

# TOSHIBA

## INTEGRATED GTR MODULE

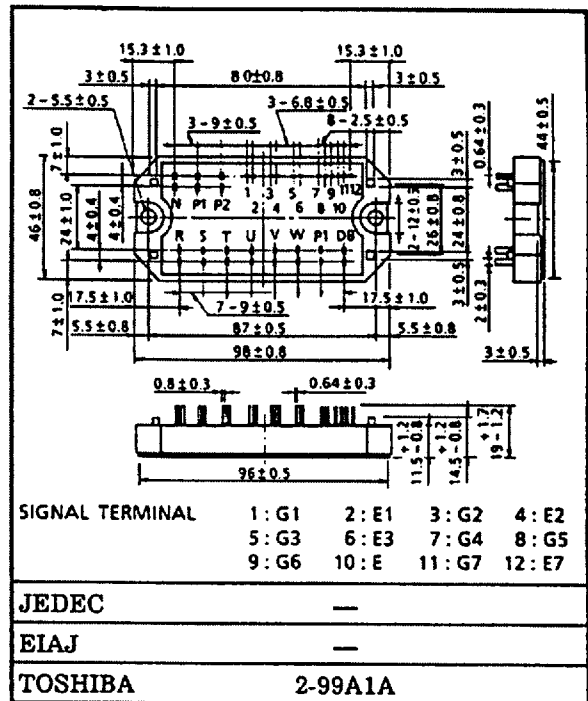
MIG20J901H

Unit in mm

### High Power Switching Applications

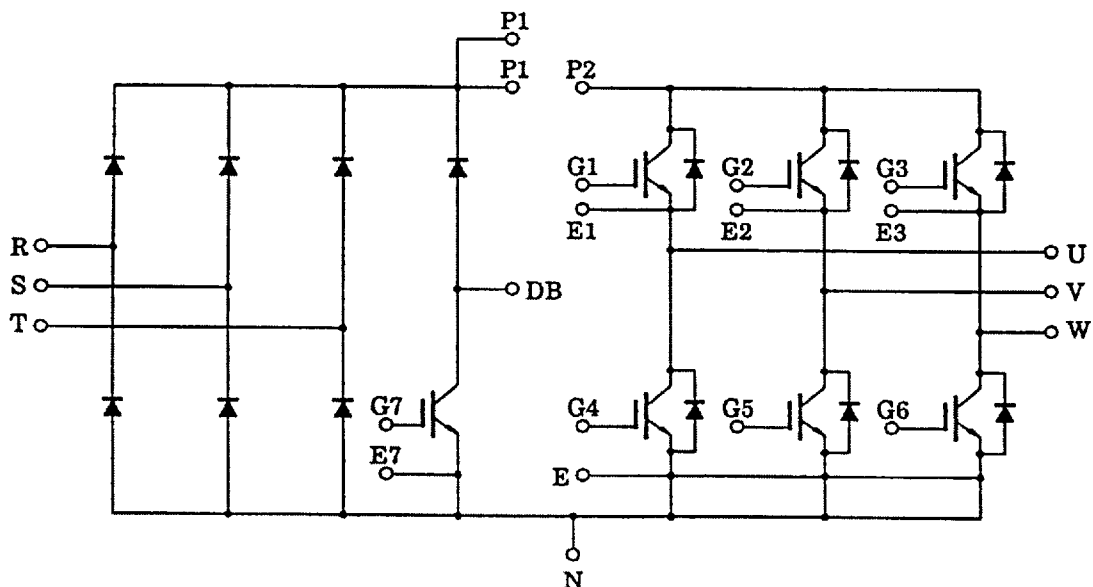
#### Motor Control Applications

- Integrates Inverter, Converter and Brake Power Circuits in One Package.
- Output (Inverter Stage)
  - : 3 $\phi$ 20A/600V High Speed Type IGBT
  - $V_{CE(sat)}$  = 4.00V (Max.)
  - $t_f$  = 0.30 $\mu$ s (Max.)
  - $t_{rr}$  = 0.15 $\mu$ s (Max.)
- Input (Converter Stage)
  - : 3 $\phi$ 20A/800V Silicon Rectifier
  - $V_F$  = 1.20V (Max.)
- Brake Stage
  - : 15A/600V IGBT & 15A/600V FRD
- The Electrodes are Isolated from Case.



Weight : 175g

### Equivalent Circuit



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## Maximum Ratings (Ta = 25°C)

STAGE		CHARACTERISTIC		SYMBOL	RATINGS	UNIT		
Inverter		Collector-Emitter Voltage		$V_{CES}$	600	V		
		Gate-Emitter Voltage		$V_{GES}$	±20	V		
		Collector Current		DC	$I_C$	20	A	
				1ms	$I_{CP}$	40		
		Forward Current		DC	$I_F$	20	A	
				1ms	$I_{FM}$	40		
		Collector Power Dissipation (Tc = 25°C)		$P_C$	80	W		
Converter		Repetitive Peak Reverse Voltage		$V_{RRM}$	800	V		
		Average Output Rectified Current		$I_O$	20	A		
		Peak One Cycle Surge Forward Current (50Hz, Non-Repetitive)		$I_{FSM}$	250	A		
Brake		IGBT		Collector-Emitter Voltage		$V_{CES}$	600	V
				Gate-Emitter Voltage		$V_{GES}$	±20	V
				DC	$I_C$	15	A	
				1ms	$I_{CP}$	30		
				Collector Power Dissipation (Tc = 25°C)		$P_C$	65	W
		FRD		Repetitive Peak Reverse Voltage		$V_{RRM}$	600	V
				Forward Current		DC	$I_F$	15
1ms	$I_{FM}$					30		
Module		Junction Temperature		$T_j$	150	°C		
		Storage Temperature Range		$T_{stg}$	-40 ~ 125	°C		
		Isolation Voltage		$V_{isol}$	2500 (AC 1 minute)	V		
		Screw Torque		—	3	N•m		

## Electrical Characteristics (Ta = 25°C)

## a. Inverter Stage

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MX.	UNIT
Gate Leakage Current		$I_{GES}$	$V_{GE} = \pm 20V, V_{CE} = 0$	-	-	$\pm 20$	$\mu A$
Collector Cut-off Current		$I_{CES}$	$V_{CE} = 600V, V_{GE} = 0$	-	-	1.0	mA
Gate-Emitter Cut-off Voltage		$V_{GE (off)}$	$V_{CE} = 5V, I_C = 20mA$	3.0	-	6.0	V
Collector-Emitter Saturation Voltage		$V_{CE (sat)}$	$I_C = 20A, V_{GE} = 15V$	-	3.0	4.0	V
Input Capacitance		$C_{ies}$	$V_{CE} = 10V, V_{GE} = 0$ $f = 1MHz$	-	1300	-	pF
Switching Time	Turn-on Delay Time	$t_{d(on)}$	Inductive Load $V_{CC} = 300V$ $I_C = 20A$ $V_{GE} = \pm 15V$ $R_G = 120\Omega$ (Note 1)	-	0.08	0.16	$\mu s$
	Rise Time	$t_r$		-	0.12	0.24	
	Turn-on Time	$t_{on}$		-	0.40	0.80	
	Turn-off Delay Time	$t_{d(off)}$		-	0.30	0.60	
	Fall Time	$t_f$		-	0.15	0.30	
	Turn-off Time	$t_{off}$		-	0.60	1.00	
Forward Voltage		$V_F$	$I_F = 20A, V_{GE} = 0$	-	1.7	2.5	V
Reverse Recovery Time		$t_{rr}$	$I_F = 20A, V_{GE} = -10V$ $di/dt = 50A/\mu s$	-	0.08	0.15	$\mu s$
Thermal Resistance		$R_{th(j-c)}$	Transistor	-	-	1.56	$^{\circ}C/W$
			Diode	-	-	2.80	

## b. Converter Stage

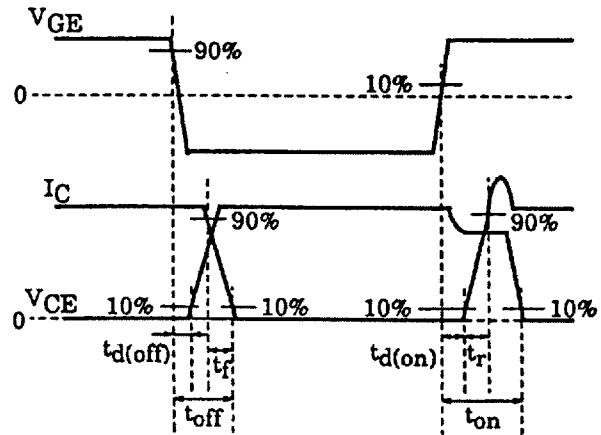
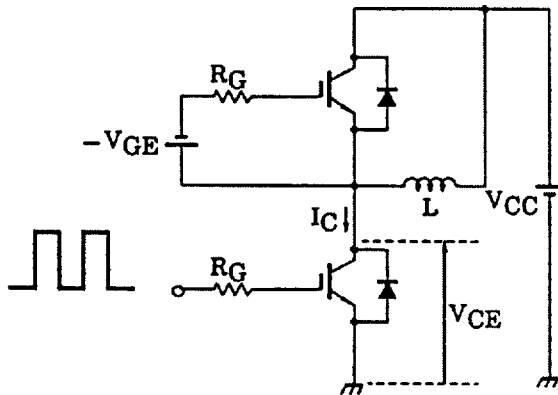
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MX.	UNIT
Repetitive Peak Reverse Current	$I_{RRM}$	$V_{RRM} = 800V$	-	-	50	$\mu A$
Peak Forward Voltage	$V_{FM}$	$I_{FM} = 20A$	-	1.05	1.20	V
Peak One Cycle Surge Forward Current	$I_{FSM}$	50Hz Sine-half-wave	250	-	-	A
Thermal Resistance	$R_{th(j-c)}$	-	-	-	2.50	$^{\circ}C/W$

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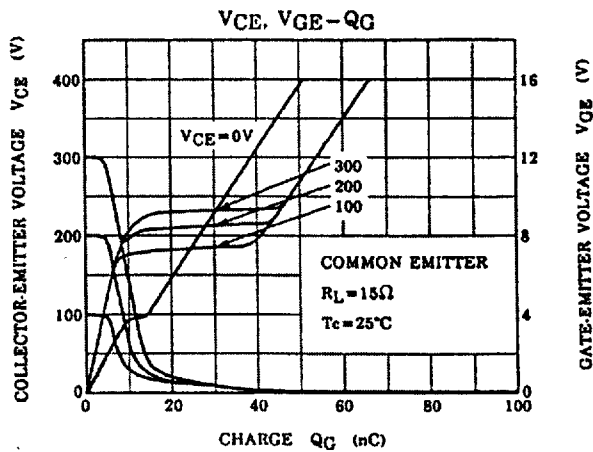
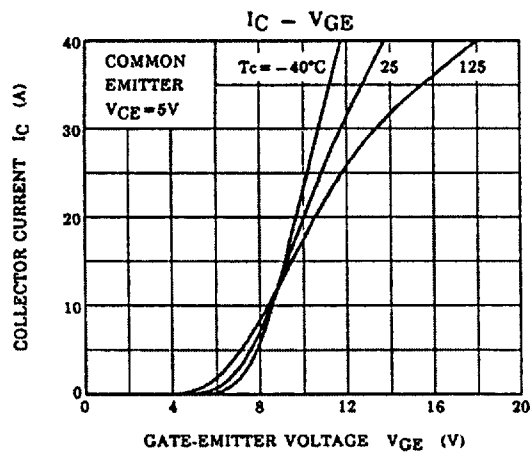
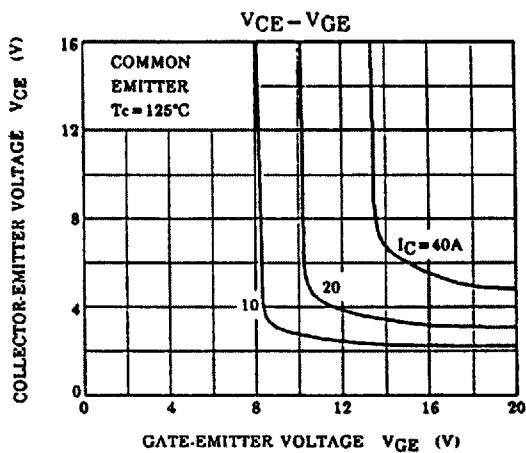
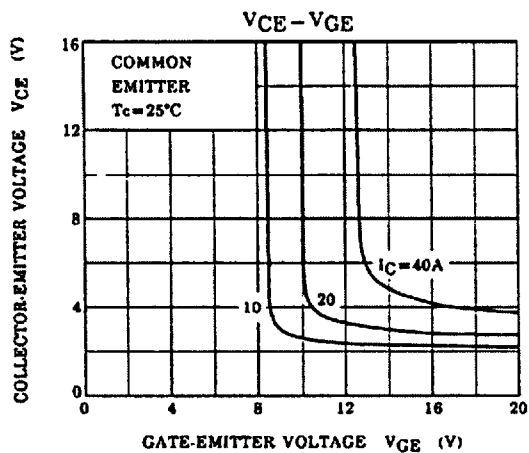
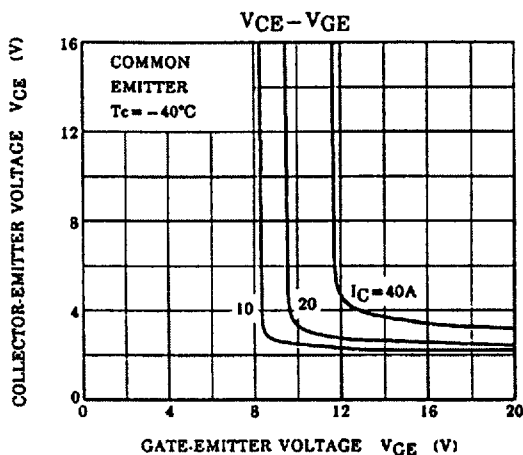
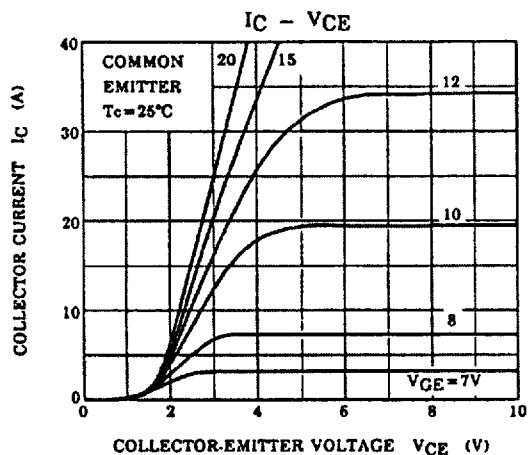
## c. Brake Stage

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MX.	UNIT
Gate Leakage Current		$I_{GES}$	$V_{GE} = \pm 20V, V_{CE} = 0$	-	-	$\pm 20$	$\mu A$
Collector Cut-off Current		$I_{CES}$	$V_{CE} = 600V, V_{GE} = 0$	-	-	1.0	mA
Repetitive Peak Reverse Current		$I_{RRM}$	$V_{RRM} = 600V$	-	-	1.0	mA
Gate-Emitter Cut-off Voltage		$V_{GE(off)}$	$V_{CE} = 5V, I_C = 15mA$	3.0	-	6.0	V
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$	$I_C = 15A, V_{GE} = 15V$	-	3.0	4.0	V
Input Capacitance		$C_{ies}$	$V_{CE} = 10V, V_{GE} = 0$ $f = 1MHz$	-	1000	-	pF
Switching Time	Turn-on Delay Time	$t_{d(on)}$	Inductive Load	-	0.08	0.16	$\mu s$
	Rise Time	$t_r$	$V_{CC} = 300V$	-	0.12	0.24	
	Turn-on Time	$t_{on}$	$I_C = 15A$	-	0.40	0.80	
	Turn-off Delay Time	$t_{d(off)}$	$V_{GE} = \pm 15V$	-	0.30	0.60	
	Fall Time	$t_f$	$R_G = 150\Omega$	-	0.30	0.55	
	Turn-off Time	$t_{off}$	(Note 1)	-	0.65	1.00	
Forward Voltage		$V_F$	$I_F = 15A, V_{GE} = 0$	-	1.7	2.5	V
Thermal Resistance		$R_{th(j-c)}$	Transistor	-	-	1.92	$^{\circ}C/W$
			Diode	-	-	2.80	

Note. 1 Switching Time Test Circuit & Timing Chart

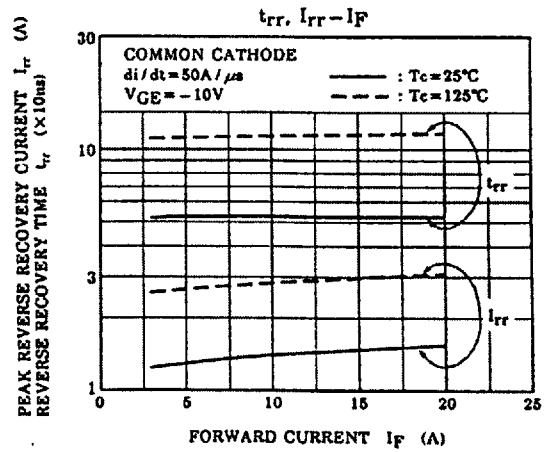
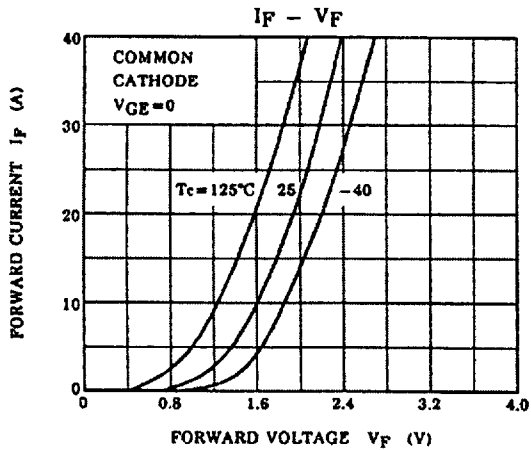
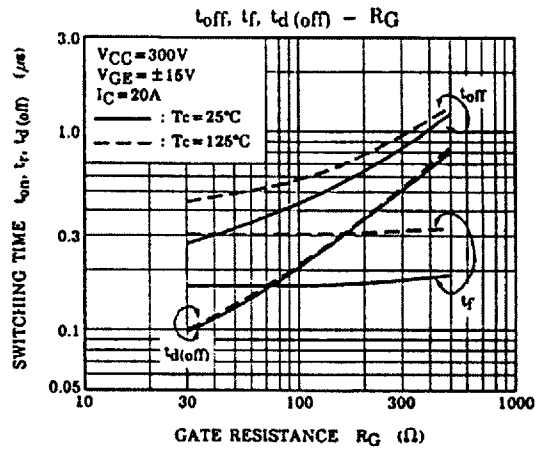
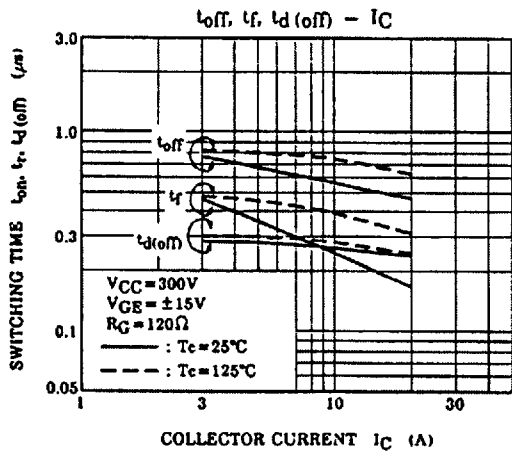
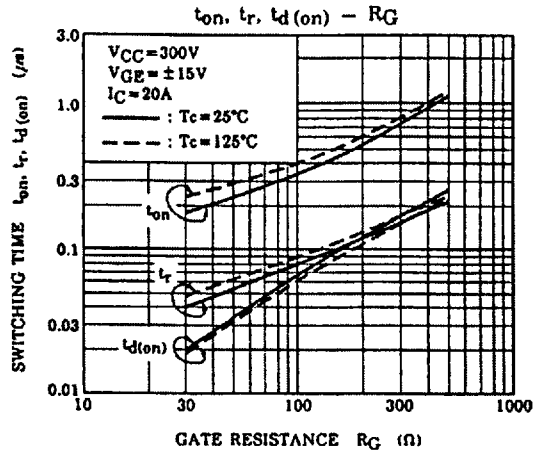
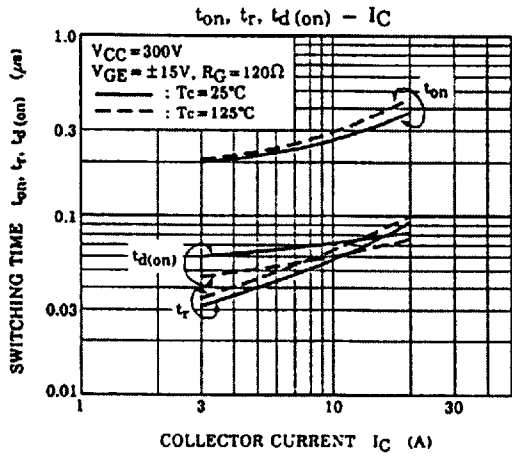


a. Inverter Stage

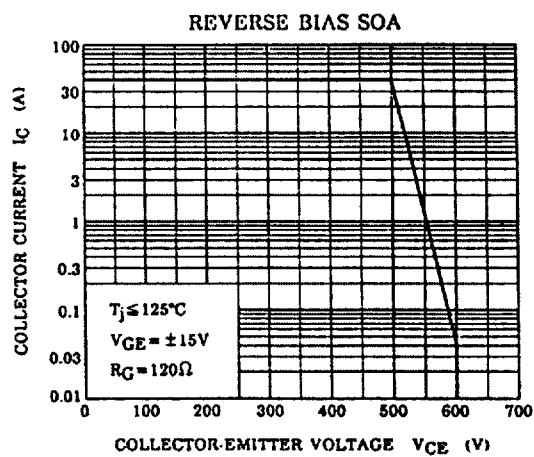
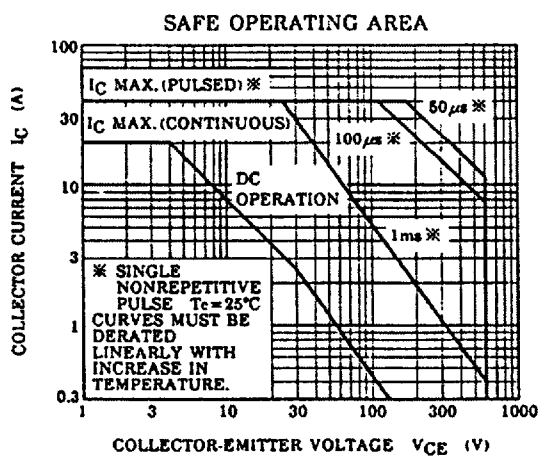
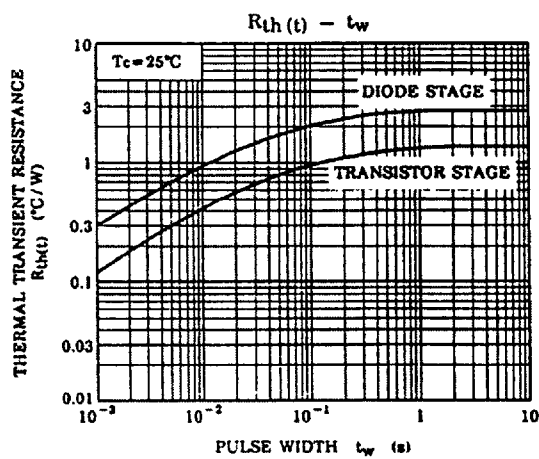
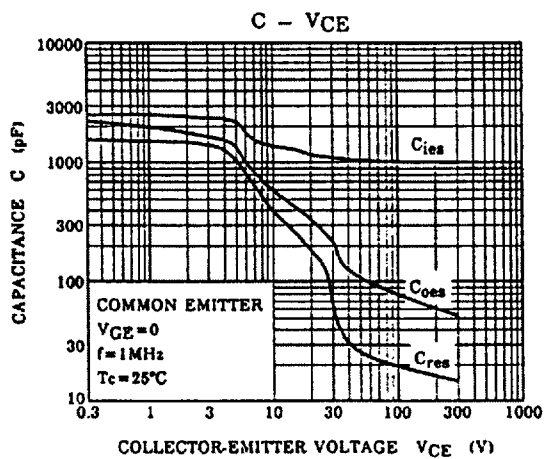


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## a. Inverter Stage

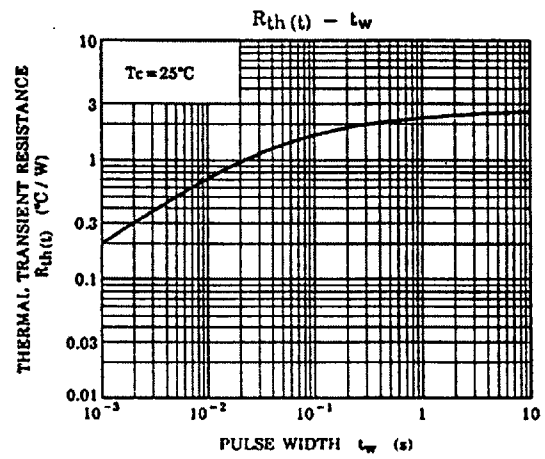
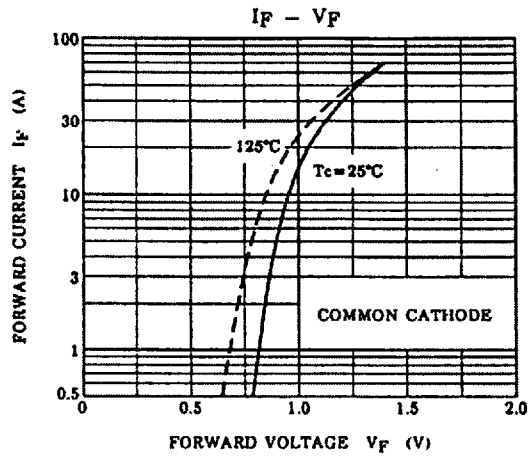


a. Inverter Stage



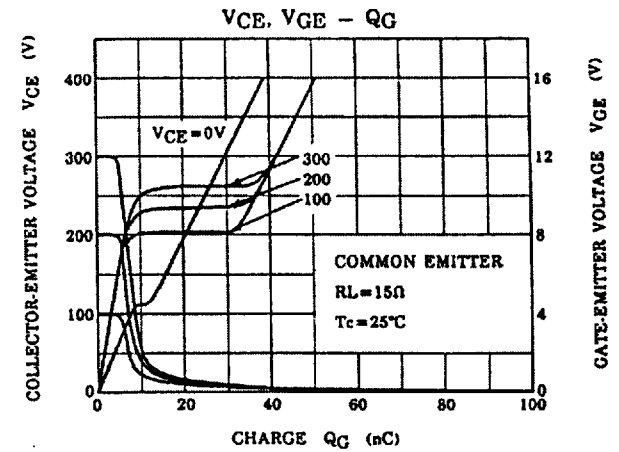
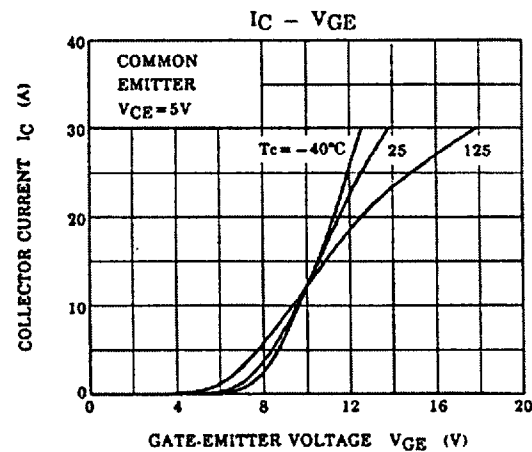
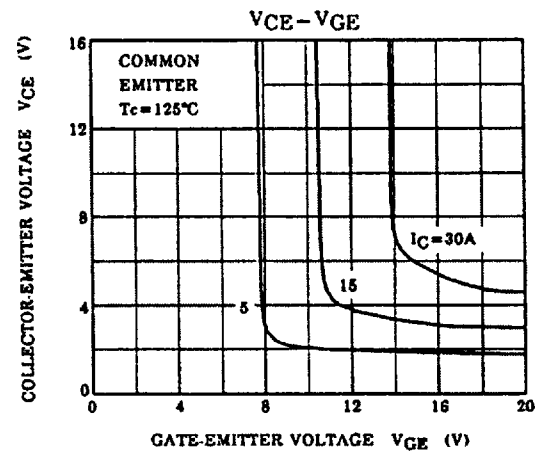
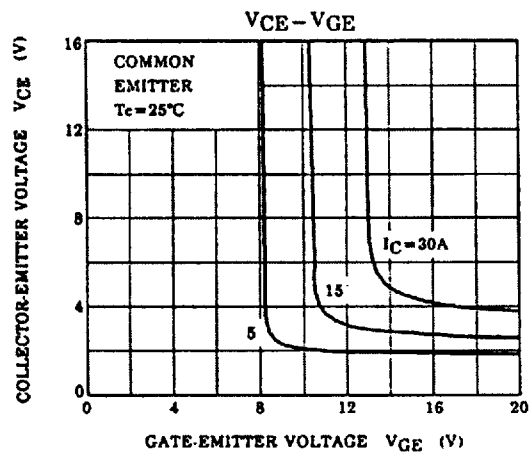
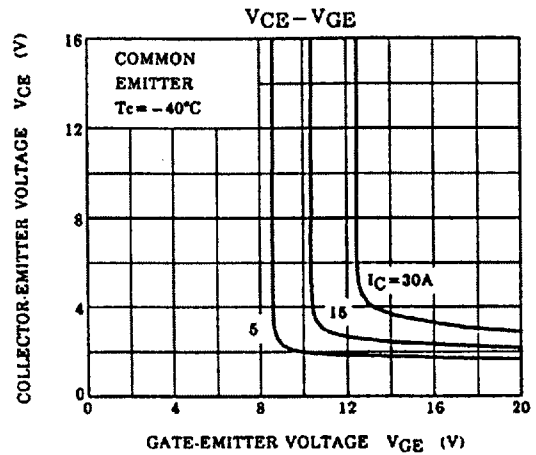
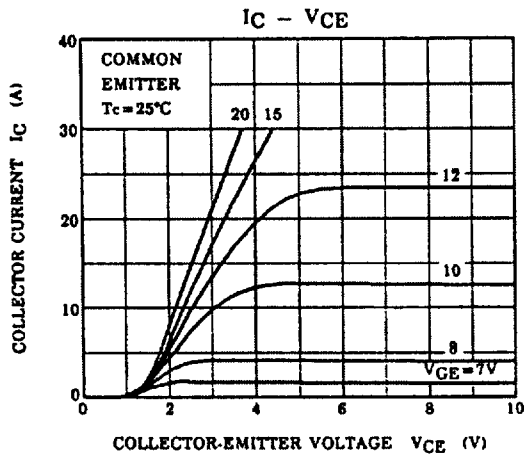
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## b. Converter Stage





c. Brake Stage

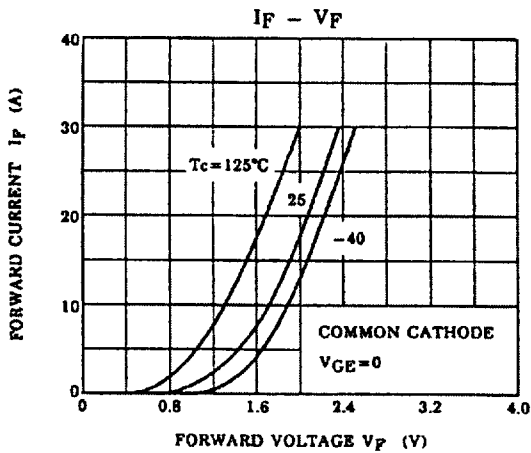
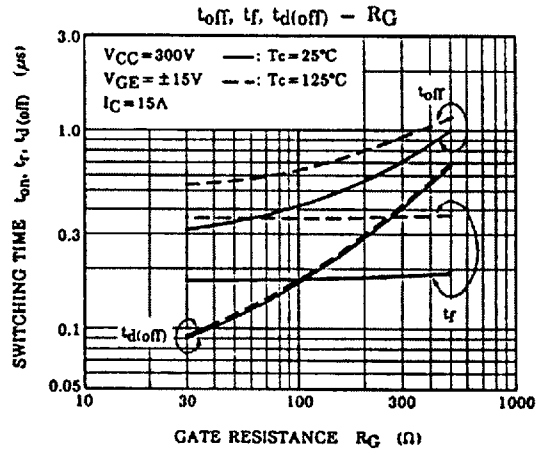
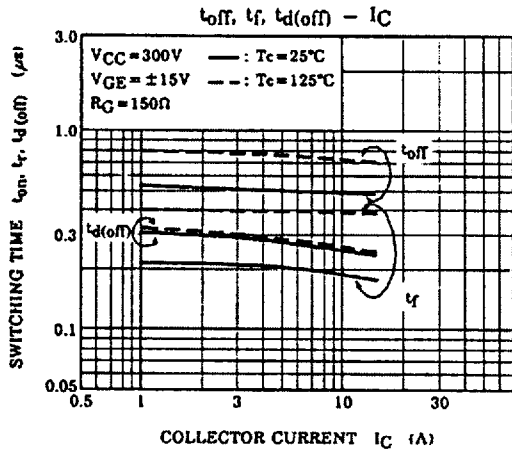
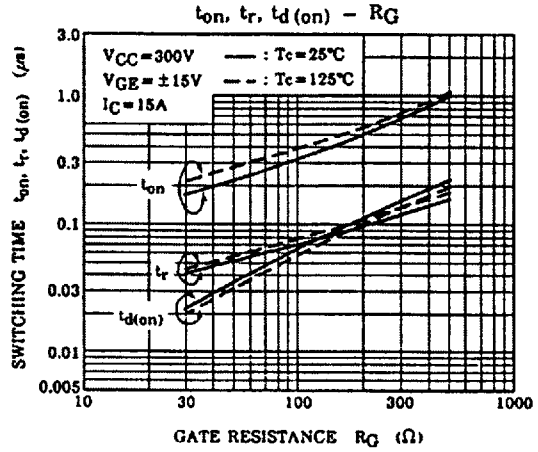
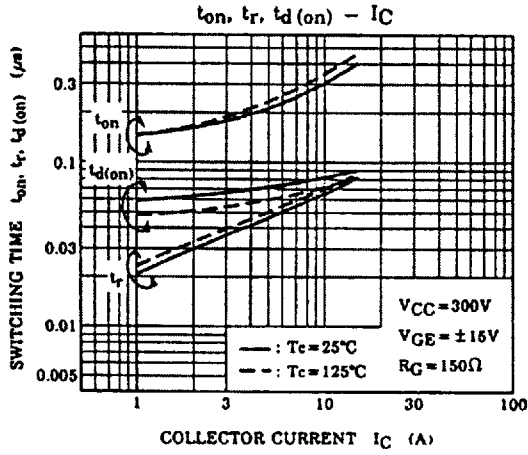


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c. Brake Stage

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c. Brake Stage



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