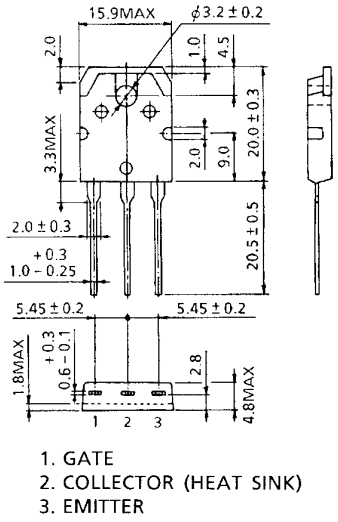
TOSHIBA Insulated Gate Bipolar Transistor Silicon N Channel IGBT

GT50N322A

Voltage Resonance Inverter Switching Application
Fifth Generation IGBT

- FRD included between emitter and collector
- Enhancement mode type
- High speed IGBT : t_f = 0.10 μs (typ.) (I_C = 60 A)
  FRD : t_{rr} = 0.8 μs (typ.) (di/dt = −20 A/μs)
- Low saturation voltage: $V_{CE\ (sat)}$ = 2.2 V (typ.) (I_C = 60 A)

Unit: mm



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

JEDEC	—
JEITA	—
TOSHIBA	2-16C1C

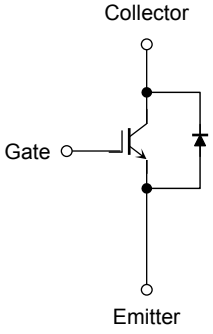
Weight: 4.6 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

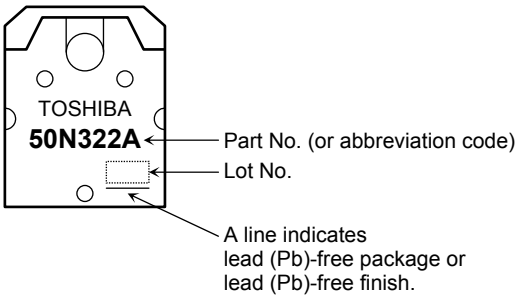
Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		V_{CES}	1000	V
Gate-emitter voltage		V_{GES}	± 25	V
Collector current	DC	I_C	50	A
	1ms	I_{CP}	120	
Diode forward current	DC	I_F	15	A
	1ms	I_{FP}	120	
Collector power dissipation (Tc = 25°C)		P_C	156	W
Junction temperature		T_j	150	°C
Storage temperature		T_{stg}	−55 to 150	°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).

Equivalent Circuit



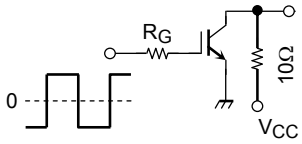
Marking

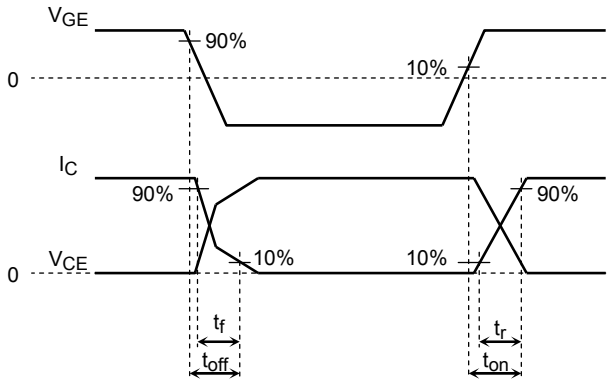


Electrical Characteristics (Ta = 25°C)

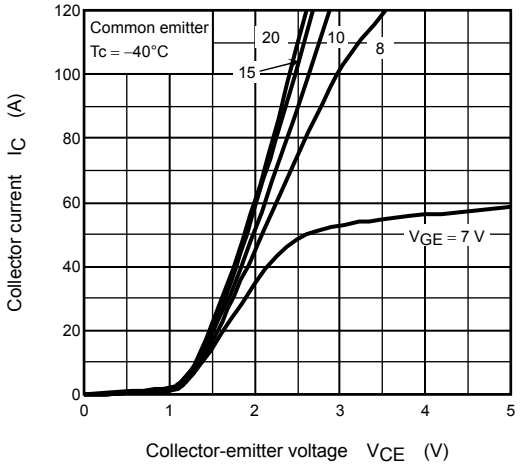
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GES}	V_{GE} = ±25 V, V_{CE} = 0	—	—	± 500	nA
Collector cut-off current		I_{CES}	V_{CE} = 1000 V, V_{GE} = 0	—	—	1.0	mA
Gate-emitter cut-off voltage		$V_{GE\ (OFF)}$	I_C = 60 mA, V_{CE} = 5 V	3.0	—	6.0	V
Collector-emitter saturation voltage		$V_{CE\ (sat)}$	I_C = 60 A, V_{GE} = 15 V	—	2.2	2.8	V
Input capacitance		C_{ies}	V_{CE} = 10 V, V_{GE} = 0, f = 1 MHz	—	4000	—	pF
Switching time	Rise time	t_r	Resistive Load	—	0.23	—	μs
	Turn-on time	t_{on}	V_{CC} = 600 V, I_C = 60 A	—	0.33	—	
	Fall time	t_f	V_{GG} = ±15 V, R_G = 51 Ω	—	0.10	0.25	
	Turn-off time	t_{off}	(Note 1)	—	0.70	—	
Diode forward voltage		V_F	I_F = 15 A, V_{GE} = 0	—	1.2	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		Rth(j-c)	—	—	—	0.8	°C/W
Thermal Resistance		Rth(j-c)	—	—	—	4.0	°C/W

Note 1: Switching time measurement circuit and input/output waveforms





$I_C - V_{CE}$



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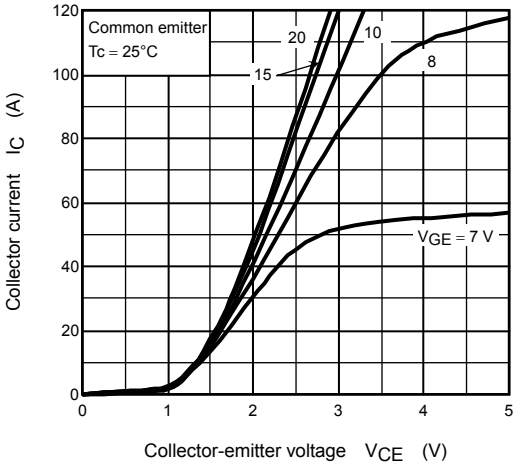

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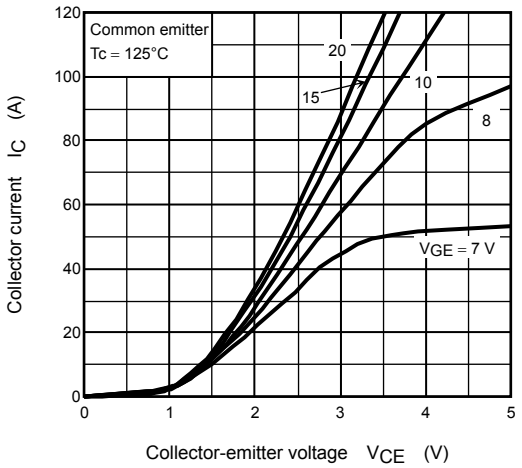
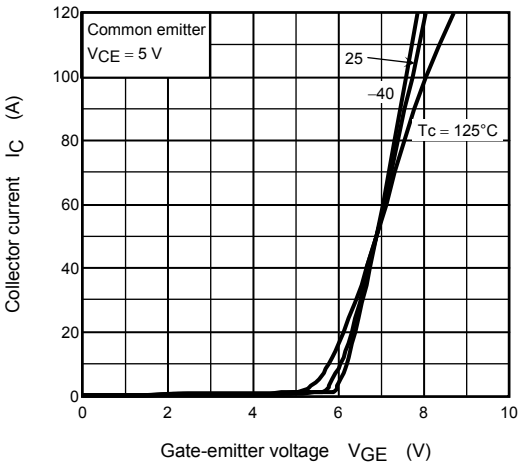
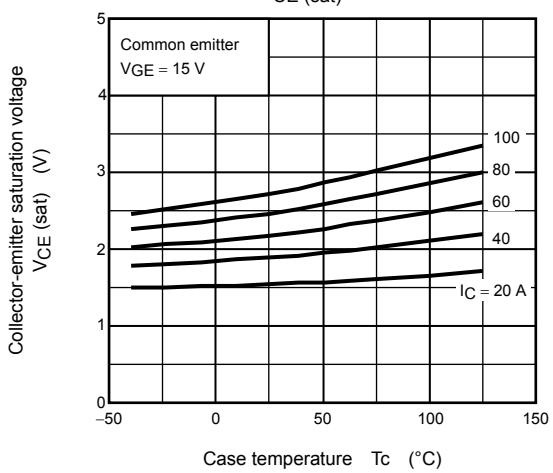


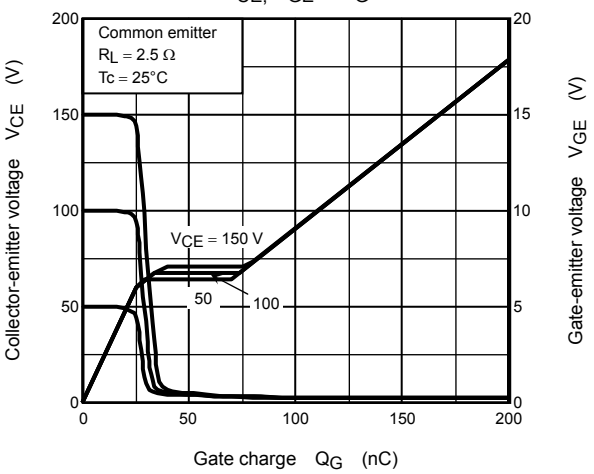
$I_C - V_{GE}$



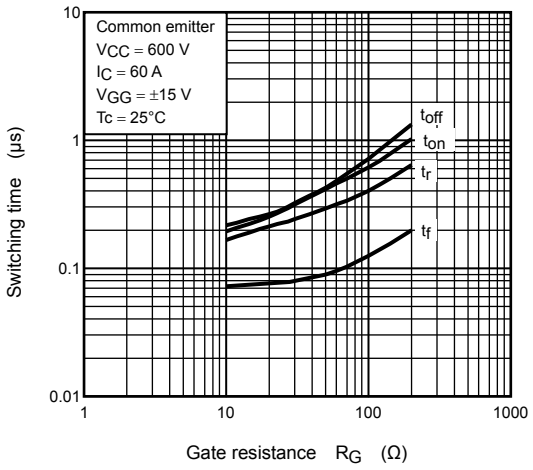
$V_{CE\ (sat)} - Tc$



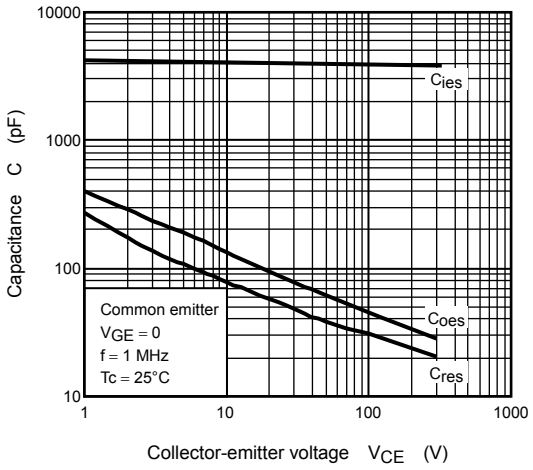
$V_{CE}, V_{GE} - Q_G$



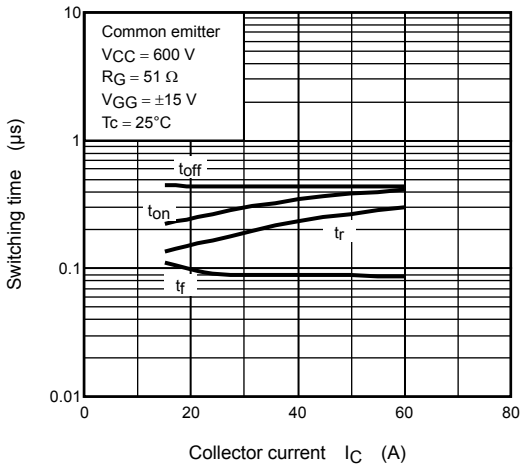
Switching Time – R_G



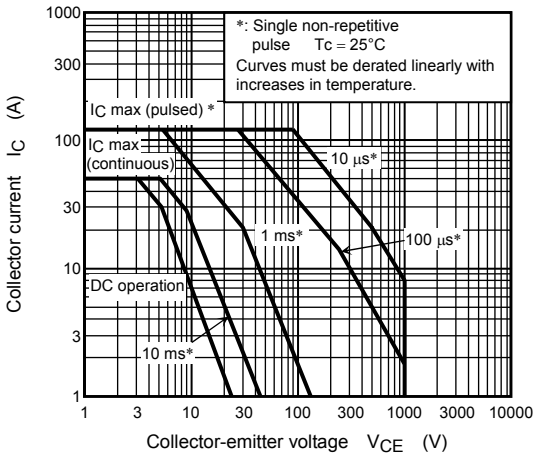
C – V_{CE}



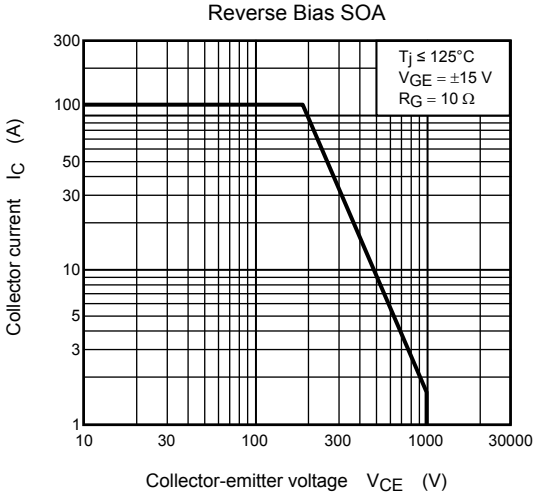
Switching Time – I_C



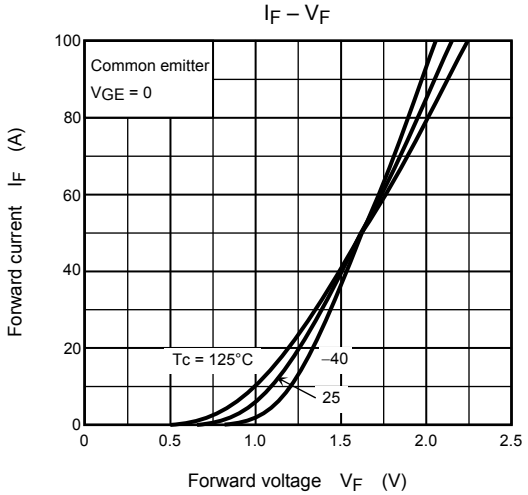
Safe Operating Area



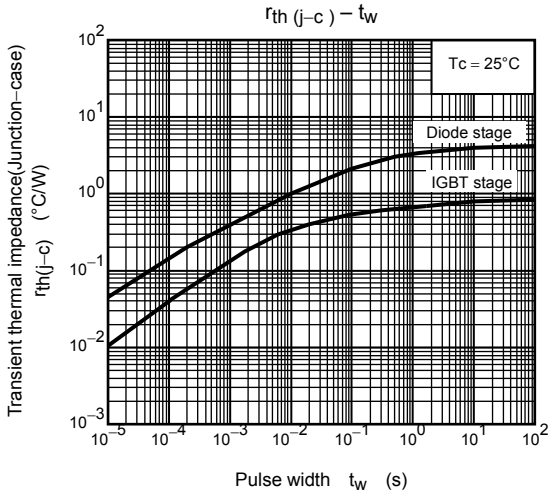
Reverse Bias SOA



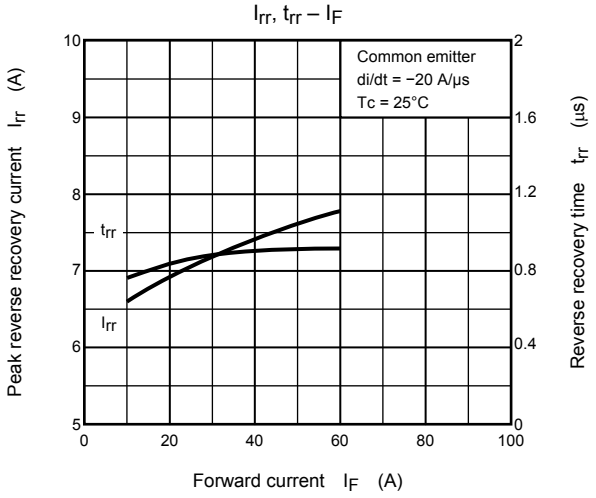
I_F – V_F



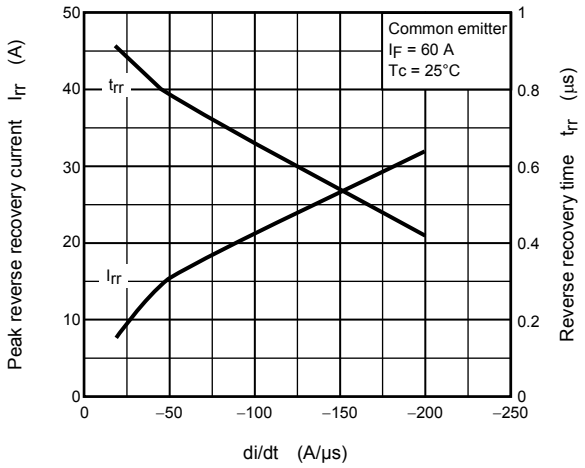
$r_{th\ (j-c)} - t_w$



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



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



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