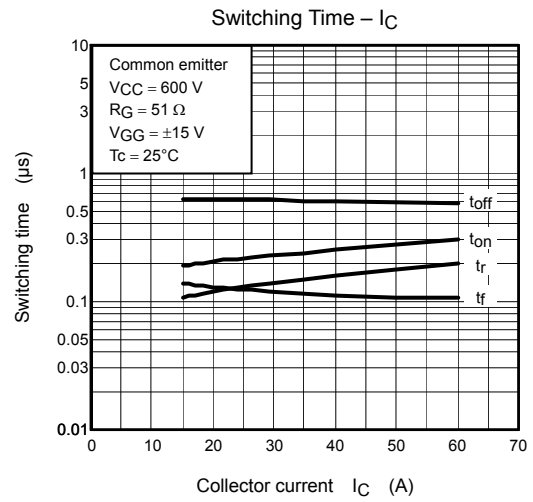
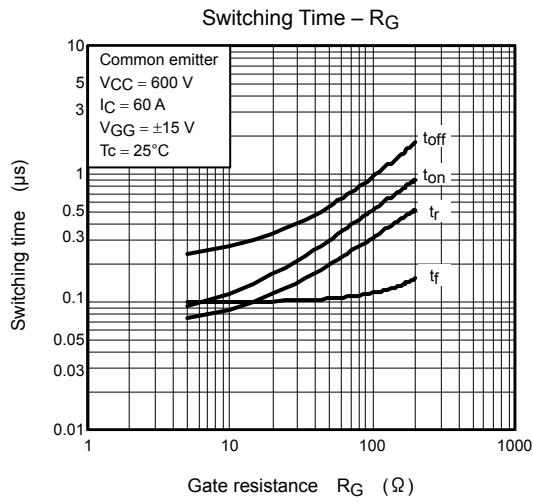
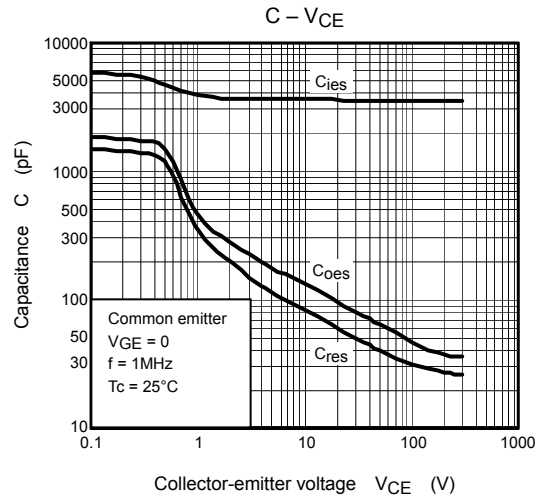
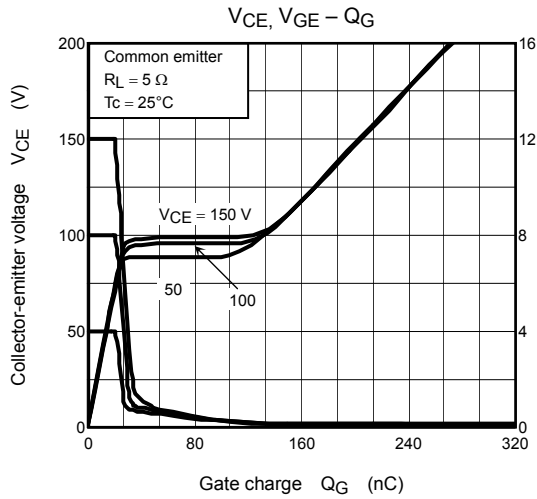
## Electrical Characteristics (Ta = 25°C)

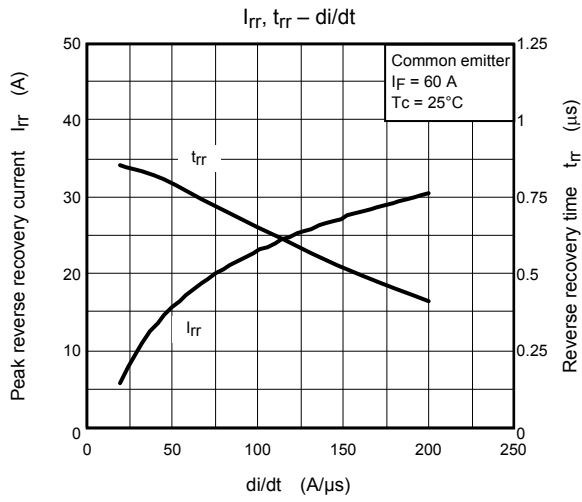
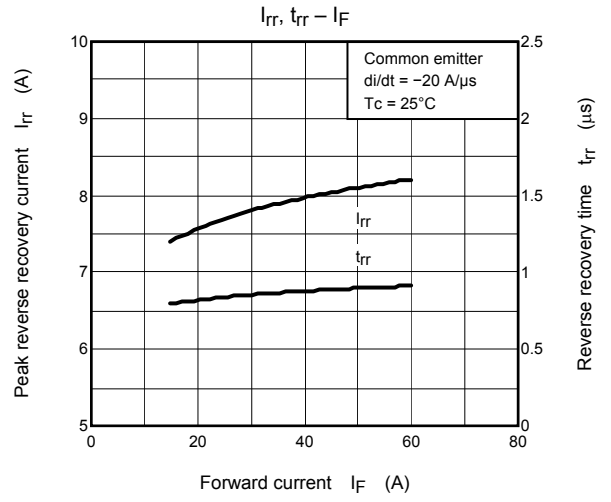
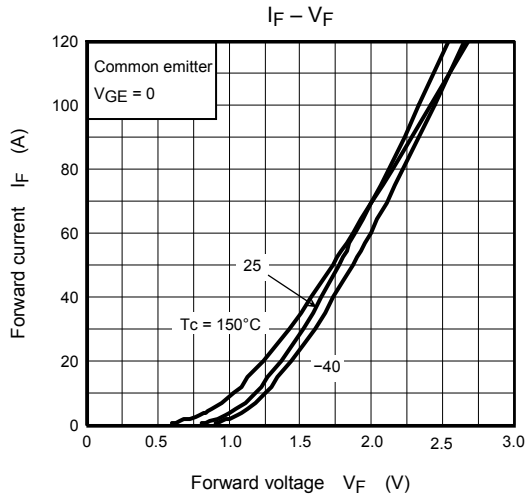
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GES}$	$V_{GE} = \pm 25\text{ V}, V_{CE} = 0$	—	—	$\pm 500$	nA
Collector cut-off current		$I_{CES}$	$V_{CE} = 900\text{ V}, V_{GE} = 0$	—	—	1.0	mA
Gate-emitter cut-off voltage		$V_{GE(OFF)}$	$I_C = 60\text{ mA}, V_{CE}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

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









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