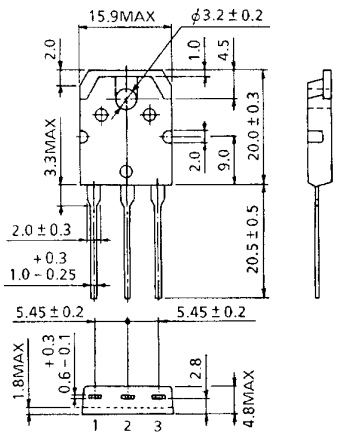
TOSHIBA Insulated Gate Bipolar Transistor Silicon N Channel IGBT

GT40J321

Current Resonance Inverter Switching Application

- FRD included between emitter and collector
- Enhancement mode type
- High-speed IGBT: t_f = 0.11 μs (typ.) (I_C = 40 A)
- Low saturation voltage: $V_{CE\ (sat)}$ = 2.0 V (typ.) (I_C = 40 A)

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-16C1C

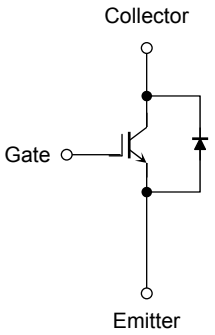
Weight: 4.6 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

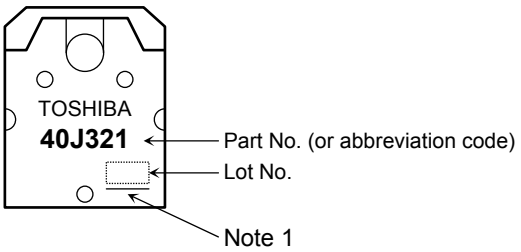
Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		V_{CES}	600	V
Gate-emitter voltage		V_{GES}	± 25	V
Collector current	DC	I_C	40	A
	1ms	I_{CP}	100	
Diode forward current	DC	I_F	30	A
	1ms	I_{FP}	60	
Collector power dissipation (Tc = 25°C)		P_C	120	W
Junction temperature		T_j	150	°C
Storage 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



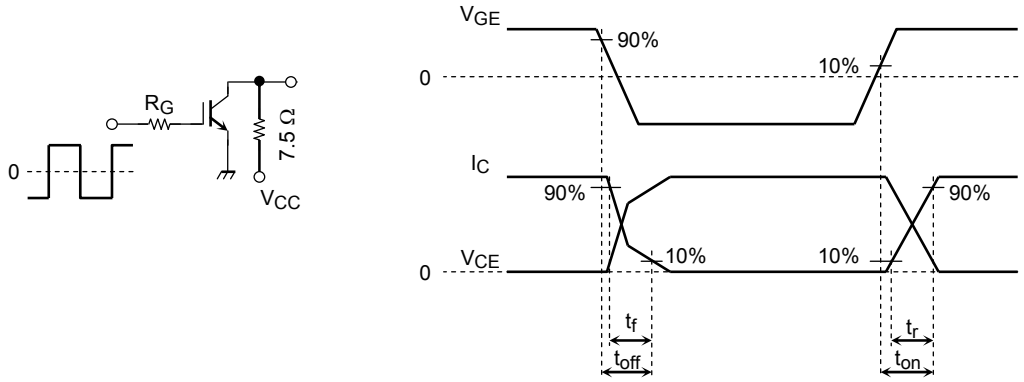
Electrical Characteristics (Ta = 25°C)

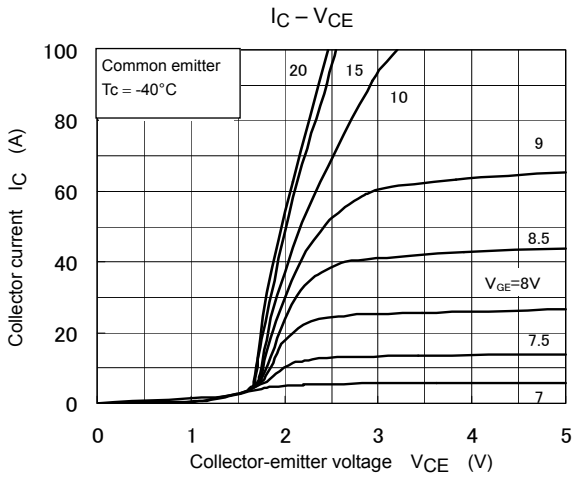
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GES}	V_{GE} = ±25 V, V_{CE} = 0	—	—	± 500	nA
Collector cut-off current		I_{CES}	V_{CE} = 600 V, V_{GE} = 0	—	—	1.0	mA
Gate-emitter cut-off voltage		$V_{GE (OFF)}$	I_C = 40 mA, V_{CE} = 5 V	3.0	—	6.0	V
Collector-emitter saturation voltage		$V_{CE (sat)}$	I_C = 40 A, V_{GE} = 15 V	—	2.0	2.9	V
Input capacitance		C_{ies}	V_{CE} = 10 V, V_{GE} = 0, f = 1 MHz	—	2500	—	pF
Switching time	Rise time	t_r	Resistive Load	—	0.20	—	μs
	Turn-on time	t_{on}	V_{CC} = 300 V, I_C = 40 A	—	0.30	—	
	Fall time	t_f	V_{GG} = ±15 V, R_G = 39 Ω	—	0.11	0.21	
	Turn-off time	t_{off}	(Note 2)	—	0.40	—	
Diode forward voltage		V_F	I_F = 30 A, V_{GE} = 0	—	1.4	2.0	V
Reverse recovery time		t_{rr}	I_F = 30 A, V_{GE} = 0, di/dt = – 100 A/μs	—	—	0.2	μs
Thermal Resistance (IGBT)		Rth(j-c)	—	—	—	1.04	°C/W
Thermal Resistance (Diode)		Rth(j-c)	—	—	—	2.0	°C/W

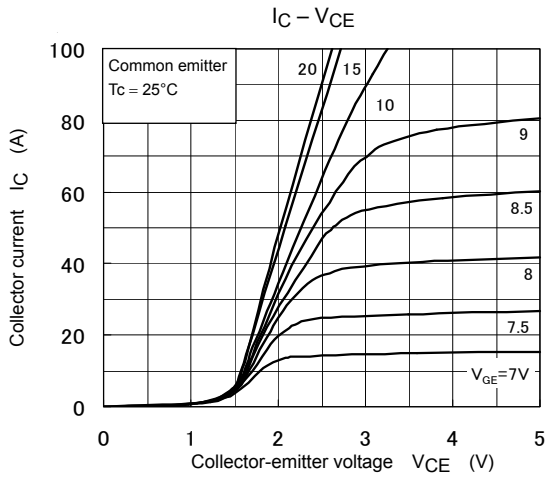
Note 1: A line under a Lot No. identifies the indication of product Labels
[[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

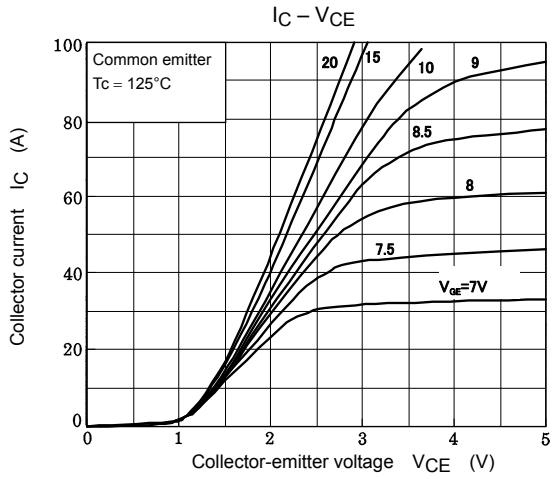
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product.
The RoHS is Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical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

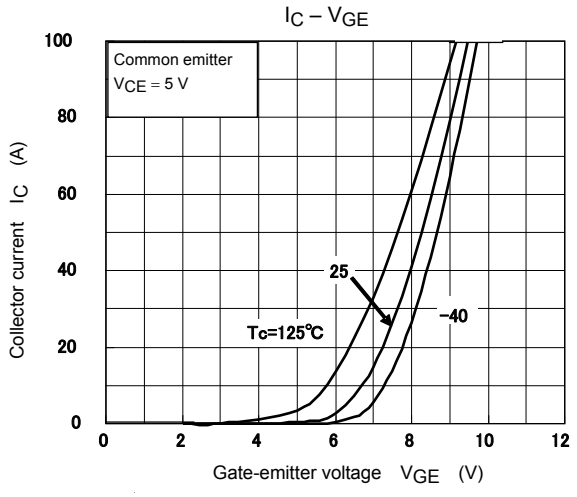
Note 2: Switching time measurement circuit and input/output waveforms

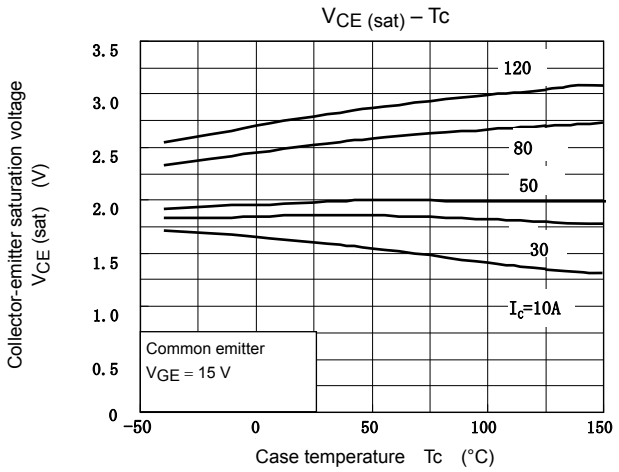


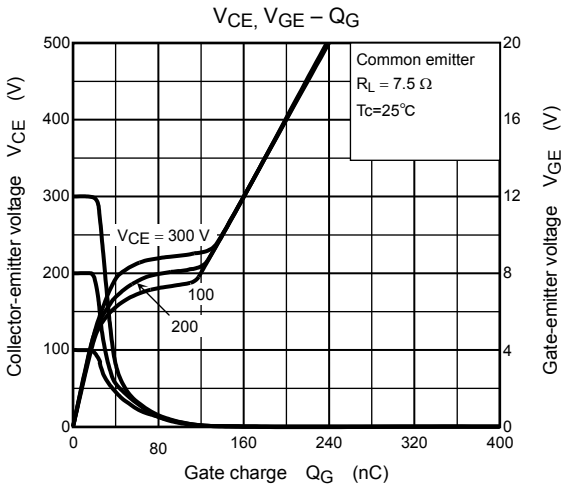

IC – VCE
Common emitter
Tc = -40°C
20
15
10
9
8.5
VGE=8V
7.5
7
Collector current IC (A)
Collector-emitter voltage VCE (V)

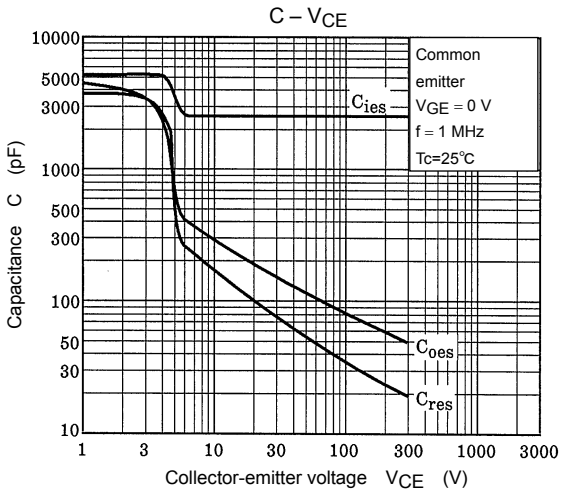

IC – VCE
Common emitter
Tc = 25°C
20
15
10
9
8.5
8
7.5
VGE=7V
Collector current IC (A)
Collector-emitter voltage VCE (V)

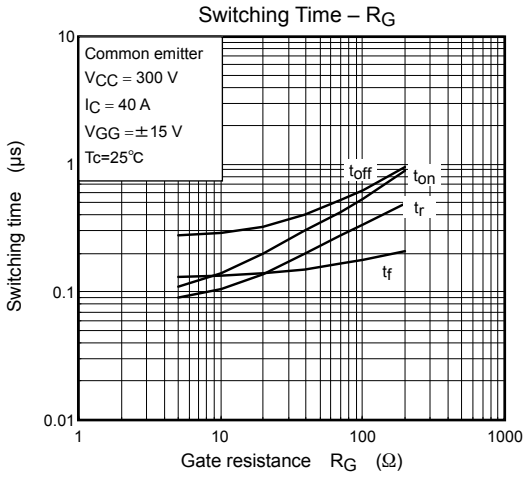

IC – VCE
Common emitter
Tc = 125°C
20
15
10
9
8.5
8
7.5
VGE=7V
Collector current IC (A)
Collector-emitter voltage VCE (V)

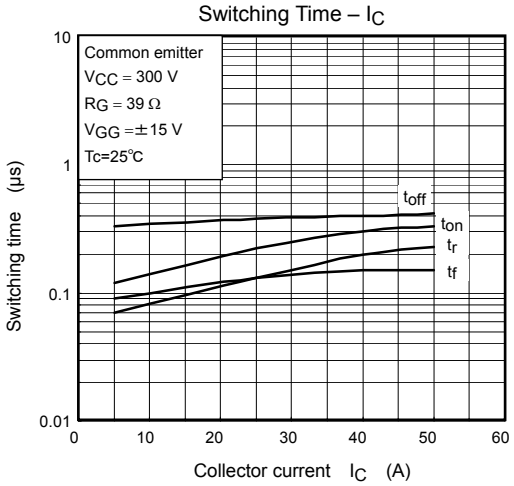

IC – VGE
Common emitter
VCE = 5 V
25
Tc=125°C
-40
Collector current IC (A)
Gate-emitter voltage VGE (V)

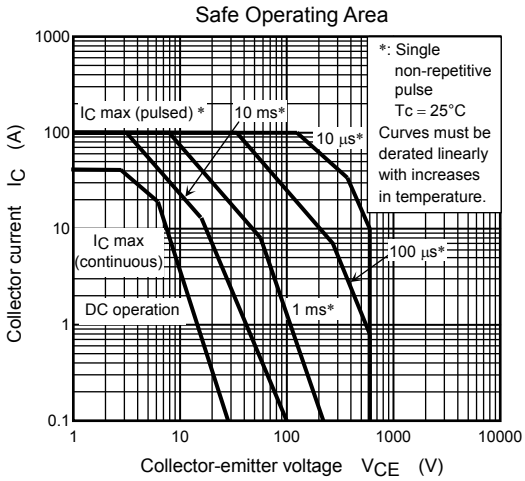

VCE (sat) – Tc
120
80
50
30
Ic=10A
Common emitter
VGE = 15 V
Collector-emitter saturation voltage VCE (sat) (V)
Case temperature Tc (°C)

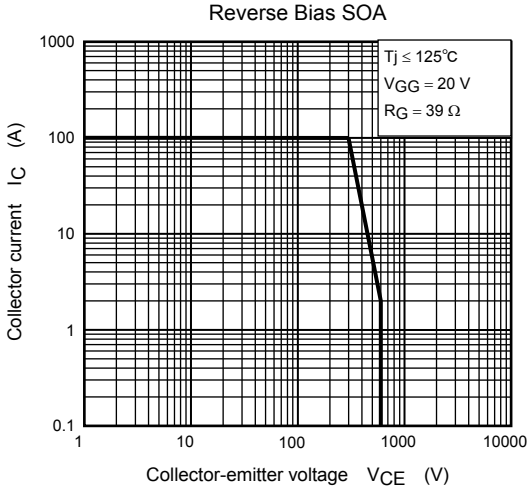

VCE, VGE – QG
Common emitter
RL = 7.5 Ω
Tc=25°C
VCE = 300 V
100
200
Collector-emitter voltage VCE (V)
Gate-emitter voltage VGE (V)
Gate charge QG (nC)

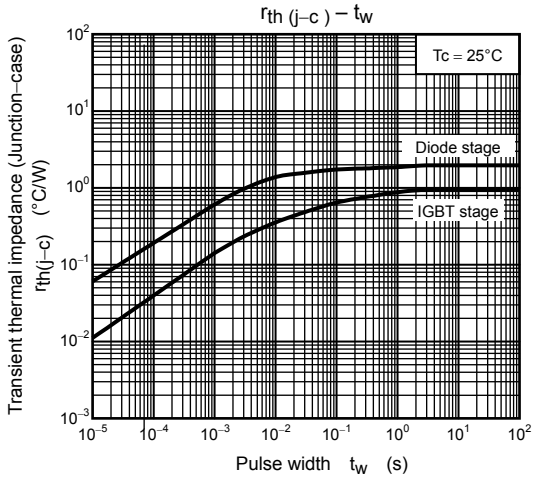

C – VCE
Common emitter
VGE = 0 V
f = 1 MHz
Tc=25°C
Cies
Coes
Cres
Capacitance C (pF)
Collector-emitter voltage VCE (V)

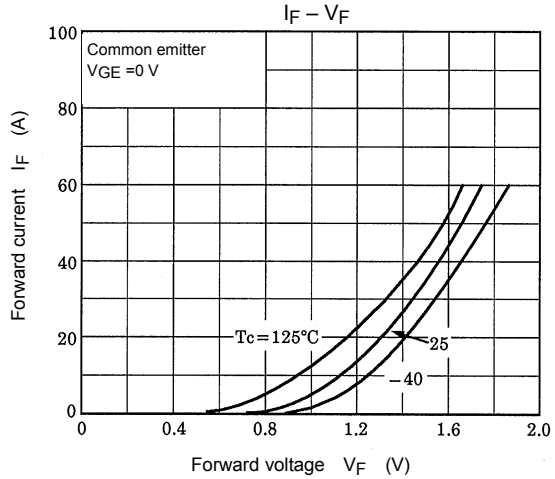

Switching Time – RG
Common emitter
VCC = 300 V
IC = 40 A
VGG = ±15 V
Tc=25°C
toff
ton
tr
tf
Switching time (μs)
Gate resistance RG (Ω)

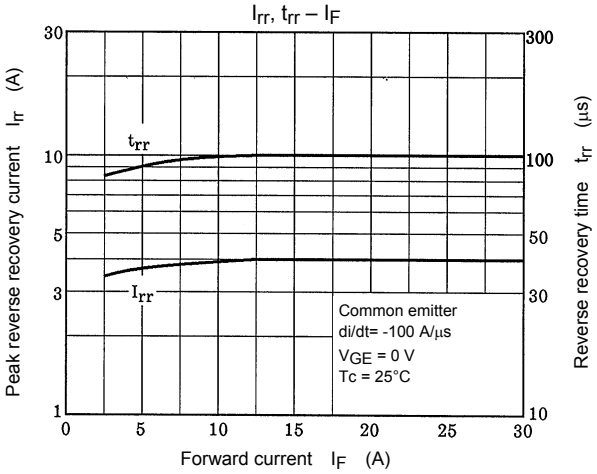

Switching Time – IC
Common emitter
VCC = 300 V
RG = 39 Ω
VGG = ±15 V
Tc=25°C
toff
ton
tr
tf
Switching time (μs)
Collector current IC (A)

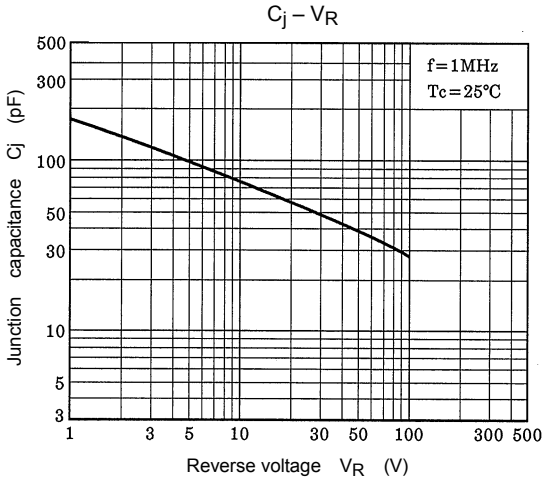

Safe Operating Area
*: Single non-repetitive pulse
Tc = 25°C
Curves must be derated linearly with increases in temperature.
IC max (pulsed) *
10 ms*
10 μs*
100 μs*
1 ms*
IC max (continuous)
DC operation
Collector current IC (A)
Collector-emitter voltage VCE (V)

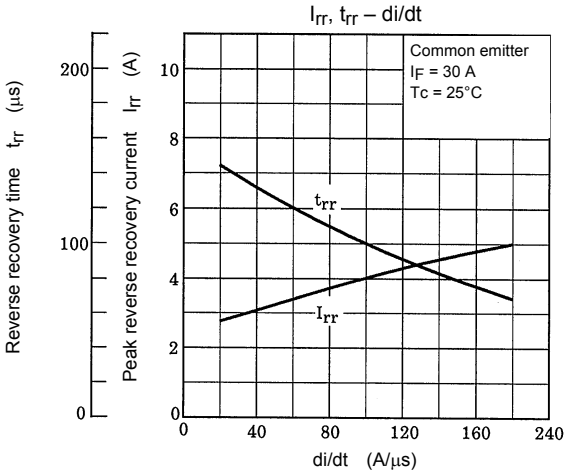

Reverse Bias SOA
Tj ≤ 125°C
VGG = 20 V
RG = 39 Ω
Collector current IC (A)
Collector-emitter voltage VCE (V)


rth (j–c) – tw
Tc = 25°C
Diode stage
IGBT stage
Transient thermal impedance (Junction–case) rth(j–c) (°C/W)
Pulse width tw (s)


IF – VF
Common emitter
VGE =0 V
Tc=125°C
25
−40
Forward current IF (A)
Forward voltage VF (V)


Irr, trr – IF
trr
Irr
Common emitter
di/dt= -100 A/μs
VGE = 0 V
Tc = 25°C
Peak reverse recovery current Irr (A)
Reverse recovery time trr (μs)
Forward current IF (A)


Cj – VR
f=1MHz
Tc=25°C
Junction capacitance Cj (pF)
Reverse voltage VR (V)


Irr, trr – di/dt
Common emitter
IF = 30 A
Tc = 25°C
trr
Irr
Reverse recovery time trr (μs)
Peak reverse recovery current Irr (A)
di/dt (A/μs)

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