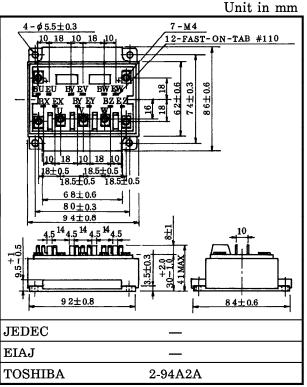
TOSHIBA GTR MODULE SILICON N CHANNEL IGBT

M G 7 5 J 6 E S 5 0

HIGH POWER SWITCHING APPLICATIONS.

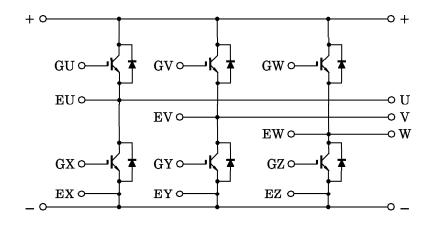
MOTOR CONTROL APPLICATIONS.

- The Electrodes are Isolated from Case.
- High Input Impedance.
- 6 IGBTs Built Into 1 Package.
- Enhancement-Mode.
- High Speed :  $t_f = 0.30 \mu s$  (Max.) (I<sub>C</sub> = 75A)  $t_{rr} = 0.15 \mu s$  (Max.) (IF = 75A)
- Low Saturation Voltage :  $V_{CE (sat)} = 2.70V$  (Max.) ( $I_{C} = 75A$ )



Weight : 505g (TYP.)

## EQUIVALENT CIRCUIT



961001EAA2

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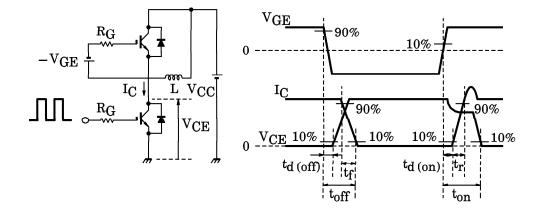
## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT	
Collector-Emitter Voltage		VCES	600	V	
Gate-Emitter Voltage		V <sub>GES</sub>	±20	V	
Collector Current	DC	IC	75	A	
	1ms	ICP	150		
Forward Current	DC	$I_{\mathbf{F}}$	75	A	
	1ms	$I_{FM}$	150	A	
Collector Power Dissipation $(Tc = 25^{\circ}C)$		PC	390	W	
Junction Temperature		Тј	150	°C	
Storage Temperature Range		T <sub>stg</sub>	$-40 \sim 125$	°C	
Isolation Voltage		VIsol	V <sub>Isol</sub> 2500 (AC 1 min.)		
Screw Torque (Terminal/Mounting)		_	2/3	N∙m	

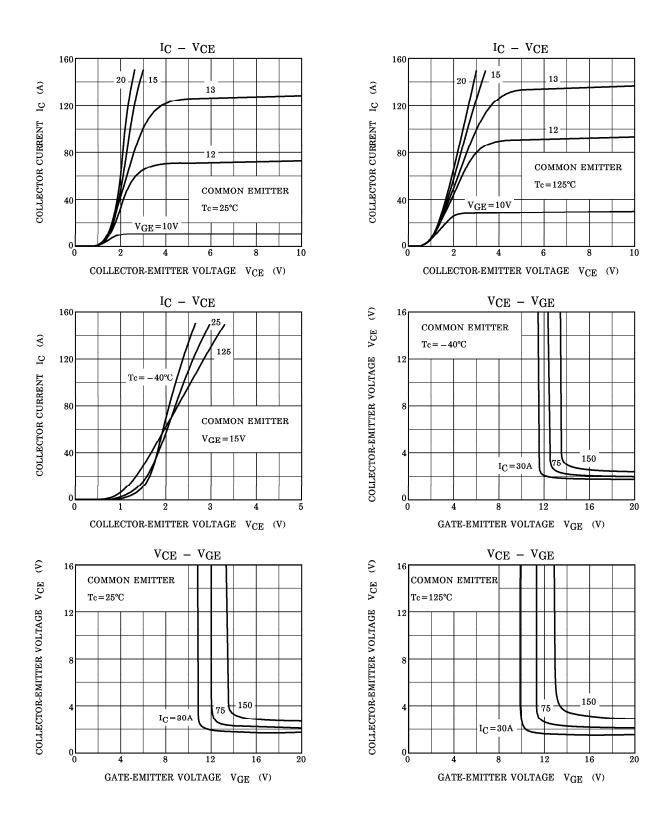
## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		IGES	$V_{GE} = \pm 20V, V_{CE} = 0$			±500	nA
Collector Cut-off Current		ICES	$V_{CE} = 600V, V_{GE} = 0$	_	_	1.0	mA
Gate-Emitter Cut-off Voltage		V <sub>GE (off)</sub>	$I_{C} = 7.5 \text{mA}, V_{CE} = 5 \text{V}$	5.0	7.0	8.0	v
Collector-Emitter Saturation Voltage		V <sub>CE</sub> (sat)	$I_{C} = 75A, V_{GE} = 15V$	_	2.10	2.70	v
Input Cap	acitance	Cies	$V_{CE} = 10V, V_{GE} = 0, f = 1MHz$	_	7100	_	pF
Switching T Time Turr	Turn-on Delay Time	<sup>t</sup> d (on)	Inductive Load $V_{CC} = 300V$ $I_C = 75A$ $V_{GE} = \pm 15V$ $R_G = 18\Omega$ (Note 1)	_	0.08	0.16	μs
	Rise Time	t <sub>r</sub>		_	0.12	0.24	
	Turn-on Time	t <sub>on</sub>		_	0.40	0.80	
	Turn-off Delay Time	<sup>t</sup> d (off)		_	0.20	0.40	
	Fall Time	tf		_	0.15	0.30	
	Turn-off Time	toff		_	0.50	1.00	
Forward V	Voltage	$V_{\mathbf{F}}$	$I_{F} = 75A, V_{GE} = 0$	—	2.10	2.80	V
Reverse Recovery Time		t <sub>rr</sub>	$I_F = 75A, V_{GE} = -10V$ di/dt=100A/ $\mu$ s	_	0.08	0.15	$\mu { m s}$
Thermal Resistance		R <sub>th (j-c)</sub>	Transistor			0.32	∣°C/W∣
			Diode	_	_	0.69	

## TOSHIBA



Note 1 Switching Time Test Circuit & Timing Chert



ε

VGE

GATE-EMITTER VOLTAGE

16

12

500

400

ton

IC - VGEVCE, VGE – QG 160 S COMMON EMITTER COMMON EMITTER VCE 400  $R_L = 4\Omega$ E Tc = 25°C  $V_{CE} = 5V$ ч  $V_{CE} = 0V$ 120 COLLECTOR-EMITTER VOLTAGE 300 COLLECTOR CURRENT 300 80 - 40  $Tc = 125^{\circ}C$ 200 200 100 25 40 100 0 0L 0 16 20 100 300 12 200 4 8 GATE-EMITTER VOLTAGE  $V_{GE}$  (V) CHARGE QG (nC) ton, td (on), tr - IC  $t_{on}$ ,  $t_{d}$  (on),  $t_{r}$  –  $R_{G}$ 3 0.5 SWITCHING TIME ton, td (on), tr (µs) (szl) :  $Tc = 25^{\circ}C$ - : Tc=125°C 0.3 ton, td (on), tr ton 0.5 td (on) <sup>t</sup>d (on) 0.1 0.3 SWITCHING TIME 0.05 COMMON EMITTER  $V_{CC} = 300V$ 0.03  $V_{GE} = \pm 15V$ 0.1  $R_{G} = 18\Omega$ COMMON EMITTER  $V_{CC} = 300V$  $V_{GE} = \pm 15V$  $I_C = 75A$ - : Tc=25°C 0.05 ----: Tc=125°C 0.01 0.03 10 30 50 100 30 50 100 3 5 10 Gate resistance  $R_{G}$  ( $\Omega$ ) Collector current  $I_{\mathbf{C}}$  (A) toff, td (off), tf - IC toff, td (off), tf - RG  $\begin{array}{c} \text{COMMON EMITTER} \\ \text{V}_{\text{CC}} = 300 \text{V} \\ \text{V}_{\text{GE}} = \pm 15 \text{V} \\ \text{I}_{\text{C}} = 75 \text{A} \end{array}$ (sr/) (sr/ SWITCHING TIME toff, td (off), tf toff, td (off), tf 0.5 toff 0.5 0.3 0.03 td (off) SWITCHING TIME tf 0.1 COMMON EMITTER 0.1 VCC=300V :  $Tc = 25^{\circ}C$  $V_{GE} = \pm 15V$ 0.05  $R_{G} = 18\Omega$ 0.05 --: Tc=125°C ----: Tc=125°C 30 50 10 50 100 3 5 10 30 COLLECTOR CURRENT  $I_{C}$  (A) GATE RESISTANCE  $R_G$  ( $\Omega$ )

off

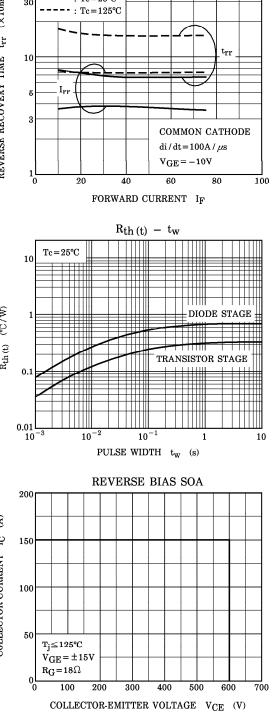
<sup>t</sup>d (off)

ŧf

:  $Tc = 25^{\circ}C$ 

100

 $I_F - V_F$ Ð 160 :  $Tc = 25^{\circ}C$ PEAK REVERSE RECOVERY CURRENT III REVERSE RECOVERY TIME III (×10ns) COMMON CATHODE 30 Ð  $V_{GE} = 0$ 120 ΙĿ FORWARD CURRENT 10 80  $Tc = 125^{\circ}C$ 2540 Irr Б 3 **4**0 0 1L 0 20 2.4 3.2 4.0 0.8 1.6 FORWARD VOLTAGE VF (V) C - VCE $Tc = 25^{\circ}C$ TRANSIENT THERMAL RESISTANCE  $R_{th (t)}$  (°C/W) 10 10000 Cies (pF) ++++ 3000 U 1 1000 CAPACITANCE ++++Coes 300 0.1 100 Cres COMMON EMITTER  $V_{GE} = 0$ 30 f=1MHz  $Tc = 25^{\circ}C$ 10 0.01 0.3 3 30 300 10 100 1 10 COLLECTOR-EMITTER VOLTAGE VCE (V) SAFE OPERATING AREA 300 200 IC MAX. (PULSED)  $50 \mu s^*$ E E IC MAX. (CONTINUOUS) 100 IC С 150 COLLECTOR CURRENT COLLECTOR CURRENT 1 ms30  $100 \,\mu s$ DC OPERATION 100 10 ※ SINGLE NONREPETITIVE PULSE Tc=25°C 3 50 CURVES MUST BE T<sub>j</sub>≤125℃ DERATED LINEARLY WITH INCREASE IN 1 TEMPERATURE.  $R_G = 18\Omega$ 0 0.3 10 30 100 3 100 300 1000 1 COLLECTOR-EMITTER VOLTAGE VCE (V)



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