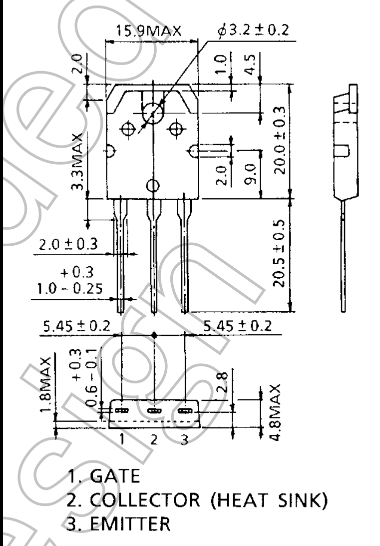
TOSHIBA Insulated Gate Bipolar Transistor Silicon N Channel IGBT

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



JEDEC	―
JEITA	―
TOSHIBA	2-16C1C

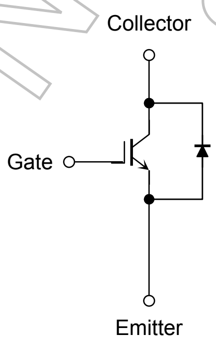
Weight: 4.6 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

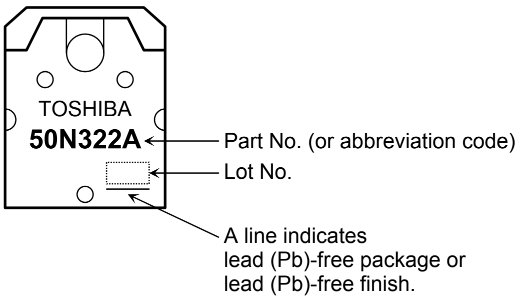
Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		V_{CES}	1000	V
Gate-emitter voltage		V_{GES}	± 25	V
Collector current	DC	I_C	50	A
	1ms	I_{CP}	120	
Diode forward current	DC	I_F	15	A
	1ms	I_{FP}	120	
Collector power dissipation (Tc = 25°C)		P_C	156	W
Junction temperature		T_j	150	°C
Storage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



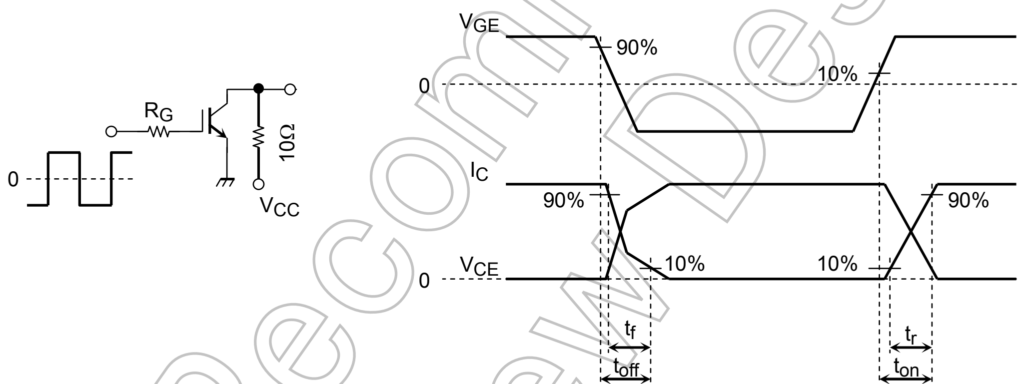
Marking



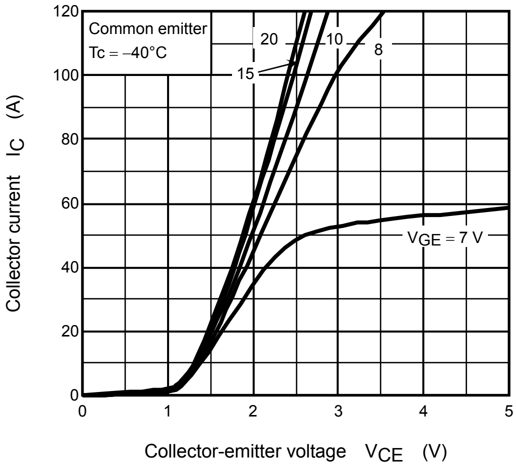
Electrical Characteristics (Ta = 25°C)

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

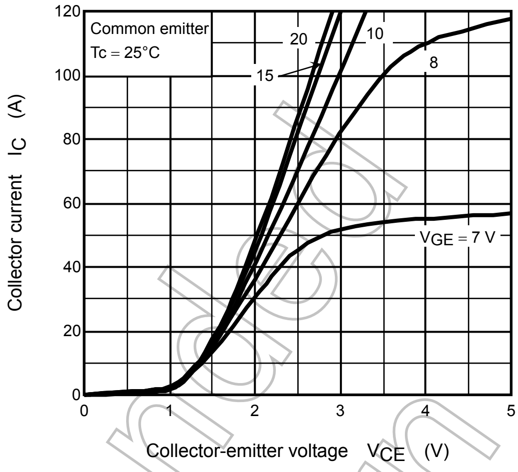
Note 1: Switching time measurement circuit and input/output waveforms



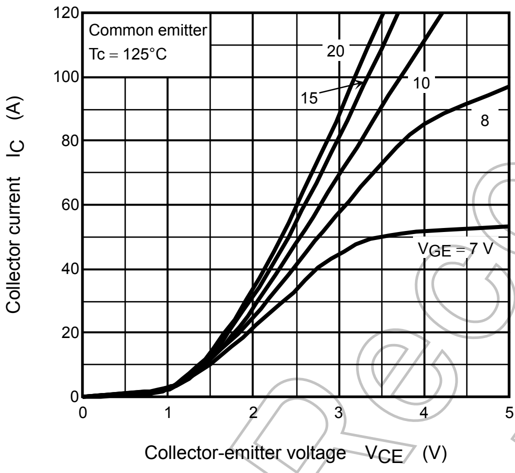
$I_C – V_{CE}$



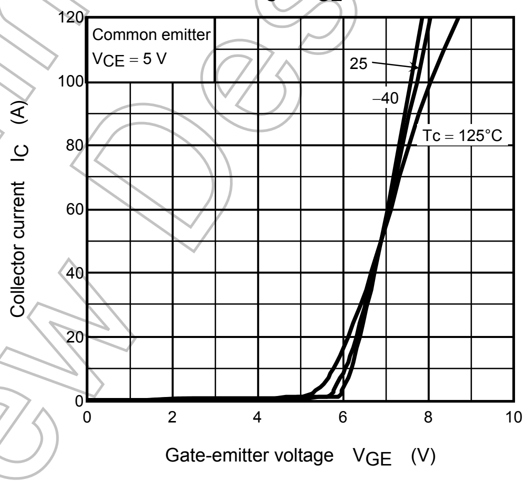
$I_C – V_{CE}$



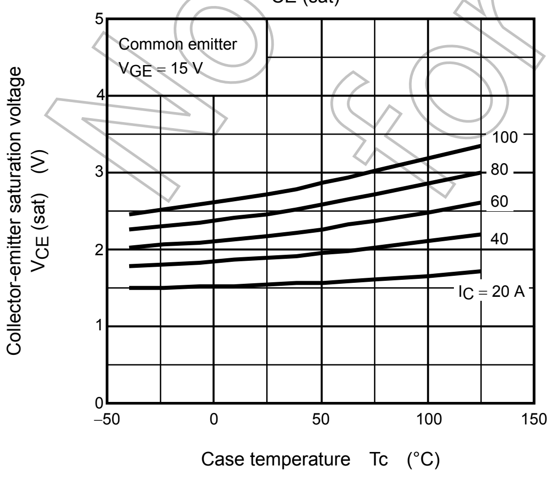
$I_C – V_{CE}$



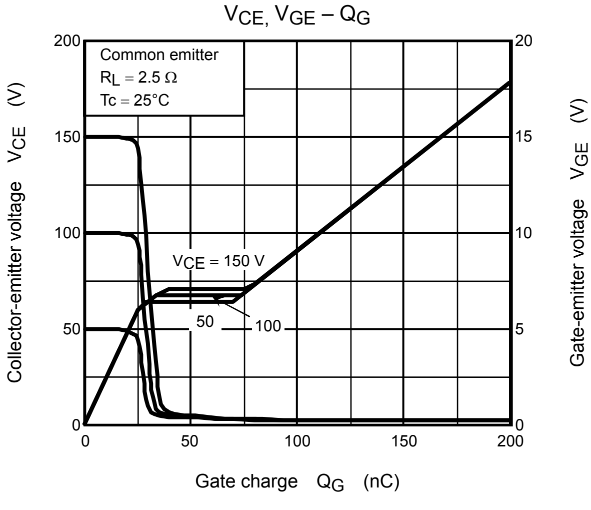
$I_C – V_{GE}$



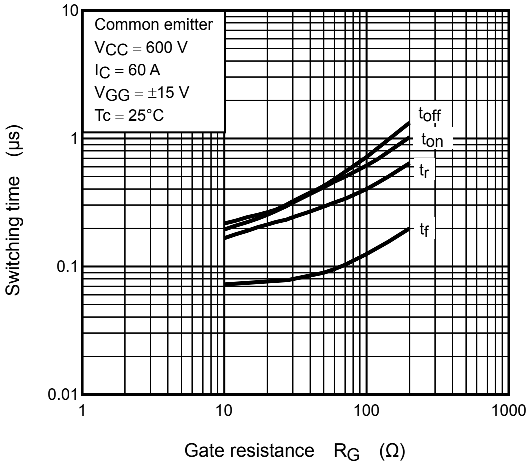
$V_{CE\ (sat)} – Tc$



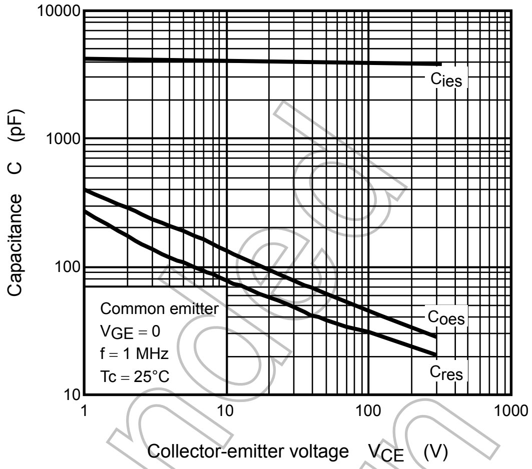
$V_{CE}, V_{GE} – Q_G$



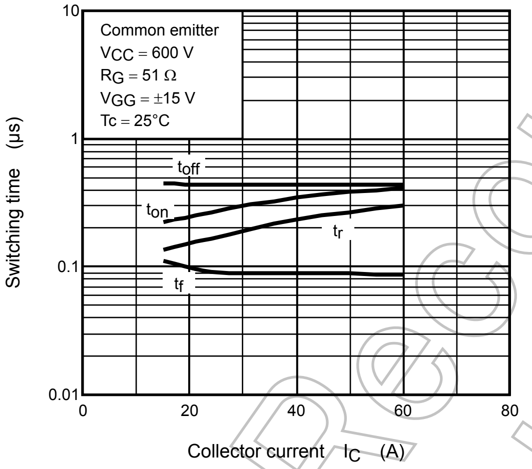
Switching Time – R_G



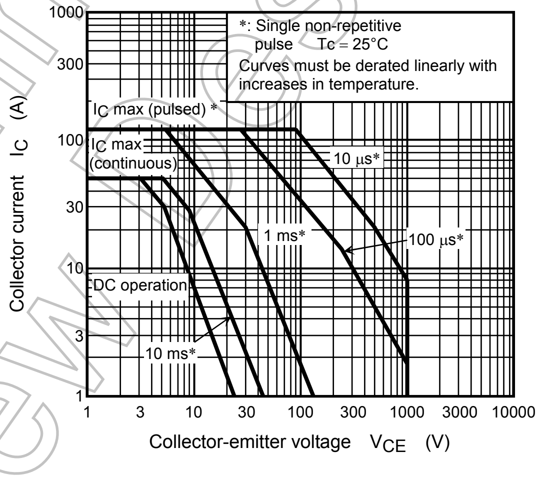
C – V_{CE}



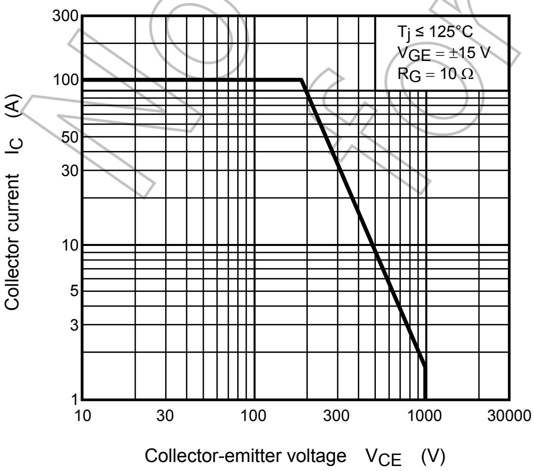
Switching Time – I_C



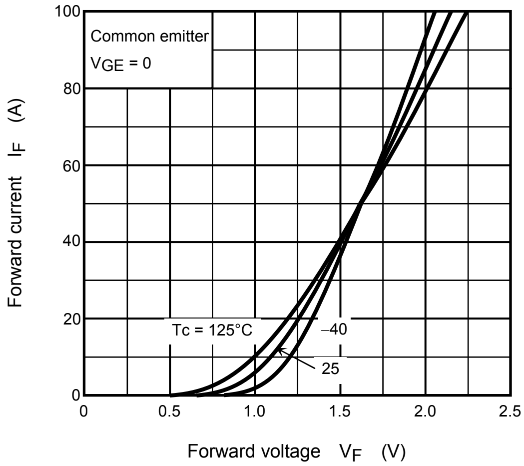
Safe Operating Area

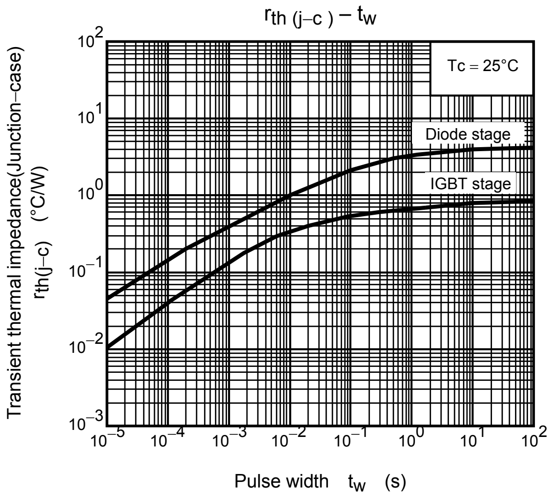


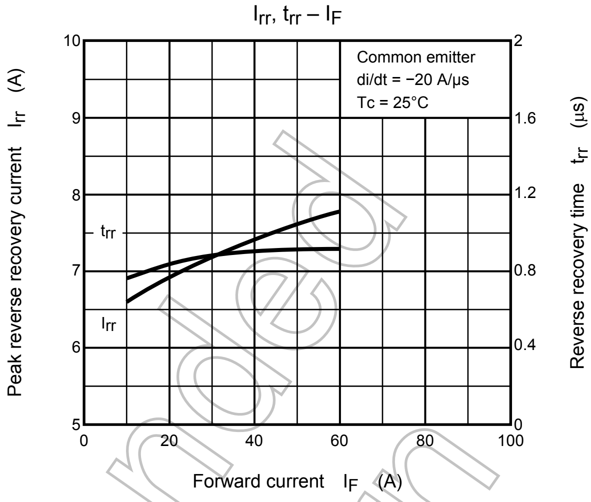
Reverse Bias SOA

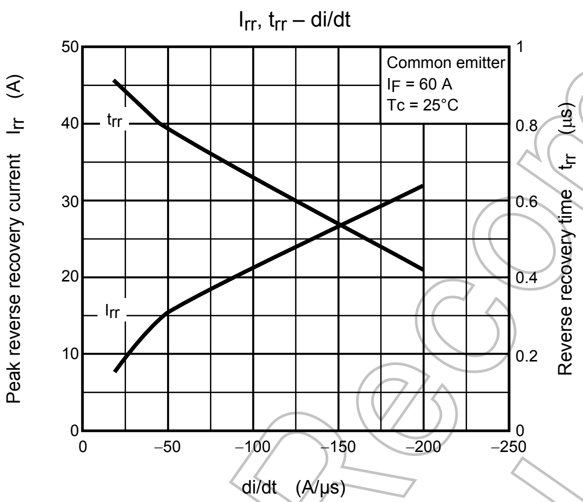


I_F – V_F




$r_{th\,(j-c)} - t_w$
Tc = 25°C
Diode stage
IGBT stage
Transient thermal impedance(Junction−case) $r_{th(j-c)}$ (°C/W)
Pulse width t_w (s)


I_{rr}, t_{rr} – I_F
Common emitter
di/dt = −20 A/μs
Tc = 25°C
t_{rr}
I_{rr}
Peak reverse recovery current I_{rr} (A)
Reverse recovery time t_{rr} (μs)
Forward current I_F (A)


I_{rr}, t_{rr} – di/dt
Common emitter
I_F = 60 A
Tc = 25°C
t_{rr}
I_{rr}
Peak reverse recovery current I_{rr} (A)
Reverse recovery time t_{rr} (μs)
di/dt (A/μs)

RESTRICTIONS ON PRODUCT USE

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- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
  In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the “Handling Guide for Semiconductor Devices,” or “TOSHIBA Semiconductor Reliability Handbook” etc.
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