TENTATIVE TOSHIBA INTEGRATED IGBT MODULE SILICON N CHANNEL IGBT

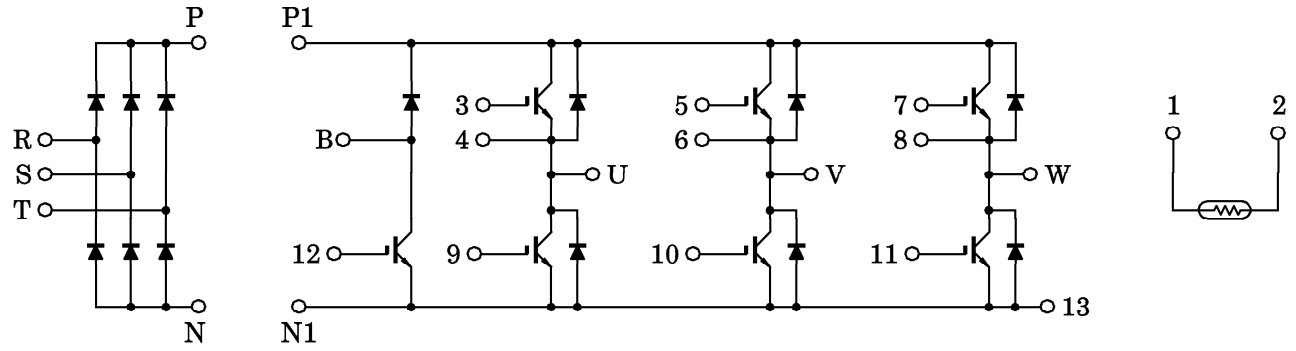
MIG20J906H, MIG20J906HA

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter, Converter and Brake Power Circuits and Thermistor in One Package.
- Output (Inverter Stage)
  : 3ϕ 20A / 600V IGBT
- Input (Converter Stage)
  : 3ϕ 30A / 800V Silicon Rectifier
- The Electrodes are Isolated from Case.
- Outline
  MIG20J906H : 2-108E5A
  MIG20J906HA : 2-108E6A
- Weight : 190g

EQUIVALENT CIRCUIT



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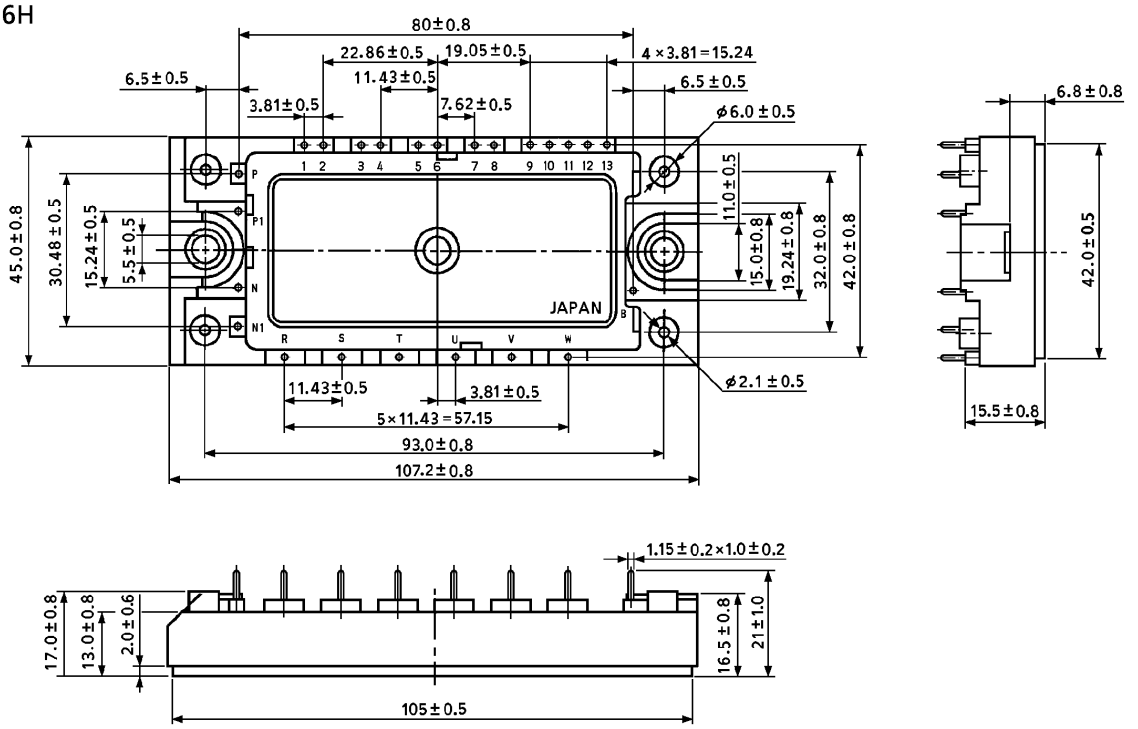
- The information contained herein is subject to change without notice.

Package Dimension

Unit : mm

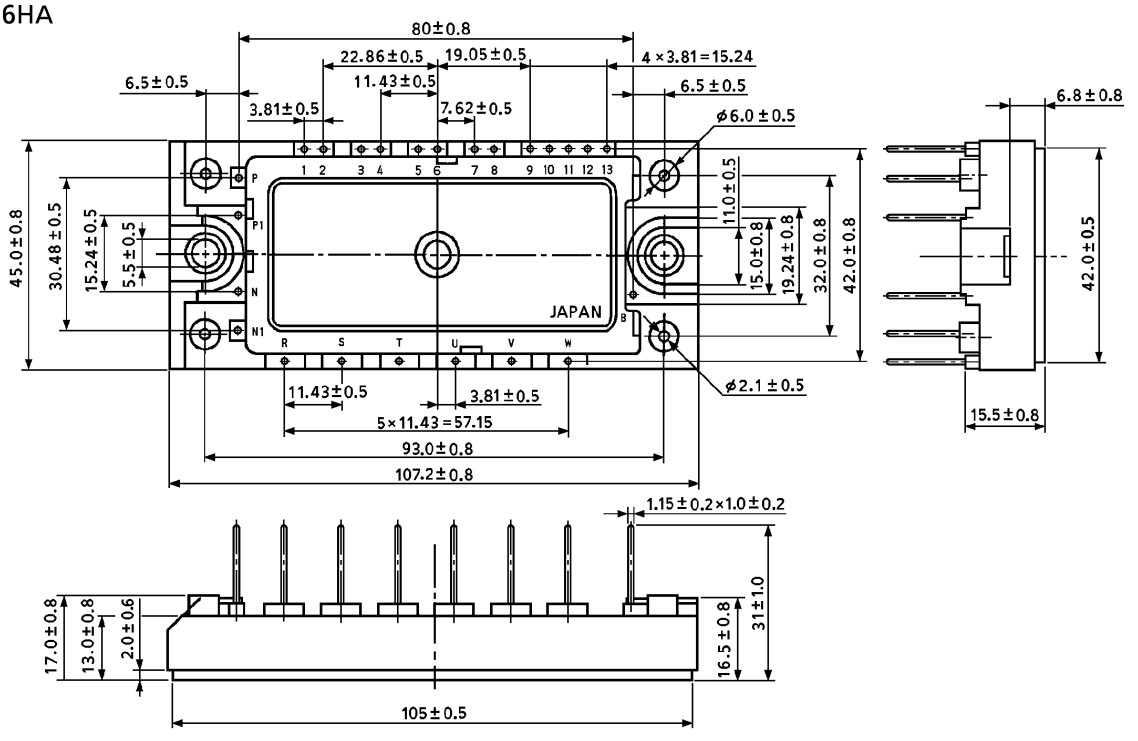
MIG20J906H



2-108E5A

Unit : mm

MIG20J906HA



2-108E6A

MAXIMUM RATINGS (Ta = 25°C)

STAGE		CHARACTERISTIC		SYMBOL	RATING	UNIT	
Inverter		Collector-Emitter Voltage		V_{CES}	600	V	
		Gate-Emitter Voltage		V_{GES}	±20	V	
		Collector Current	DC	I_C	25 / 20	A	(25°C / 40°C)
			1ms	I_{CP}	50 / 40	A	(25°C / 40°C)
		Forward Current	DC	I_F	20	A	
			1ms	I_{FM}	40	A	
		Collector Power Dissipation (Tc = 25°C)		P_C	90	W	
Converter		Repetitive Peak Reverse Voltage		V_{RRM}	800	V	
		Average Output Rectified Current		I_O	30	A	
		Peak One Cycle Surge Forward Current (50Hz, Non-Repetitive)		I_{FSM}	400	A	
Brake	IGBT	Collector-Emitter Voltage		V_{CES}	600	V	
		Gate-Emitter Voltage		V_{GES}	±20	V	
		Collector Current	DC	I_C	25 / 20	A	(25°C / 40°C)
			1ms	I_{CP}	50 / 40	A	(25°C / 40°C)
		Collector Power Dissipation (Tc = 25°C)		P_C	90	W	
	FWD	Reverse Voltage		V_R	600	V	
		Forward Current	DC	I_F	20	A	
			1ms	I_{FM}	40	A	
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		—	6	N·m	

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

a. Inverter stage

CHARACTERISTIC		SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GES}	$V_{GE} = \pm 20V$, $V_{CE} = 0$		—	—	±500	nA
Collector Cut-Off Current		I_{CES}	$V_{CE} = 600V$, $V_{GE} = 0$		—	—	1.0	mA
Gate-Emitter Cut-Off Voltage		$V_{GE\ (off)}$	$I_C = 2mA$, $V_{CE} = 5V$		5.0	—	8.0	V
Collector-Emitter Saturation Voltage		$V_{CE\ (sat)}$	$I_C = 20A$, $V_{GE} = 15V$	$T_j = 25°C$	—	2.1	2.7	V
				$T_j = 125°C$	—	2.2	2.8	
Input Capacitance		C_{ies}	$V_{CE} = 10V$, $V_{GE} = 0$, f = 1MHz		—	1850	—	pF
Switching Time	Rise Time	t_r	$V_{CC} = 300V$, $I_C = 20A$, $V_{GE} = \pm 15V$, $R_G = 62\Omega$ (Note 1)		—	0.10	0.20	μs
	Turn-On Time	t_{on}			—	0.25	0.50	
	Fall Time	t_f			—	0.15	0.30	
	Turn-Off Time	t_{off}			—	0.50	0.80	
Forward Voltage		V_F	$I_F = 20A$, $V_{GE} = 0$		—	2.0	2.8	V
Reverse Recovery Time		t_{rr}	$I_F = 20A$, $V_{GE} = -10V$, $di/dt = 100A/\mu s$		—	0.08	0.15	μs
Thermal Resistance		$R_{th\ (j-c)}$	Transistor		—	—	1.39	°C / W
			Diode		—	—	2.6	

b. Converter stage

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Repetitive Peak Reverse Current	I_{RRM}	$V_{RRM} = 800V$	—	—	50	μA
Peak Forward Voltage	V_{FM}	$I_{FM} = 30A$	—	1.05	1.20	V
Peak One Cycle Surge Forward Current	I_{FSM}	50Hz sine-half-wave	400	—	—	A
Thermal Resistance	$R_{th\ (j-c)}$	—	—	—	1.56	°C / W

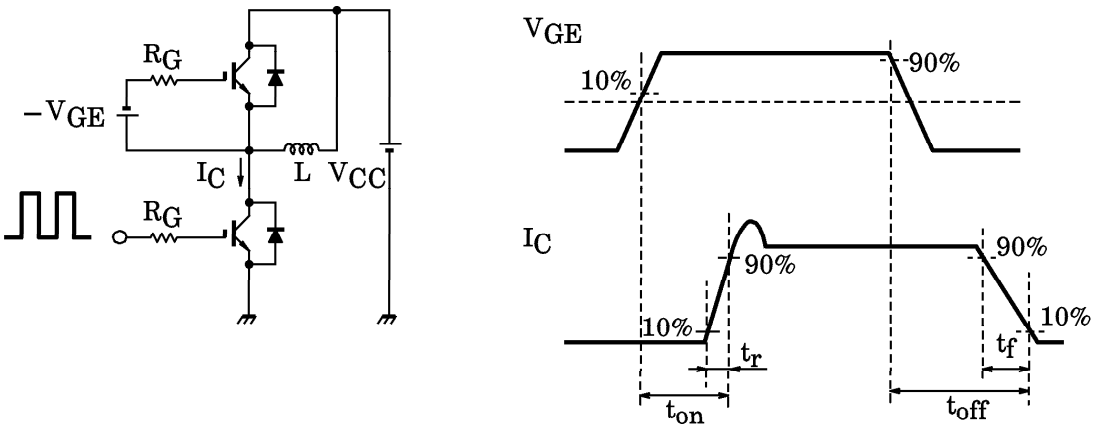
c. Brake stage

CHARACTERISTIC		SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GES}	$V_{GE}=\pm20V$, $V_{CE}=0$		—	—	±500	nA
Collector Cut-Off Current		I_{CES}	$V_{CE}=600V$, $V_{GE}=0$		—	—	1.0	mA
Reverse Current		I_R	$V_R=600V$		—	—	1.0	mA
Gate-Emitter Cut-Off Voltage		$V_{GE\ (off)}$	$I_C=2mA$, $V_{CE}=5V$		5.0	—	8.0	V
Collector-Emitter Saturation Voltage		$V_{CE\ (sat)}$	$I_C=20A$, $V_{GE}=15V$	$T_j=25°C$	—	2.1	2.7	V
				$T_j=125°C$	—	2.2	2.8	
Input Capacitance		C_{ies}	$V_{CE}=10V$, $V_{GE}=0$, f=1MHz		—	1850	—	pF
Switching Time	Rise Time	t_r	$V_{CC}=600V$, $I_C=20A$, $V_{GE}=\pm15V$, $R_G=62\Omega$ (Note 1)		—	0.10	0.20	μs
	Turn-On Time	t_{on}			—	0.25	0.50	
	Fall Time	t_f			—	0.15	0.30	
	Turn-Off Time	t_{off}			—	0.50	0.80	
Forward Voltage		V_F	$I_F=20A$, $V_{GE}=0$		—	2.0	2.8	V
Thermal Resistance		$R_{th\ (j-c)}$	Transistor		—	—	1.39	°C / W
			Diode		—	—	2.6	

d. Thermistor

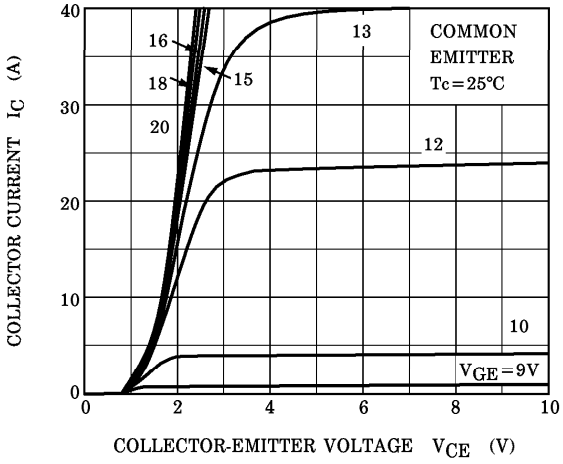
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Zero-power Resistance	R_{25}	$I_{TM}=0.2mA$, Tc=25°C	17.31	20	23.14	kΩ
B Value	$B_{25/85}$	Tc=25°C / Tc=85°C	—	3760	—	K

(Note 1) Switching Time Test Circuit & Timing Chart

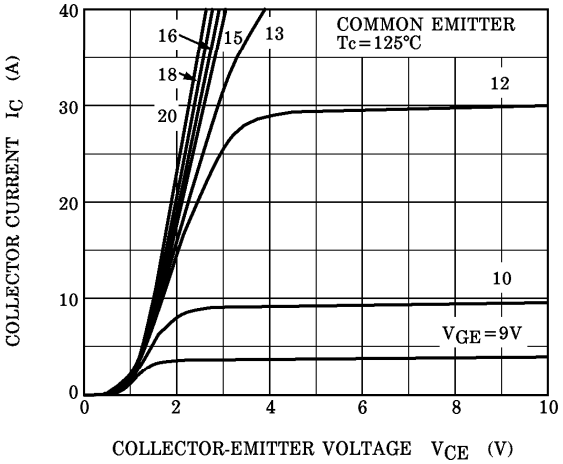


a. Inverter stage / c. Brake stage

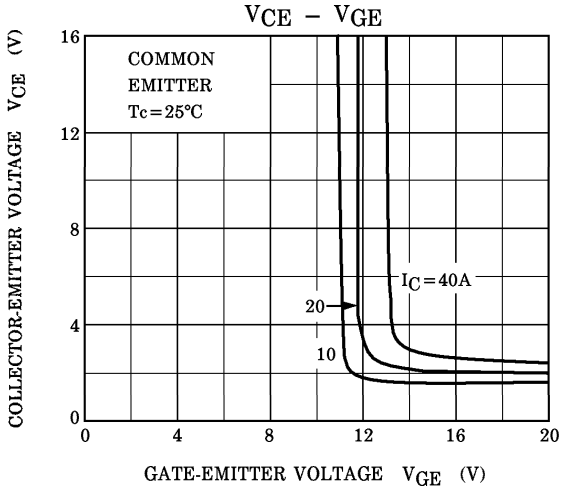
I_C – V_{CE}



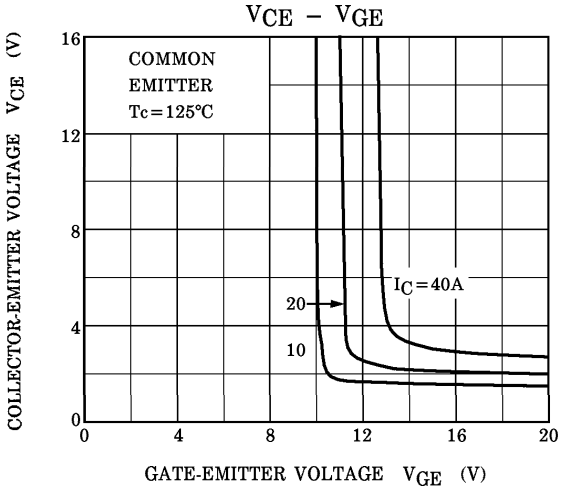
I_C – V_{CE}



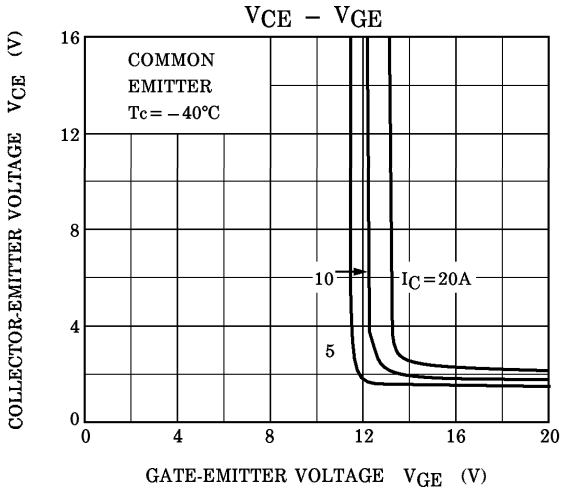
V_{CE} – V_{GE}



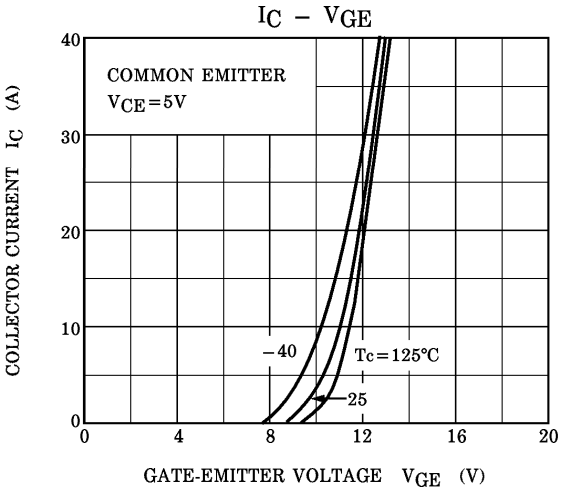
V_{CE} – V_{GE}



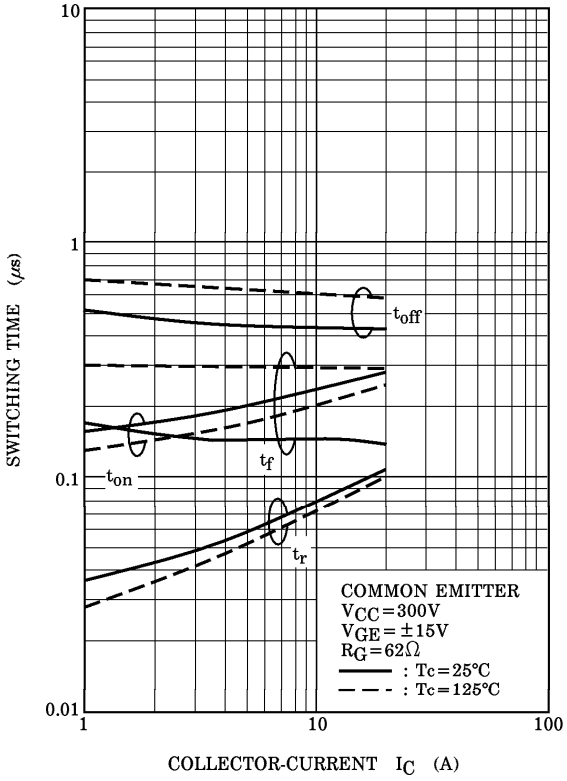
V_{CE} – V_{GE}



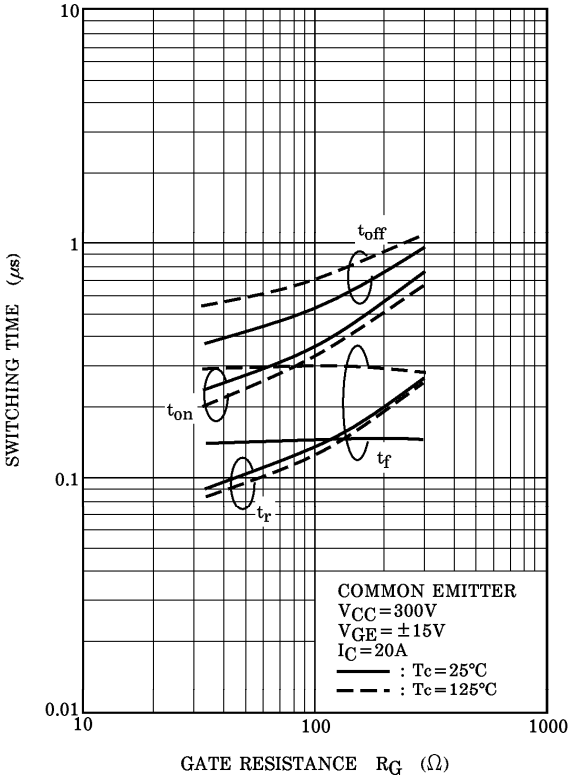
I_C – V_{GE}



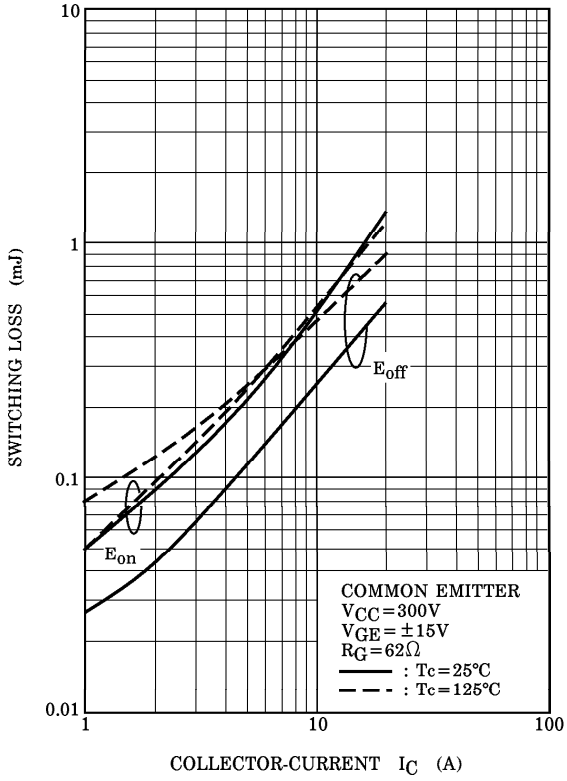
SWITCHING TIME – I_C



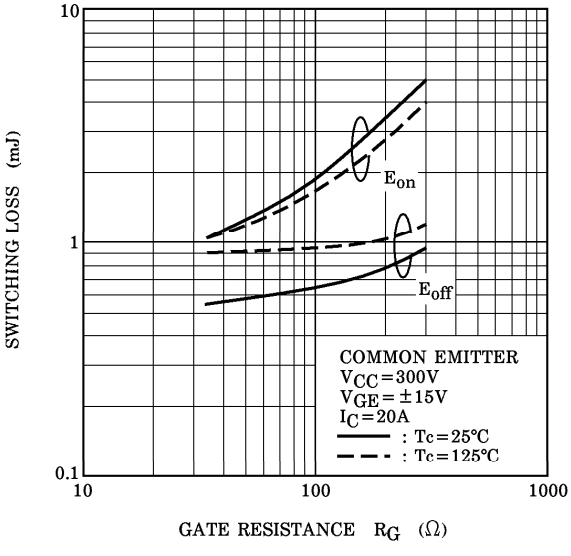
SWITCHING TIME – R_G



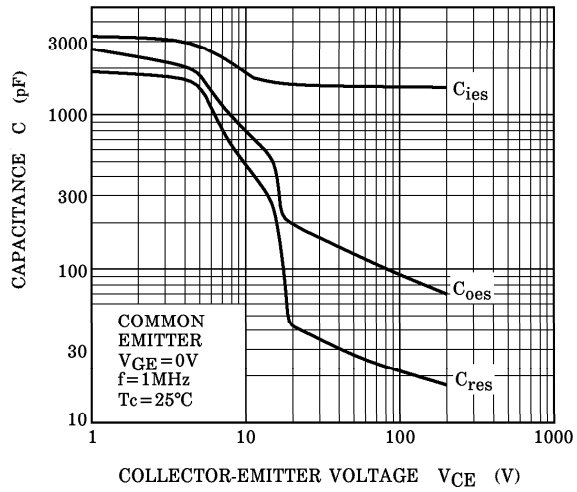
SWITCHING LOSS – I_C



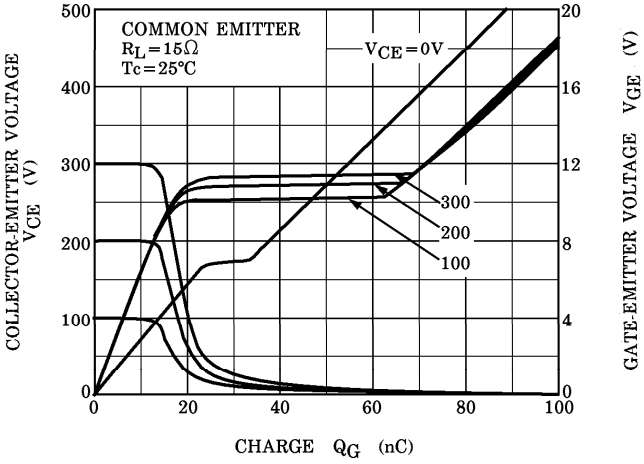
SWITCHING LOSS – I_C



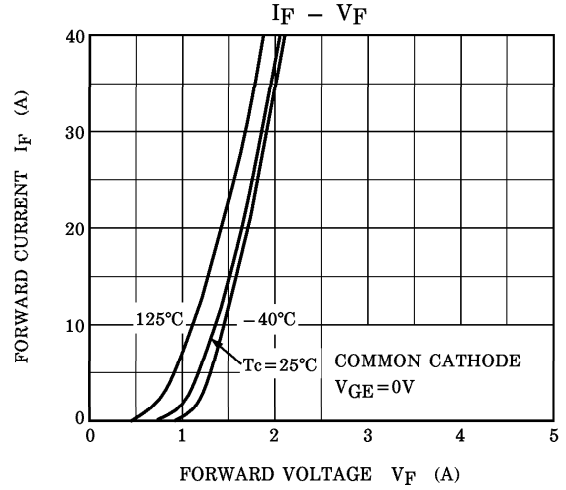
C – V_{CE}



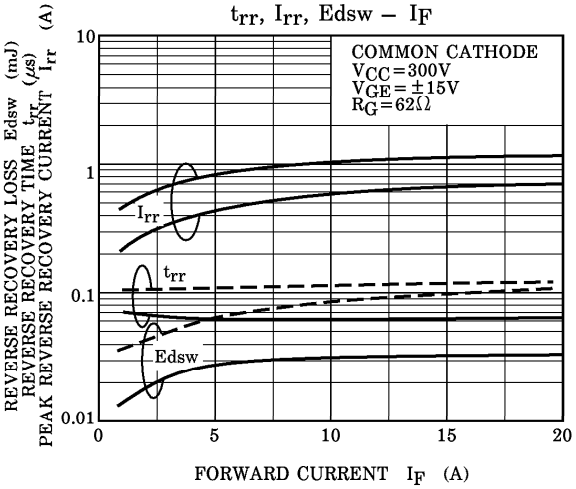
V_{CE}, V_{GE} – Q_G



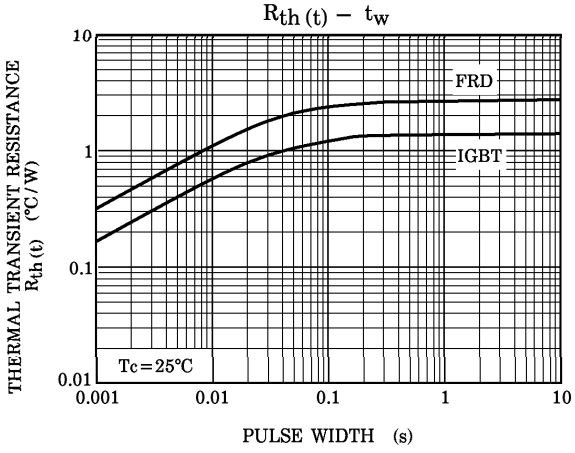
I_F – V_F



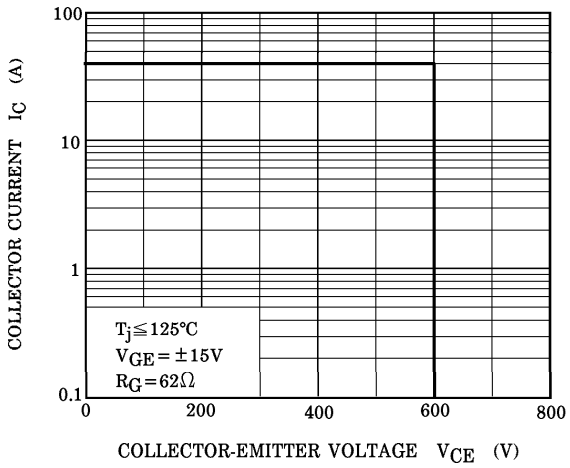
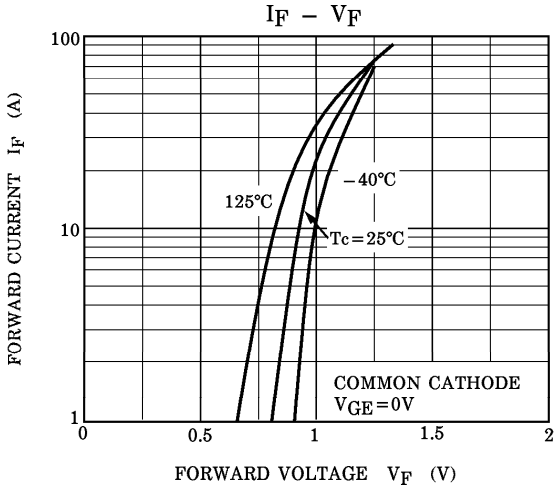
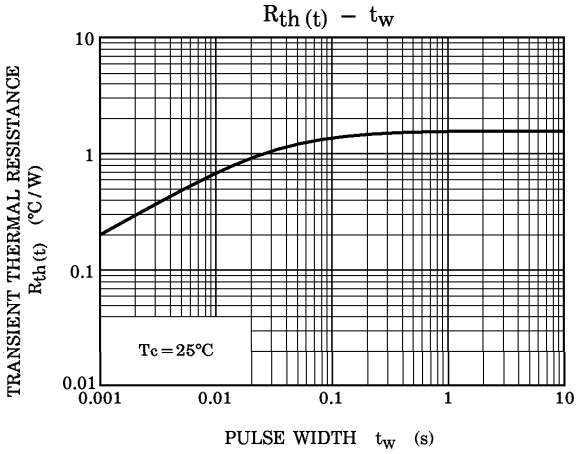
t_{rr}, I_{rr}, Edsw – I_F



$R_{th\,(t)}$ – t_w



REVERSE BIAS SOA



b. Converter stage