

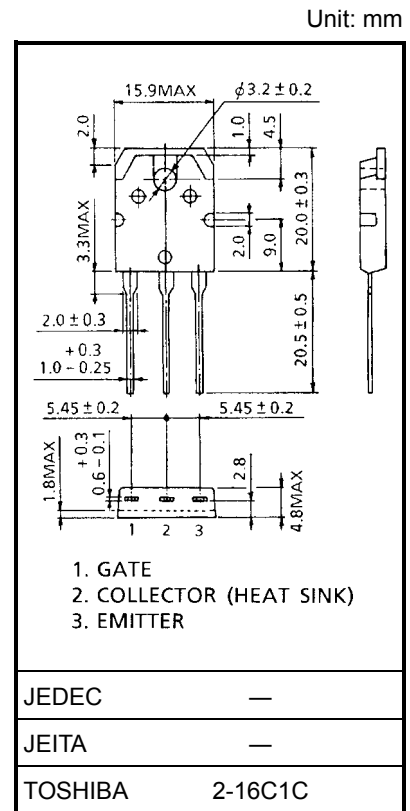
# GT40Q321

## Voltage Resonance Inverter Switching Application

- The 5th generation
- Enhancement-mode
- High speed :  $t_f = 0.41 \mu s$  (typ.) ( $I_C = 40A$ )
- Low saturation voltage:  $V_{CE(sat)} = 2.8 V$  (typ.) ( $I_C = 40A$ )
- FRD included between emitter and collector

### Maximum Ratings ( $T_a = 25^\circ C$ )

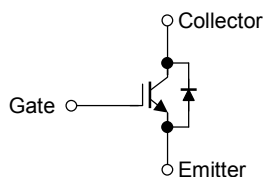
Characteristics	Symbol	Rating	Unit
Collector-emitter voltage	$V_{CES}$	1200	V
Gate-emitter voltage	$V_{GES}$	$\pm 25$	V
Continuous collector current	$I_C$	@ $T_c = 100^\circ C$	23
		@ $T_c = 25^\circ C$	42
Pulsed collector current	$I_{CP}$	80	A
Diode forward current	DC	$I_F$	10
	Pulsed	$I_{FP}$	80
Collector power dissipation	$P_C$	@ $T_c = 100^\circ C$	68
		@ $T_c = 25^\circ C$	170
Junction temperature	$T_j$	150	$^\circ C$
Storage temperature range	$T_{stg}$	-55 to 150	$^\circ C$



### Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance (IGBT)	$R_{th(j-c)}$	0.74	$^\circ C/W$
Thermal resistance (diode)	$R_{th(j-c)}$	1.79	$^\circ C/W$

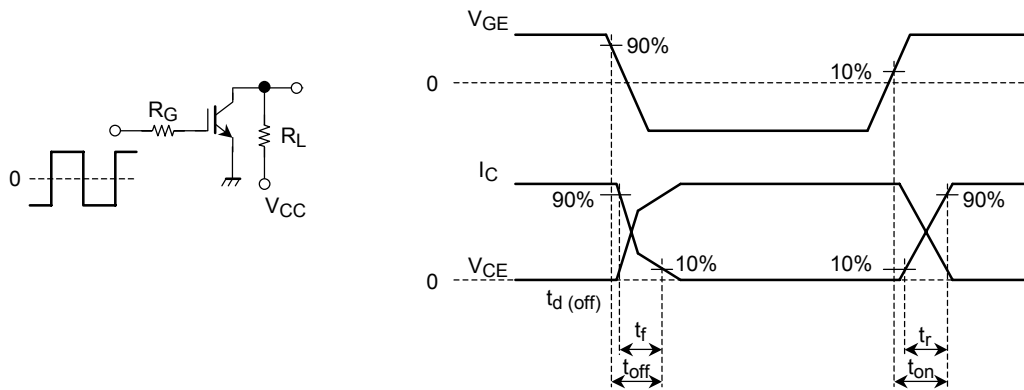
### Equivalent Circuit



## Electrical Characteristics (Ta = 25°C)

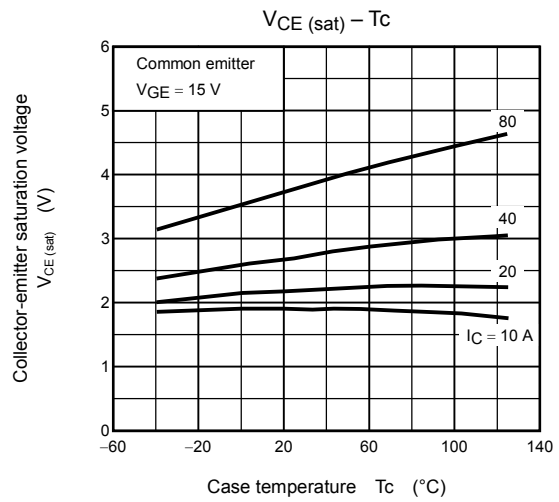
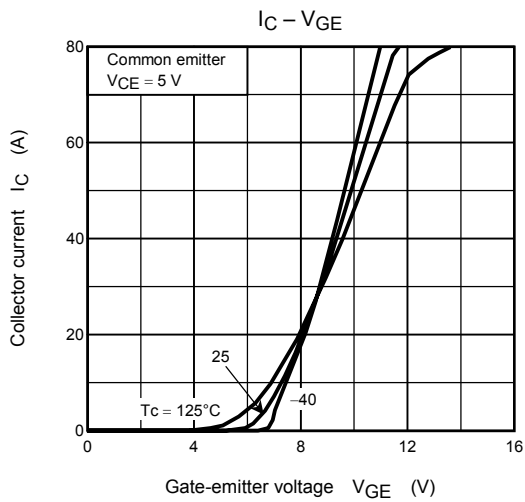
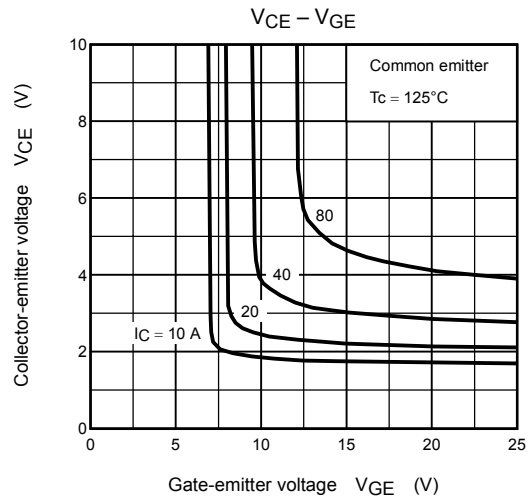
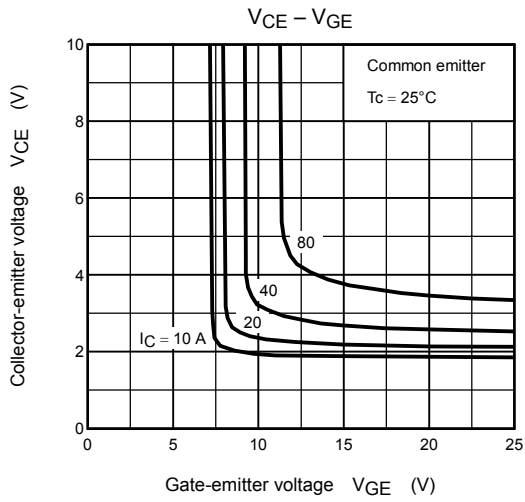
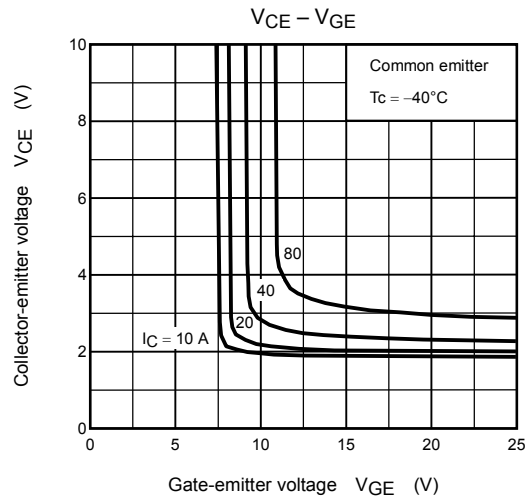
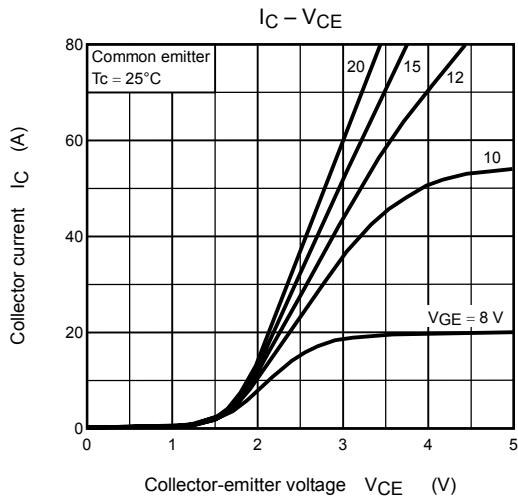
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GES}$	$V_{GE} = \pm 25\text{ V}, V_{CE} = 0$	—	—	$\pm 500$	nA
Collector cut-off current		$I_{CES}$	$V_{CE} = 1200\text{ V}, V_{GE} = 0$	—	—	5.0	mA
Gate-emitter cut-off voltage		$V_{GE(OFF)}$	$I_C = 40\text{ mA}, V_{CE} = 5\text{ V}$	4.0	—	7.0	V
Collector-emitter saturation voltage		$V_{CE(sat)}$	$I_C = 40\text{ A}, V_{GE} = 15\text{ V}$	—	2.8	3.6	V
Input capacitance		$C_{ies}$	$V_{CE} = 10\text{ V}, V_{GE} = 0, f = 1\text{ MHz}$	—	3200	—	pF
Switching time	Rise time	$t_r$	Resistive Load $V_{CC} = 600\text{ V}, I_C = 40\text{ A}$ $V_{GG} = \pm 15\text{ V}, R_G = 39\ \Omega$  (Note 1)	—	0.19	—	$\mu\text{s}$
	Turn-on time	$t_{on}$		—	0.25	—	
	Fall time	$t_f$		—	0.41	0.72	
	Turn-off time	$t_{off}$		—	0.57	—	
Diode forward voltage		$V_F$	$I_F = 10\text{ A}, V_{GE} = 0$	—	—	2.0	V
Reverse recovery time		$t_{rr}$	$I_F = 10\text{ A}, di/dt = -20\text{ A}/\mu\text{s}$	—	0.6	—	$\mu\text{s}$

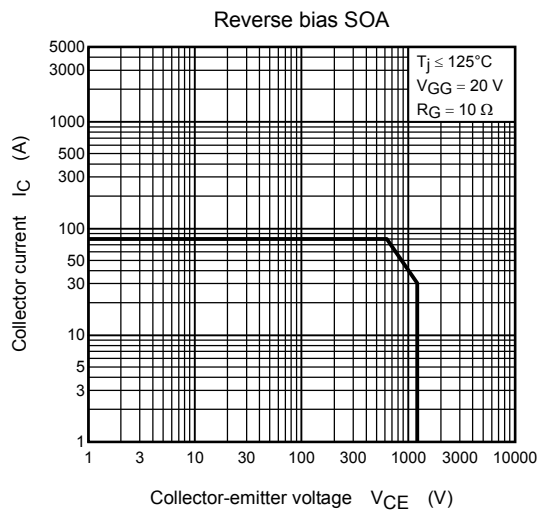
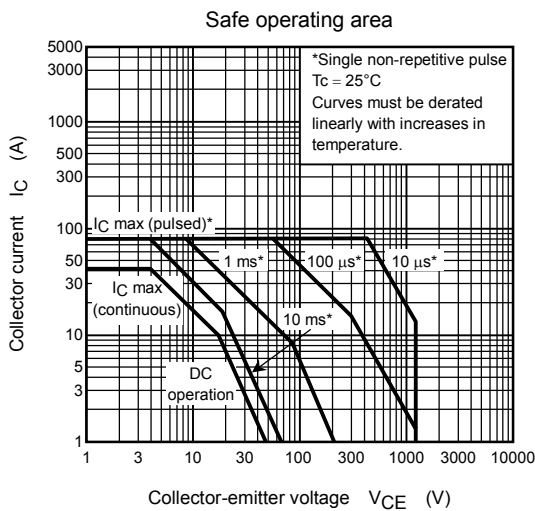
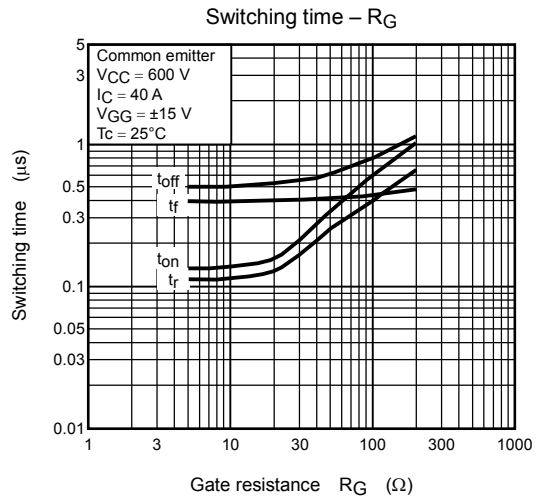
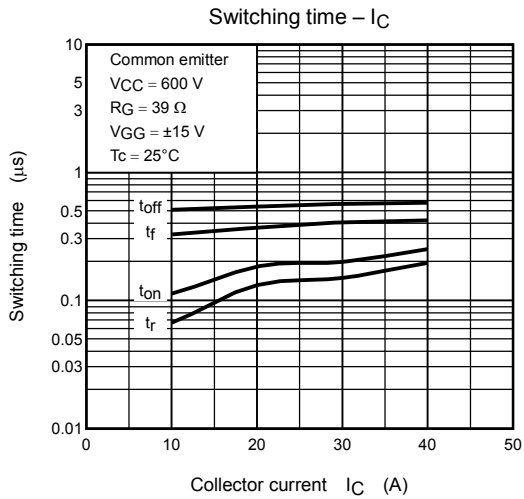
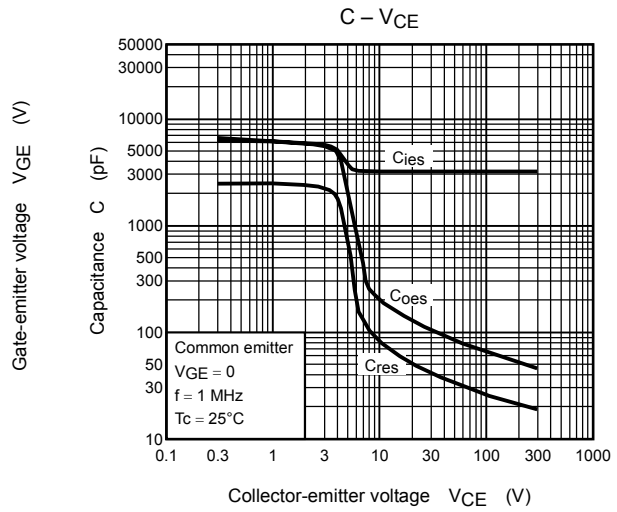
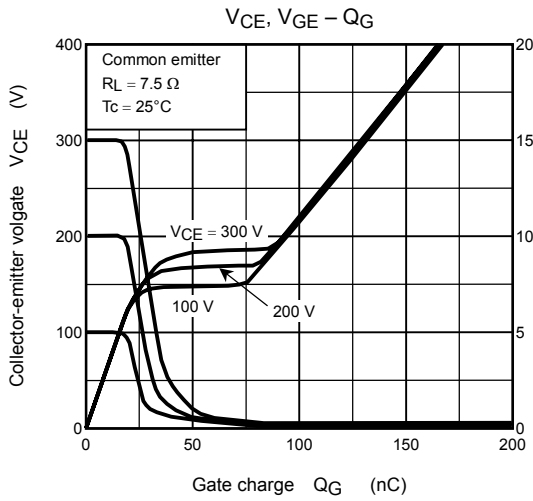
Note 1: Switching time measurement circuit and input/output waveforms

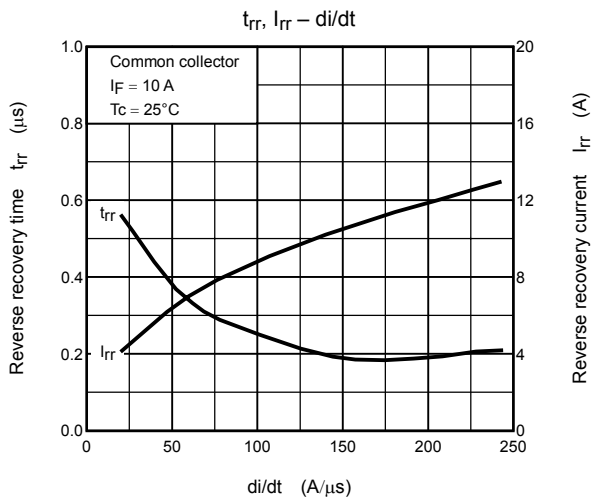
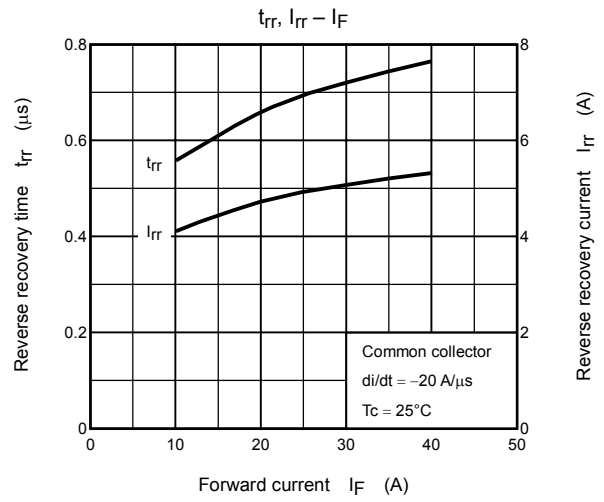
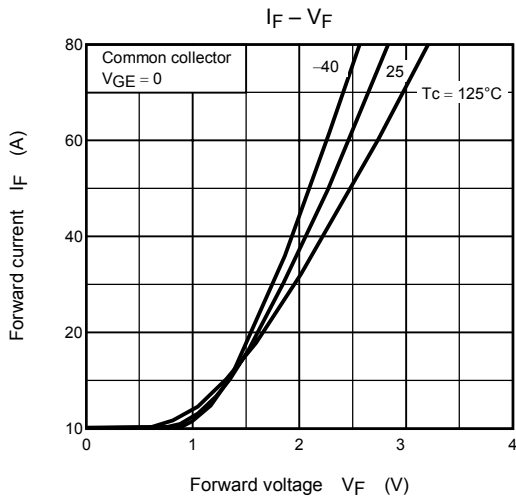
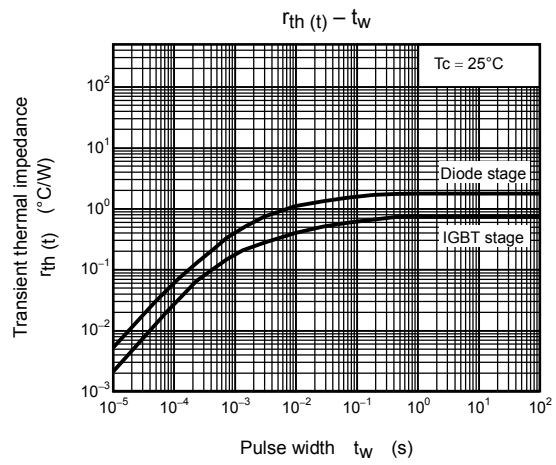
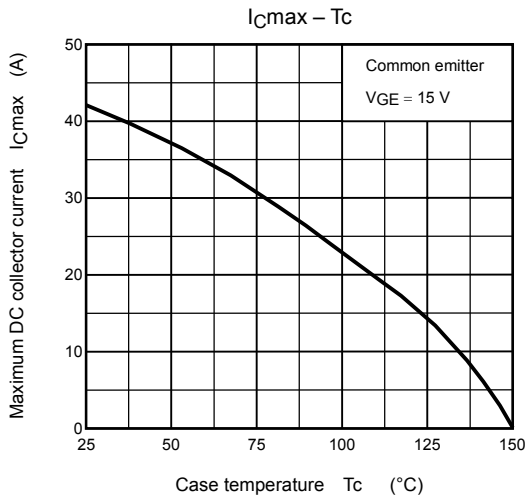


## General Safety Precautions and Usage Considerations

- The GT40Q321 is only intended for single-transistor voltage resonant circuits in induction heating (IH) equipment. For other applications, please contact your nearest Toshiba sales office.
- Do not use devices under conditions in which their maximum ratings will be exceeded. A device may break down or its performance may be degraded, causing it to catch fire or explode resulting in injury to the user. It is therefore necessary to incorporate device derating into circuit design.
- In all IGBT devices, maximum collector-emitter voltage ( $V_{CES}$ ) decreases when the junction temperature becomes low. It is therefore necessary to incorporate device derating into circuit design.
- Maximum collector current is calculated from  $T_j\text{ MAX.}(150^\circ\text{C})$ , the thermal resistance and DC forward power dissipation. However it's limited in real application by another factors such as switching loss, limitation of the inner bonding wires and so on.







**RESTRICTIONS ON PRODUCT USE**

000707EAA

- 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..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.