

TOSHIBA INTEGRATED IGBT MODULE SILICON N CHANNEL IGBT

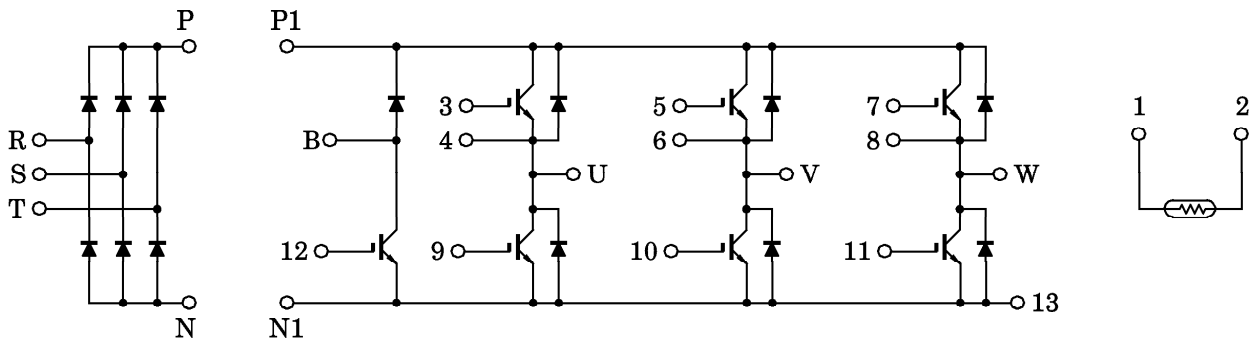
# MIG10Q906H, MIG10Q906HA

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter, Converter and Brake Power Circuits and Thermistor in One Package.
- Output (Inverter Stage) : 3 $\phi$  10 A / 1200 V IGBT
- Input (Converter Stage) : 3 $\phi$  15 A / 1600 V Silicon Rectifier
- The Electrodes are Isolated from Case.
- Outline
  - MIG10Q906H : 2-108E5A
  - MIG10Q906HA : 2-108E6A
- Weight : 190 g

EQUIVALENT CIRCUIT



961001EAA2

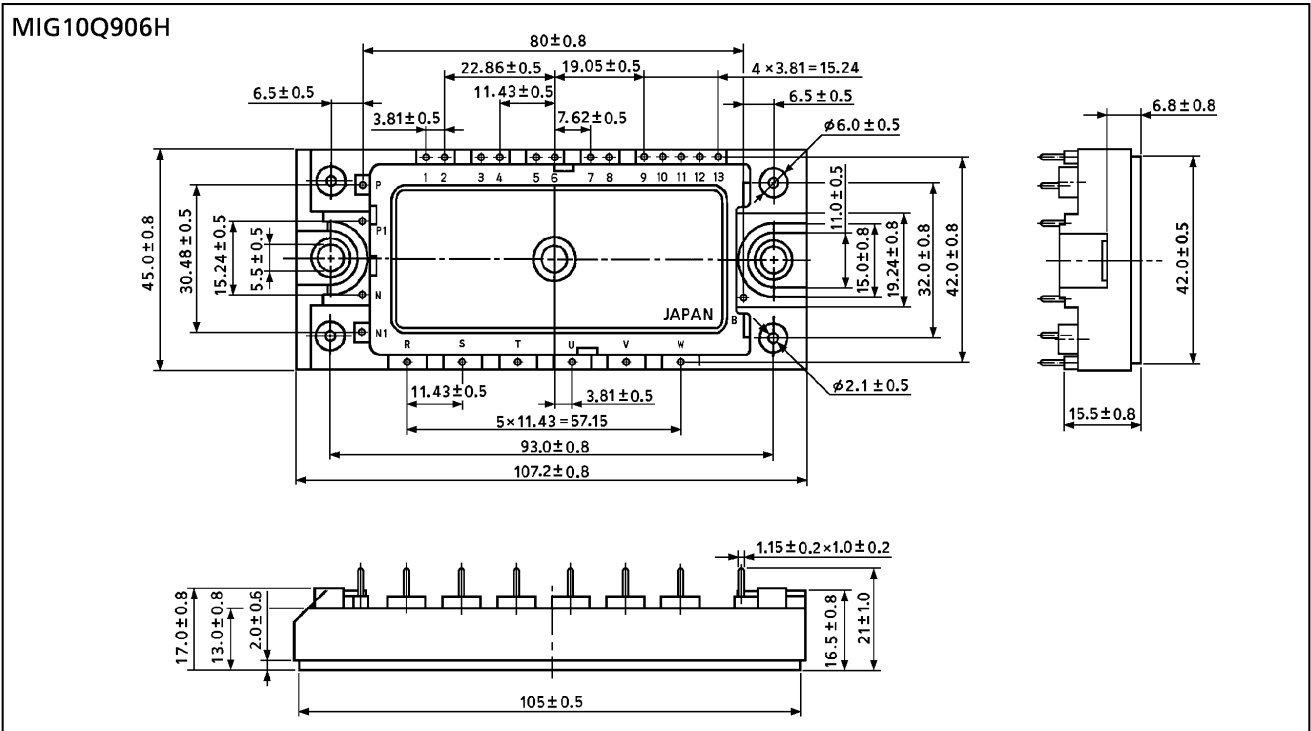
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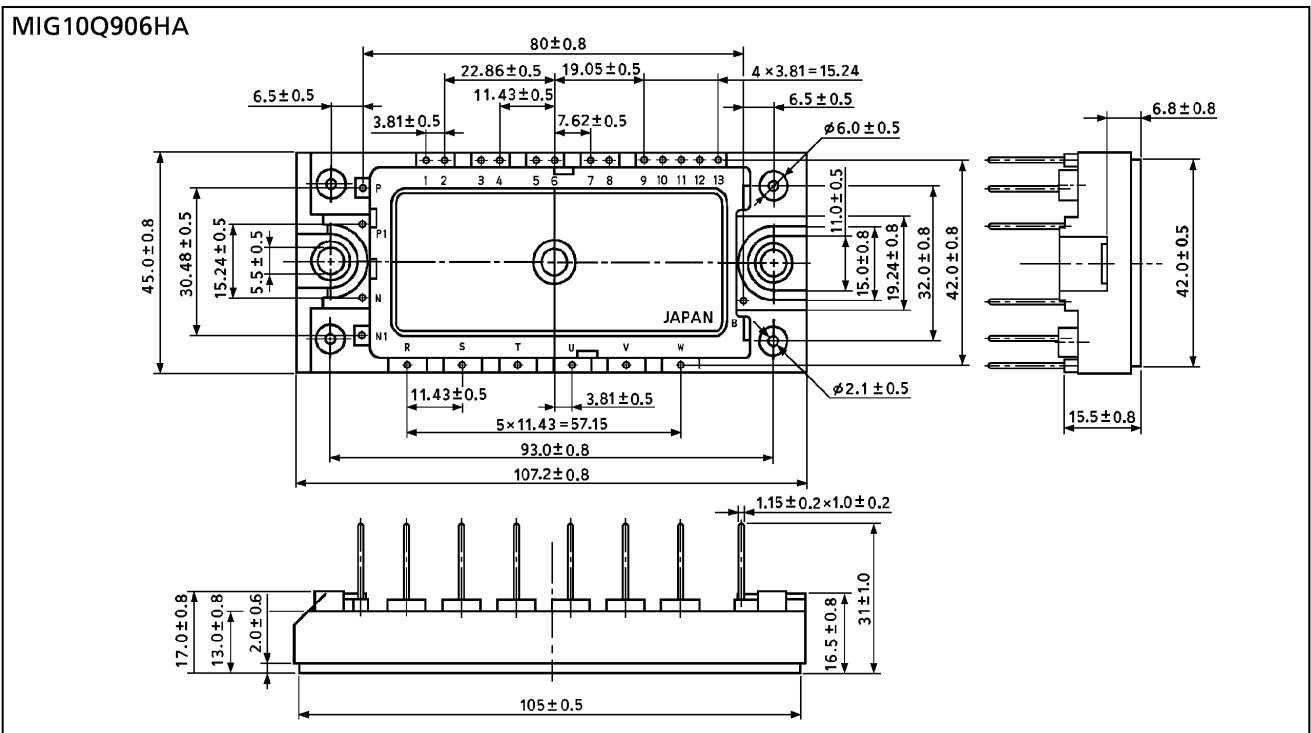
Package Dimension

Unit : mm



2-108E5A

Unit : mm



2-108E6A

MAXIMUM RATINGS (Ta = 25°C)

STAGE		CHARACTERISTIC		SYMBOL	RATING	UNIT	
Inverter	Collector-Emitter Voltage			V <sub>CES</sub>	1200	V	
	Gate-Emitter Voltage			V <sub>GES</sub>	±20	V	
	Collector Current	DC	I <sub>C</sub>	15 / 10	A	(25°C / 80°C)	
		1 ms	I <sub>CP</sub>	30 / 20	A	(25°C / 80°C)	
	Forward Current	DC	I <sub>F</sub>	10	A		
		1 ms	I <sub>FM</sub>	20	A		
Collector Power Dissipation (Tc = 25°C)			P <sub>C</sub>	82	W		
Converter	Repetitive Peak Reverse Voltage			V <sub>R</sub> RM	1600	V	
	Average Output Rectified Current			I <sub>O</sub>	15	A	
	Peak One Cycle Surge Forward Current (50 Hz, Non-Repetitive)			I <sub>FSM</sub>	250	A	
Brake	IGBT	Collector-Emitter Voltage		V <sub>CES</sub>	1200	V	
		Gate-Emitter Voltage		V <sub>GES</sub>	±20	V	
		Collector Current	DC	I <sub>C</sub>	15 / 10	A	(25°C / 80°C)
			1 ms	I <sub>CP</sub>	30 / 20	A	(25°C / 80°C)
	Collector Power Dissipation (Tc = 25°C)			P <sub>C</sub>	82	W	
	FWD	Reverse Voltage			V <sub>R</sub>	1200	V
		Forward Current	DC	I <sub>F</sub>	10	A	
			1 ms	I <sub>FM</sub>	20	A	
Module	Junction Temperature			T <sub>j</sub>	150	°C	
	Storage Temperature Range			T <sub>stg</sub>	-40~125	°C	
	Isolation Voltage			V <sub>Isol</sub>	2500 (AC 1 minute)	V	
	Screw Torque			—	6	N·m	

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

## a. Inverter stage

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GES}$	$V_{GE} = \pm 20 \text{ V}, V_{CE} = 0$	—	—	$\pm 500$	nA
Collector Cut-Off Current		$I_{CES}$	$V_{CE} = 1200 \text{ V}, V_{GE} = 0$	—	—	0.5	mA
Gate-Emitter Cut-Off Voltage		$V_{GE}(\text{off})$	$I_C = 10 \text{ mA}, V_{CE} = 5 \text{ V}$	—	6.0	—	V
Collector-Emitter Saturation Voltage		$V_{CE}(\text{sat})$	$I_C = 10 \text{ A}$	—	2.8	3.2	V
			$V_{GE} = 15 \text{ V}$	—	3.1	3.7	
Input Capacitance		$C_{ies}$	$V_{CE} = 10 \text{ V}, V_{GE} = 0,$ $f = 1 \text{ MHz}$	—	1200	—	pF
Switching Time	Rise Time	$t_r$	$V_{CC} = 600 \text{ V}$	—	0.07	0.15	$\mu\text{s}$
	Turn-On Time	$t_{on}$	$I_C = 10 \text{ A}$	—	0.15	0.30	
	Fall Time	$t_f$	$V_{GE} = \pm 15 \text{ V}$ $R_G = 120 \Omega$	—	0.07	0.10	
	Turn-Off Time	$t_{off}$	$T_j = 125^\circ\text{C}$ (Note 1)	—	0.60	0.90	
Forward Voltage		$V_F$	$I_F = 10 \text{ A}, V_{GE} = 0$	—	2.0	2.8	V
Reverse Recovery Time		$t_{rr}$	$I_F = 10 \text{ A}, V_{GE} = -10 \text{ V},$ $di/dt = 200 \text{ A}/\mu\text{s}$	—	0.10	0.25	$\mu\text{s}$
Thermal Resistance		$R_{th(j-c)}$	Transistor	—	—	1.52	$^\circ\text{C}/\text{W}$
			Diode	—	—	1.5	

## b. Converter stage

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Repetitive Peak Reverse Current		$I_{RRM}$	$V_{RRM} = 1600 \text{ V}$	—	—	50	$\mu\text{A}$
Peak Forward Voltage		$V_{FM}$	$I_{FM} = 15 \text{ A}$	—	1.05	1.20	V
Peak One Cycle Surge Forward Current		$I_{FSM}$	50 Hz sine-half-wave	250	—	—	A
Thermal Resistance		$R_{th(j-c)}$	—	—	—	1.90	$^\circ\text{C}/\text{W}$

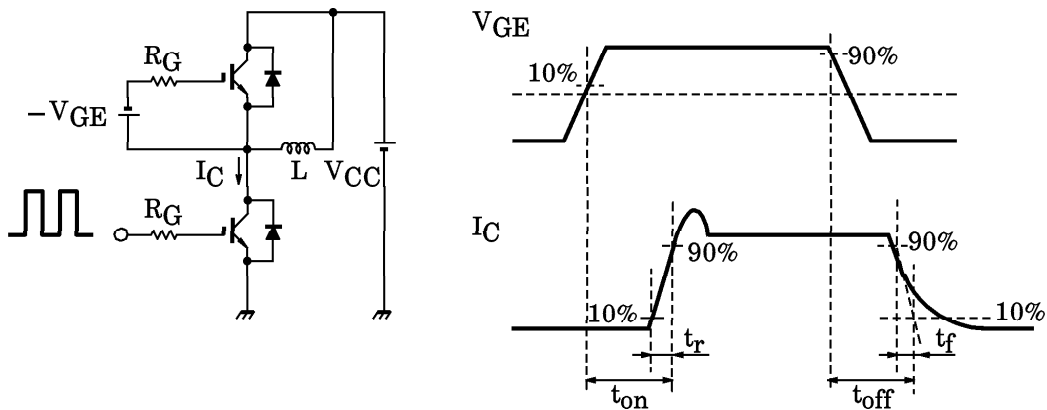
c. Brake stage

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GES}$	$V_{GE} = \pm 20\text{ V}, V_{CE} = 0$	—	—	$\pm 500$	nA
Collector Cut-Off Current		$I_{CES}$	$V_{CE} = 1200\text{ V}, V_{GE} = 0$	—	—	0.5	mA
Reverse Current		$I_R$	$V_R = 1200\text{ V}, V_{GE} = 0$	—	—	0.5	mA
Gate-Emitter Cut-Off Voltage		$V_{GE}(\text{off})$	$I_C = 10\text{ mA}, V_{CE} = 5\text{ V}$	—	6.0	—	V
Collector-Emitter Saturation Voltage		$V_{CE}(\text{sat})$	$I_C = 10\text{ A}$	—	2.8	3.2	V
			$V_{GE} = 15\text{ V}$	—	3.1	3.7	
Input Capacitance		$C_{ies}$	$V_{CE} = 10\text{ V}, V_{GE} = 0,$ $f = 1\text{ MHz}$	—	1200	—	pF
Switching Time	Rise Time	$t_r$	$V_{CC} = 600\text{ V}$ $I_C = 10\text{ A}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 120\ \Omega$ $T_j = 125^\circ\text{C}$ (Note 1)	—	0.07	0.15	$\mu\text{s}$
	Turn-On Time	$t_{on}$		—	0.15	0.30	
	Fall Time	$t_f$		—	0.07	0.10	
	Turn-Off Time	$t_{off}$		—	0.60	0.90	
Forward Voltage		$V_F$	$I_F = 10\text{ A}, V_{GE} = 0$	—	2.0	2.8	V
Thermal Resistance		$R_{th(j-c)}$	Transistor	—	—	1.52	$^\circ\text{C/W}$
			Diode	—	—	1.5	

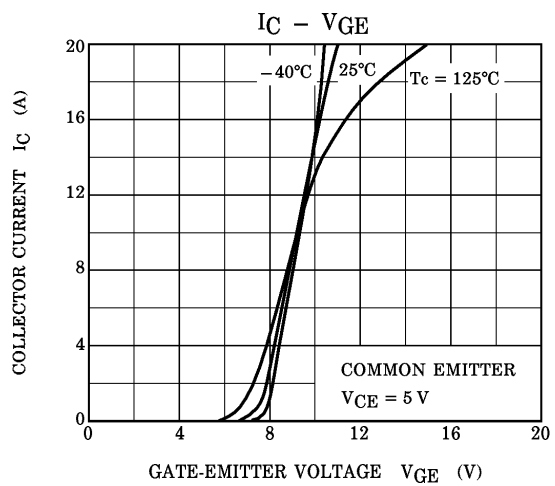
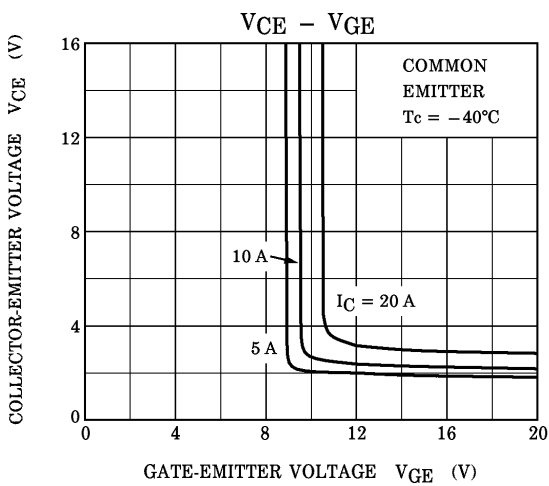
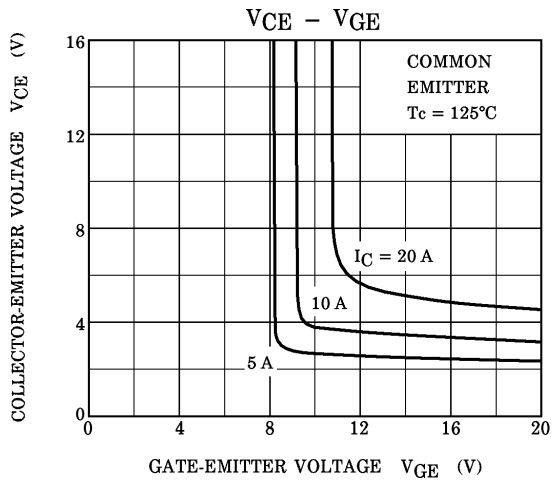
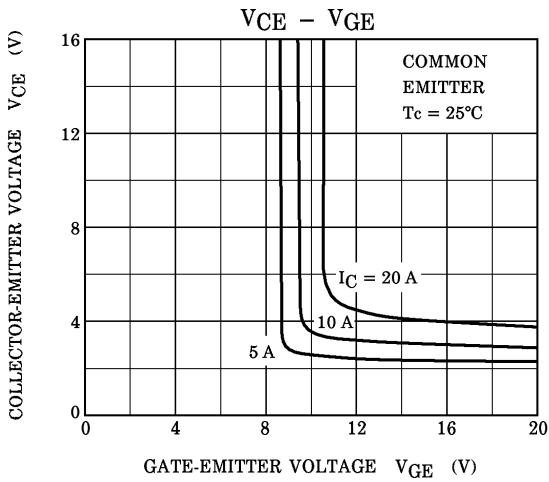
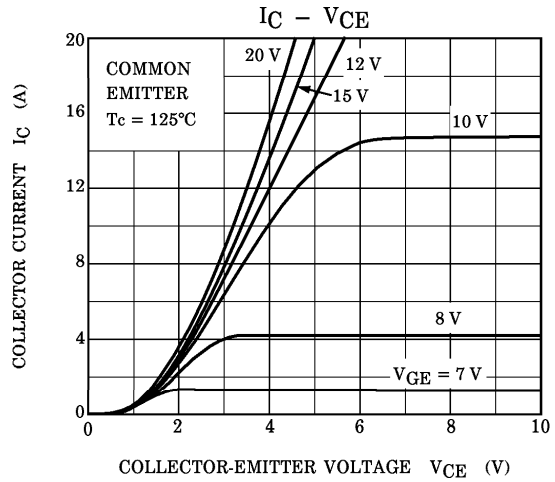
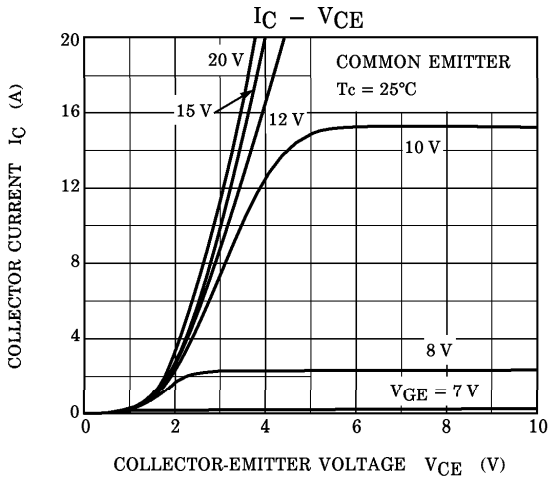
d. Thermistor

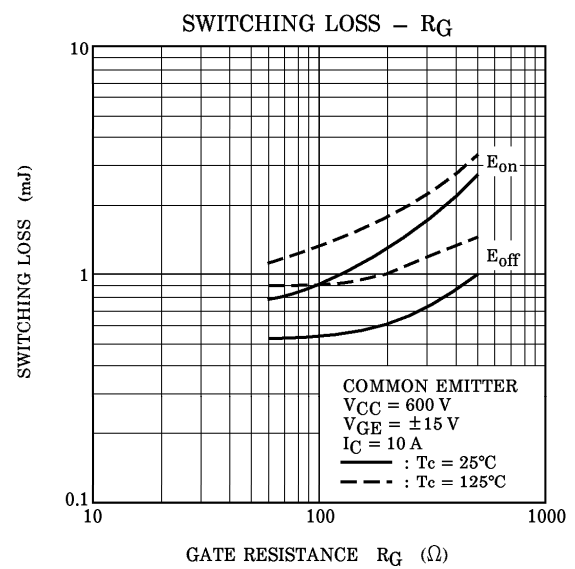
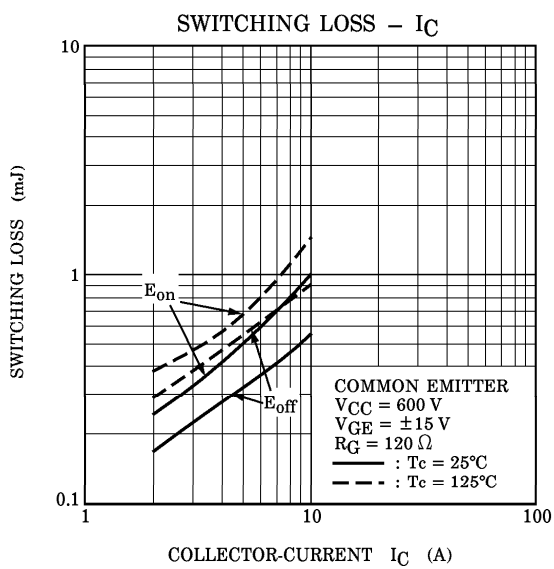
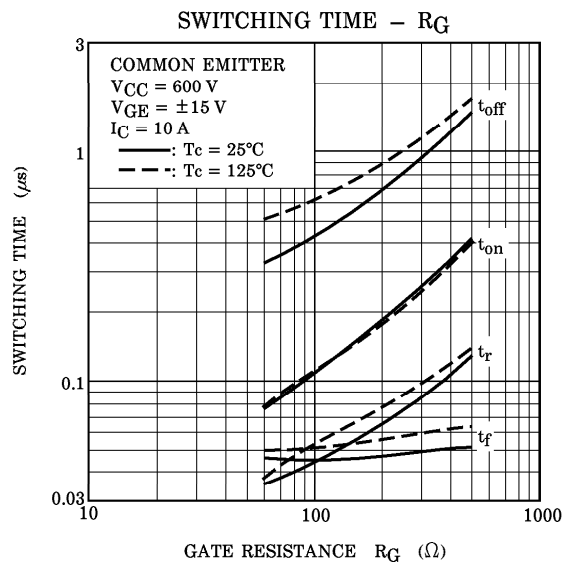
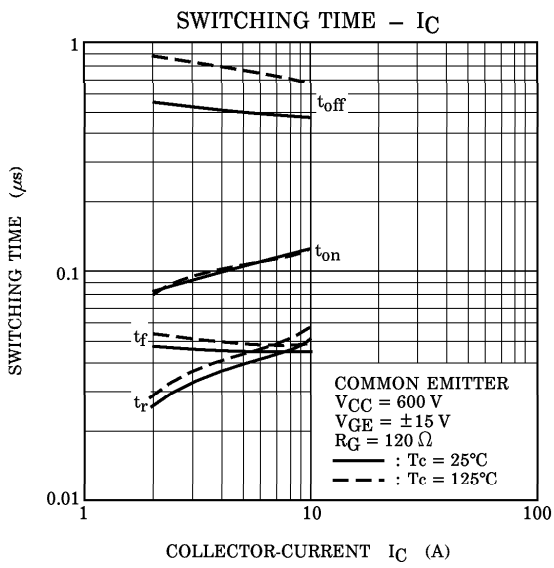
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Zero-power Resistance	$R_{25}$	$I_{TM} = 0.2\text{ mA}, T_c = 25^\circ\text{C}$	17.31	20	23.14	$\text{k}\Omega$
B Value	$B_{25/85}$	$T_c = 25^\circ\text{C} / T_c = 85^\circ\text{C}$	—	3760	—	K

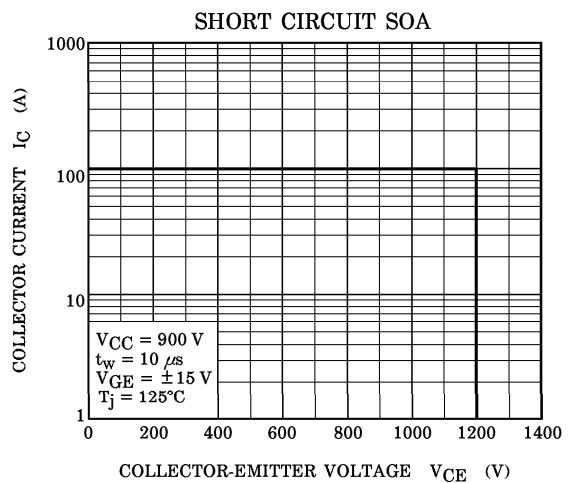
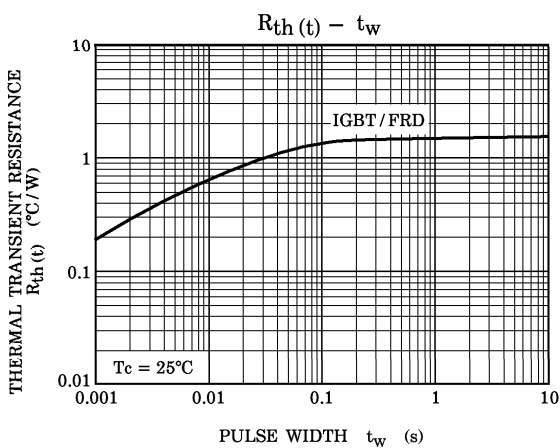
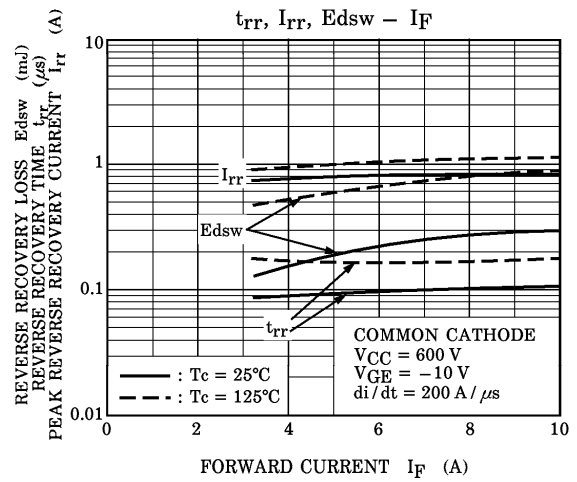
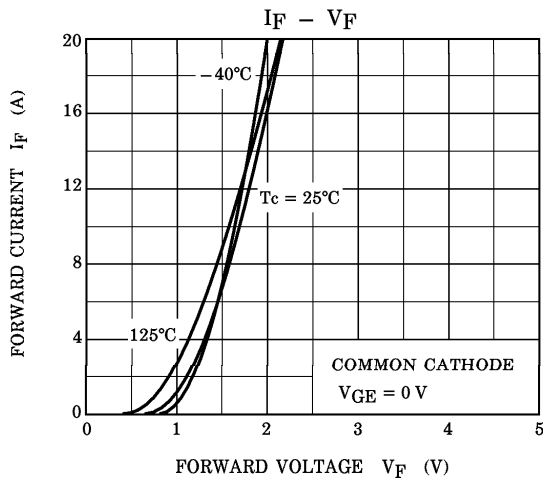
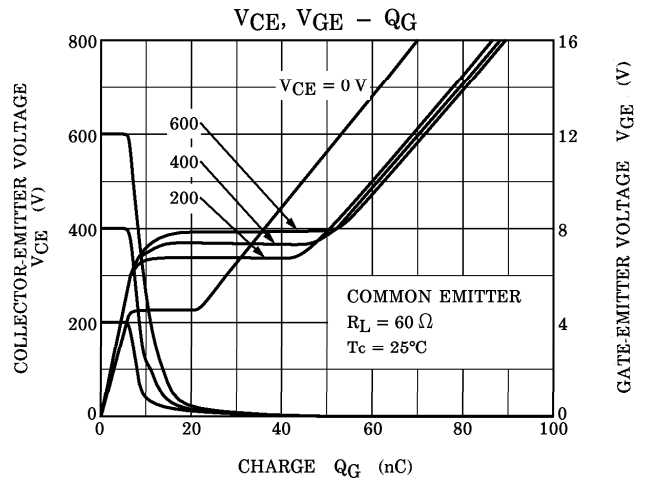
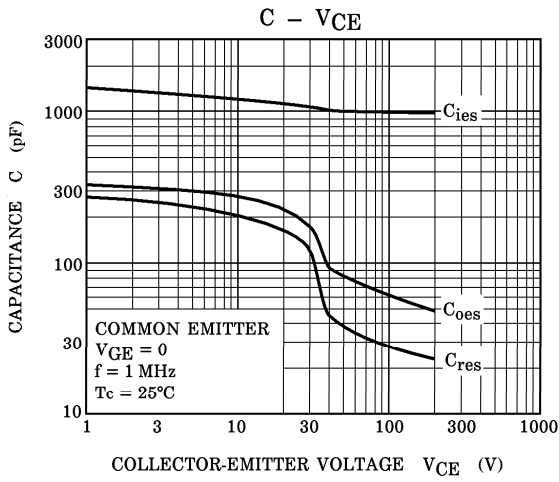
(Note 1) Switching Time Test Circuit & Timing Chart



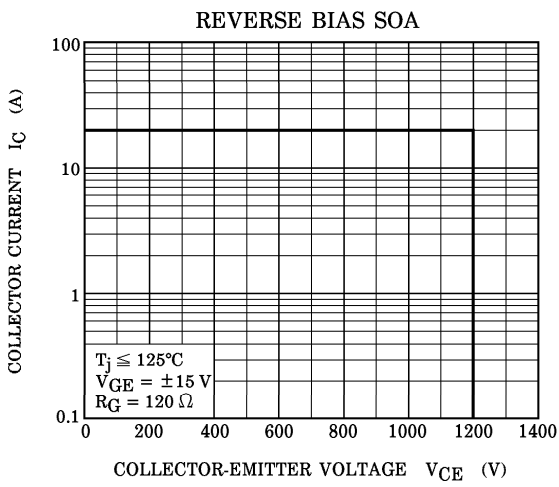
a. Inverter stage/c. Brake stage











**b. Converter stage**

