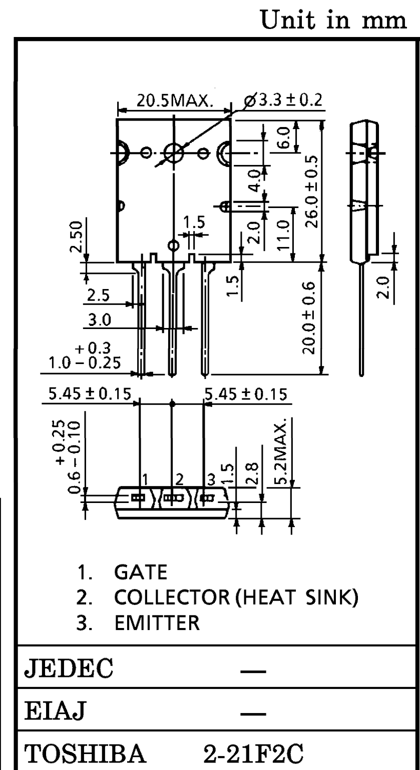
TOSHIBA INSULATED GATE BIPOLAR TRANSISTOR SILICON N CHANNEL MOS TYPE

GT50J322

THE 4TH GENERATION

CURRENT RESONANCE INVERTER SWITCHING APPLICATIONS

Unit in mm



JEDEC	—
EIAJ	—
TOSHIBA	2-21F2C

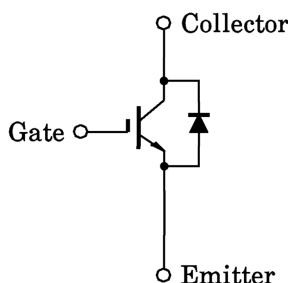
Weight : 9.75g

- FRD Included Between Emitter and Collector
- Enhancement-Mode
- High Speed : $t_f = 0.25 \mu s$ (Typ.) ($I_C = 50A$)
- Low Saturation Voltage : $V_{CE\,(sat)} = 2.1V$ (Typ.) ($I_C = 50A$)

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Collector-Emitter Voltage		V_{CES}	600	V
Gate-Emitter Voltage		V_{GES}	±20	V
Collector Current	DC	I_C	50	A
	1ms	I_{CP}	100	
Emitter-Collector Foward Current	DC	I_F	30	A
	1ms	I_{FP}	60	
Collector Power Dissipation (Tc = 25°C)		P_C	130	W
Junction Temperature		T_j	150	°C
Storage Temperature Range		T_{stg}	−55~150	°C

EQUIVALENT CIRCUIT



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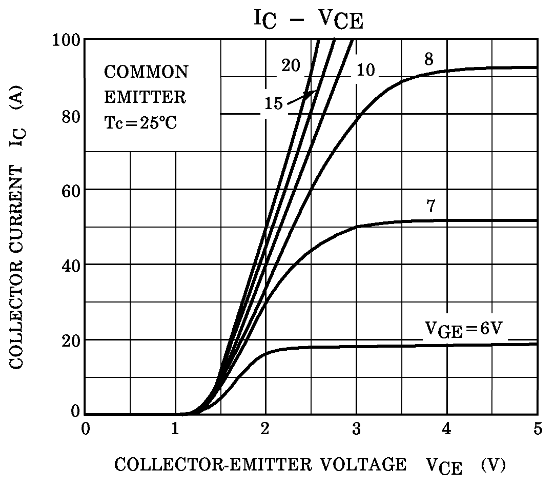
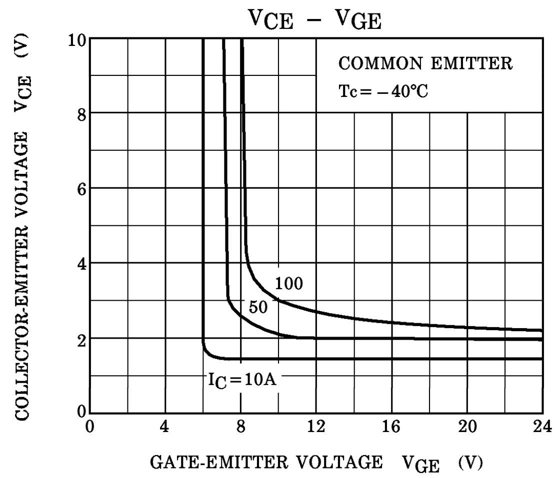
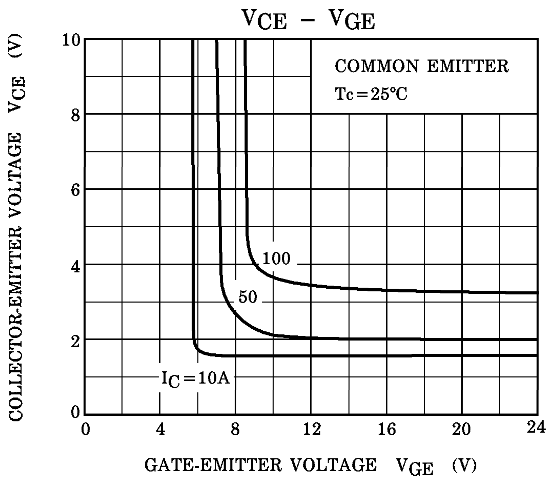
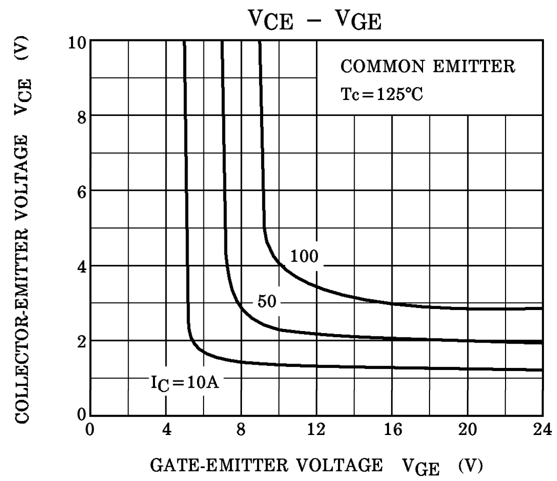
ELECTRICAL CHARACTERISTICS ($Ta = 25°C$)

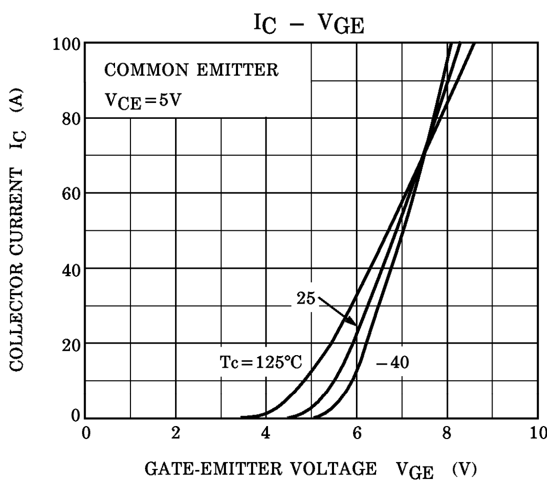
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP	MAX.	UNIT
Gate Leakage Current		I_{GES}	$V_{GE} = \pm 20V$, $V_{CE} = 0$	—	—	±500	nA
Collector Cut-off Current		I_{CES}	$V_{CE} = 600V$, $V_{GE} = 0$	—	—	1.0	mA
Gate-Emitter Cut-off Voltage		$V_{GE (OFF)}$	$I_C = 50mA$, $V_{CE} = 5V$	3.0	—	6.0	V
Collector-Emitter Saturation Voltage		$V_{CE (sat)}$	$I_C = 50A$, $V_{GE} = 15V$	—	2.1	2.8	V
Input Capacitance		C_{ies}	$V_{CE} = 10V$, $V_{GE} = 0$, $f = 1MHz$	—	2500	—	pF
Switching Time	Rise Time	t_r	15V, 0, −15V, 39Ω, 6Ω, 300V	—	0.20	—	μs
	Turn-on Time	t_{on}		—	0.30	—	
	Fall Time	t_f		—	0.25	0.40	
	Turn-off Time	t_{off}		—	0.40	—	
Forward Voltage		V_F	$I_F = 30A$, $V_{GE} = 0$	—	—	2.0	V
Reverse Recovery Time		t_{rr}	$I_F = 30A$, $V_{GE} = 0$ $di / dt = -100A / \mu s$	—	—	0.2	μs
Thermal Resistance		$R_{th (j-c)}$	IGBT	—	—	0.96	°C / W
Thermal Resistance		$R_{th (j-c)}$	Diode	—	—	1.56	°C / W

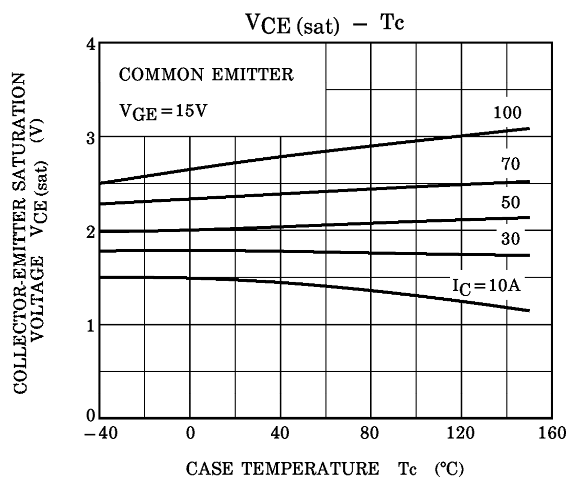

IC – VCE
COMMON
EMITTER
Tc = 25°C
20
15
10
8
7
VGE = 6V
COLLECTOR CURRENT IC (A)
COLLECTOR-EMITTER VOLTAGE VCE (V)

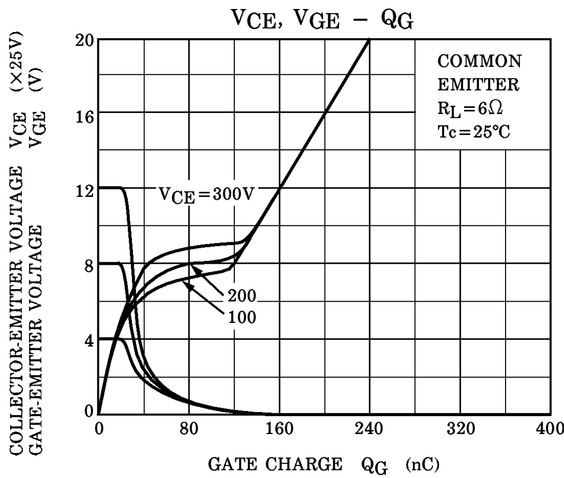

VCE – VGE
COMMON EMITTER
Tc = –40°C
100
50
IC = 10A
COLLECTOR-EMITTER VOLTAGE VCE (V)
GATE-EMITTER VOLTAGE VGE (V)

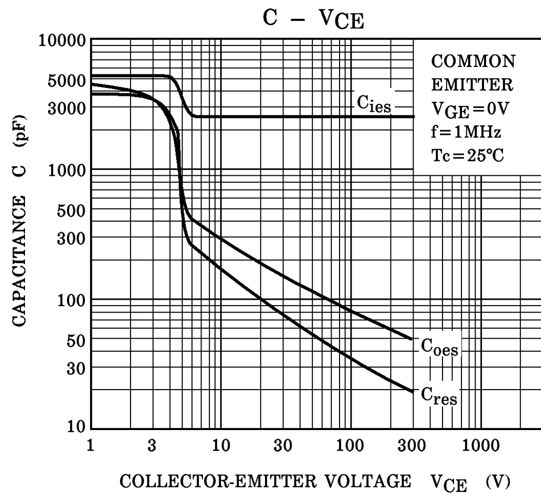

VCE – VGE
COMMON EMITTER
Tc = 25°C
100
50
IC = 10A
COLLECTOR-EMITTER VOLTAGE VCE (V)
GATE-EMITTER VOLTAGE VGE (V)

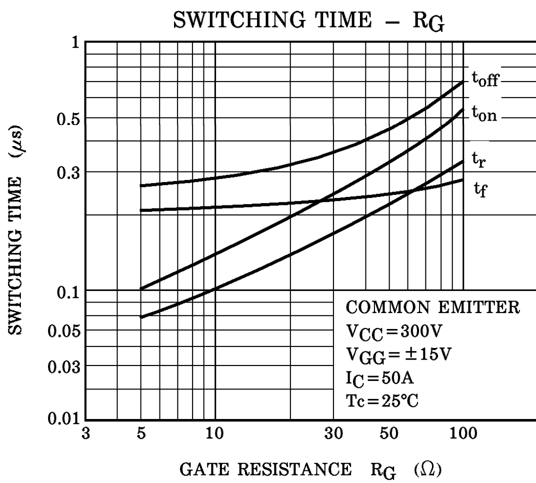

VCE – VGE
COMMON EMITTER
Tc = 125°C
100
50
IC = 10A
COLLECTOR-EMITTER VOLTAGE VCE (V)
GATE-EMITTER VOLTAGE VGE (V)

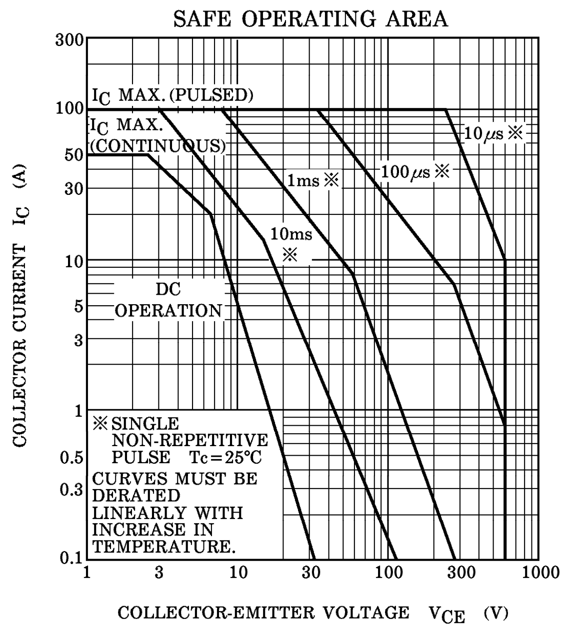

IC – VGE
COMMON EMITTER
VCE = 5V
25
Tc = 125°C
–40
COLLECTOR CURRENT IC (A)
GATE-EMITTER VOLTAGE VGE (V)

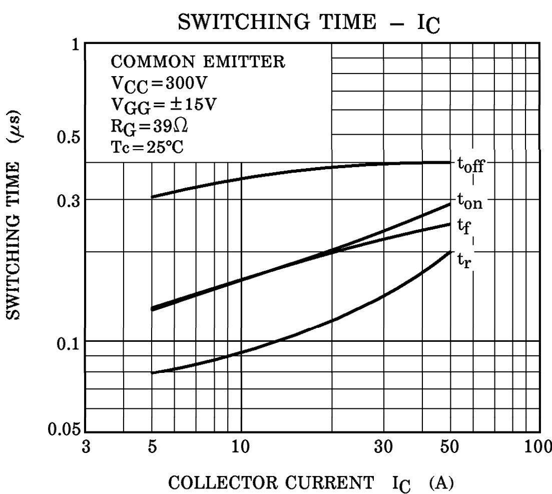

VCE (sat) – Tc
COMMON EMITTER
VGE = 15V
100
70
50
30
IC = 10A
COLLECTOR-EMITTER SATURATION VOLTAGE VCE (sat) (V)
CASE TEMPERATURE Tc (°C)

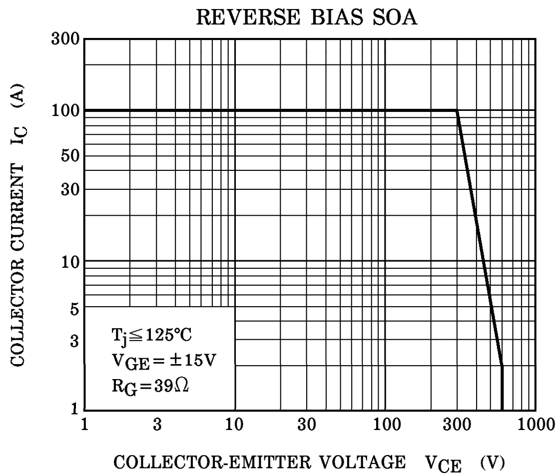

VCE, VGE – QG
COMMON EMITTER
RL=6Ω
Tc=25°C
VCE=300V
200
100
COLLECTOR-EMITTER VOLTAGE VCE (×25V)
GATE-EMITTER VOLTAGE VGE (V)
GATE CHARGE QG (nC)
0
4
8
12
16
20
0
80
160
240
320
400

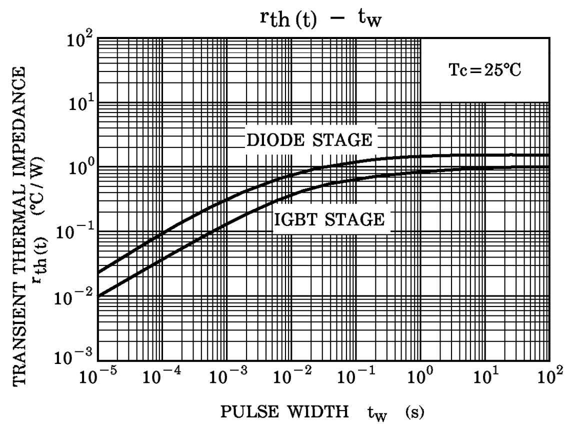

C – VCE
COMMON EMITTER
VGE=0V
f=1MHz
Tc=25°C
Cies
Coes
Cres
CAPACITANCE C (pF)
COLLECTOR-EMITTER VOLTAGE VCE (V)
10000
5000
3000
1000
500
300
100
50
30
10
1
3
10
30
100
300
1000

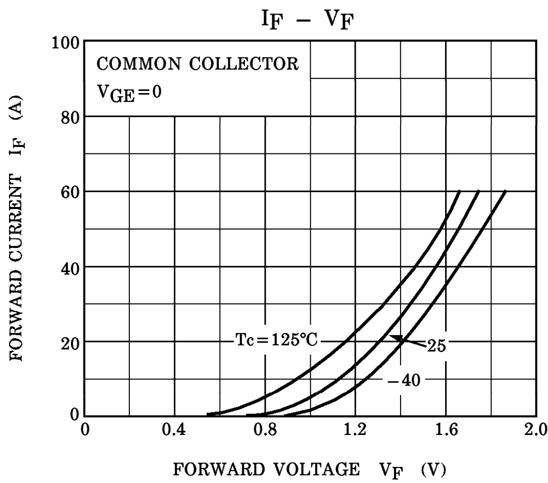

SWITCHING TIME – RG
toff
ton
tr
tf
COMMON EMITTER
VCC=300V
VGG=±15V
IC=50A
Tc=25°C
SWITCHING TIME (μs)
GATE RESISTANCE RG (Ω)
1
0.5
0.3
0.1
0.05
0.03
0.01
3
5
10
30
50
100

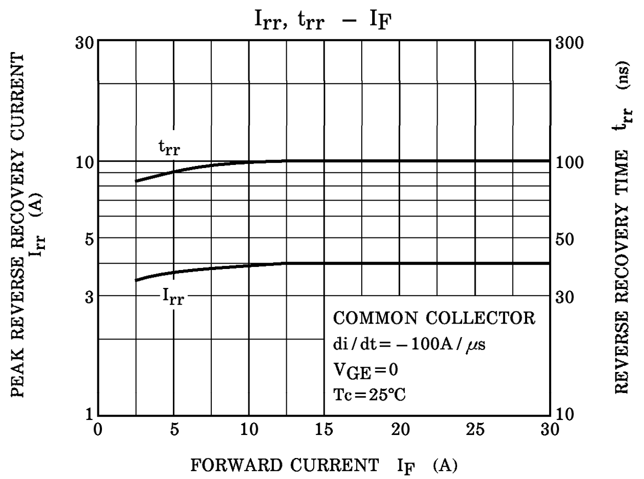

SAFE OPERATING AREA
IC MAX. (PULSED)
IC MAX. (CONTINUOUS)
10μs ※
1ms ※
100μs ※
10ms ※
DC OPERATION
※ SINGLE NON-REPETITIVE PULSE Tc=25°C
CURVES MUST BE DERATED LINEARLY WITH INCREASE IN TEMPERATURE.
COLLECTOR CURRENT IC (A)
COLLECTOR-EMITTER VOLTAGE VCE (V)
300
100
50
30
10
5
3
1
0.5
0.3
0.1
1
3
10
30
100
300
1000

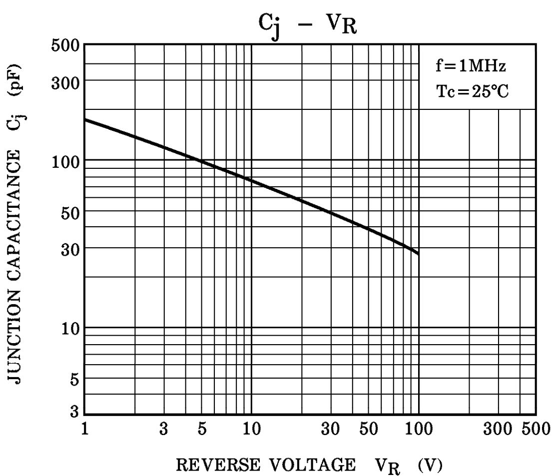

SWITCHING TIME – IC
COMMON EMITTER
VCC=300V
VGG=±15V
RG=39Ω
Tc=25°C
toff
ton
tf
tr
SWITCHING TIME (μs)
COLLECTOR CURRENT IC (A)
1
0.5
0.3
0.1
0.05
3
5
10
30
50
100

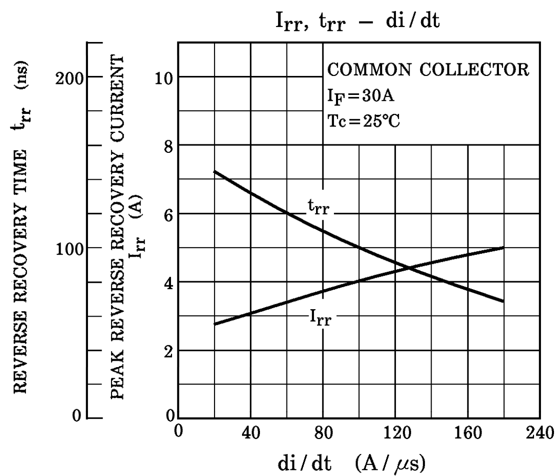

REVERSE BIAS SOA
COLLECTOR CURRENT IC (A)
COLLECTOR-EMITTER VOLTAGE VCE (V)
Tj≦125°C
VGE=±15V
RG=39Ω


rth (t) – tw
TRANSIENT THERMAL IMPEDANCE rth (t) (°C/W)
PULSE WIDTH tw (s)
Tc=25°C
DIODE STAGE
IGBT STAGE


IF – VF
FORWARD CURRENT IF (A)
FORWARD VOLTAGE VF (V)
COMMON COLLECTOR
VGE=0
Tc=125°C
25
−40


Irr, trr – IF
PEAK REVERSE RECOVERY CURRENT Irr (A)
REVERSE RECOVERY TIME trr (ns)
FORWARD CURRENT IF (A)
trr
Irr
COMMON COLLECTOR
di/dt=−100A/μs
VGE=0
Tc=25°C


Cj – VR
JUNCTION CAPACITANCE Cj (pF)
REVERSE VOLTAGE VR (V)
f=1MHz
Tc=25°C


Irr, trr – di/dt
REVERSE RECOVERY TIME trr (ns)
PEAK REVERSE RECOVERY CURRENT Irr (A)
di/dt (A/μs)
COMMON COLLECTOR
IF=30A
Tc=25°C
trr
Irr