

TENTATIVE TOSHIBA INTEGRATED IGBT MODULE SILICON N CHANNEL IGBT

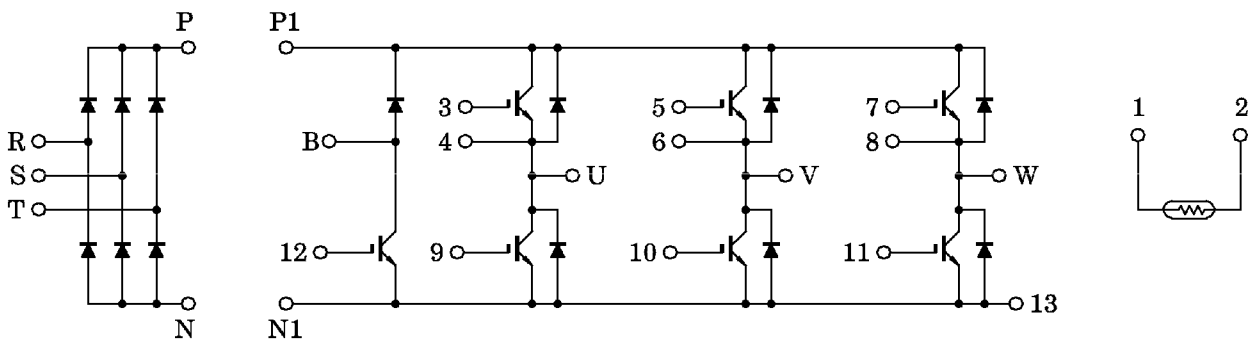
# MIG20J906E, MIG20J906EA

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter, Converter and Brake Power Circuits and Thermistor in One Package.
- Output (Inverter Stage) : 3 $\phi$  20 A / 600 V IGBT
- Input (Converter Stage) : 3 $\phi$  30 A / 800 V Silicon Rectifier
- The Electrodes are Isolated from Case.
- Outline
  - MIG20J906E : 2-108E5A
  - MIG20J906EA : 2-108E6A
- Weight : 190 g

EQUIVALENT CIRCUIT



961001EAA1

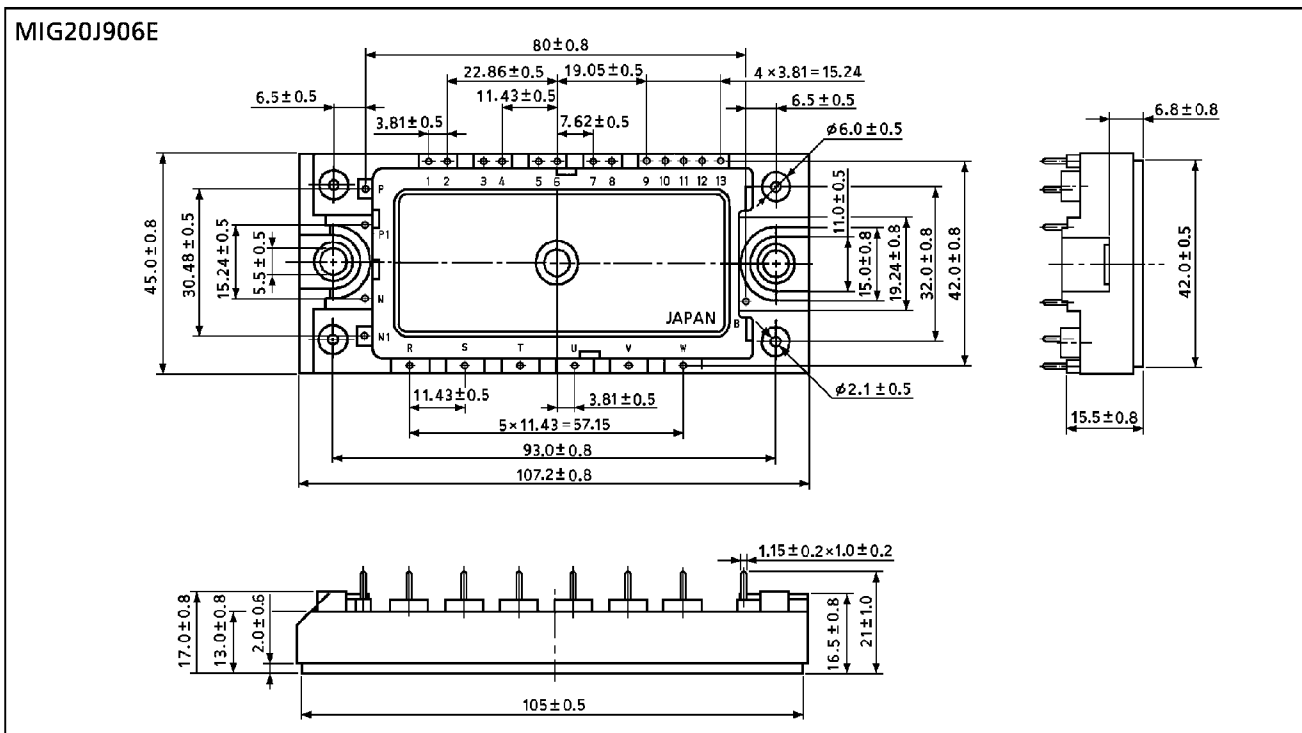
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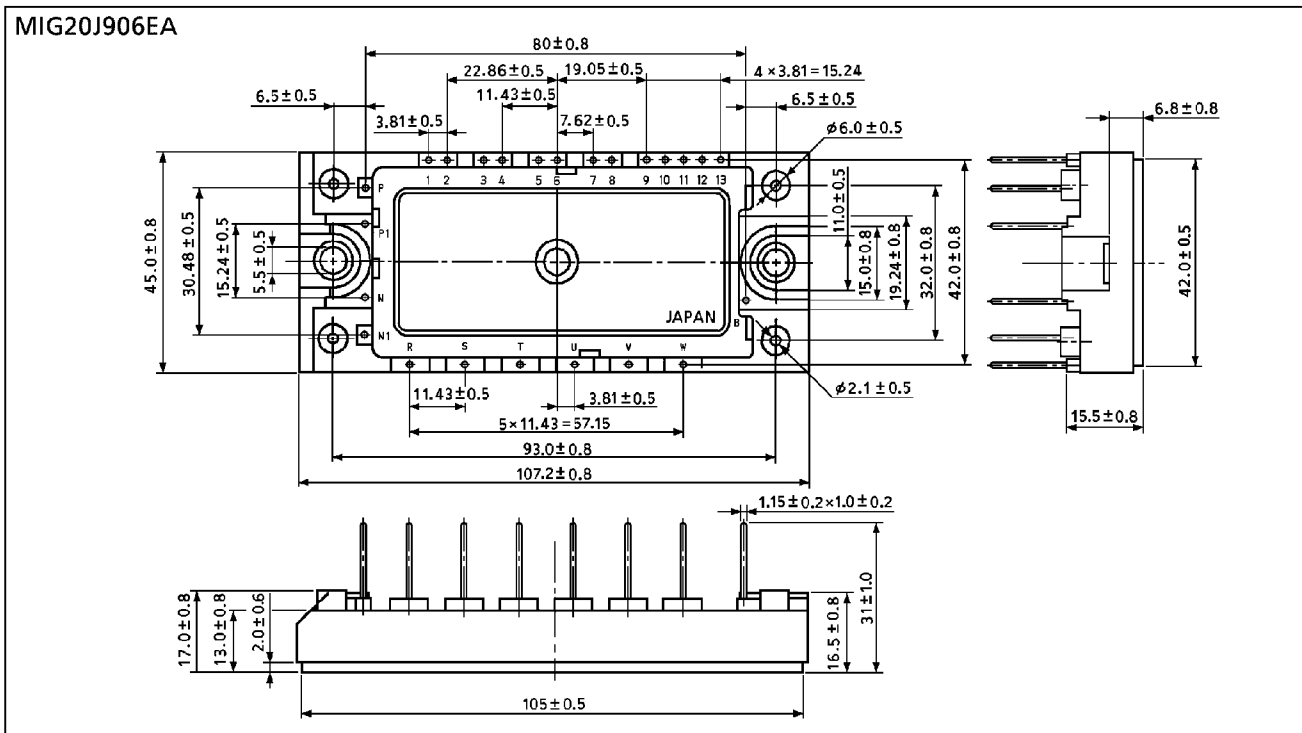
Package Dimension

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>	600	V		
	Gate-Emitter Voltage		V <sub>GES</sub>	±20	V		
	Collector Current	DC	I <sub>C</sub>	25 / 20	A	(25°C / 40°C)	
		1 ms	I <sub>CP</sub>	50 / 40	A	(25°C / 40°C)	
	Forward Current	DC	I <sub>F</sub>	20	A		
		1 ms	I <sub>FM</sub>	40	A		
Collector Power Dissipation (T <sub>c</sub> = 25°C)		P <sub>C</sub>	90	W			
Converter	Repetitive Peak Reverse Voltage		V <sub>R</sub> RM	800	V		
	Average Output Rectified Current		I <sub>O</sub>	30	A		
	Peak One Cycle Surge Forward Current (50 Hz, Non-Repetitive)		I <sub>F</sub> SM	400	A		
Brake	IGBT	Collector-Emitter Voltage		V <sub>CES</sub>	600	V	
		Gate-Emitter Voltage		V <sub>GES</sub>	±20	V	
		Collector Current	DC	I <sub>C</sub>	25 / 20	A	(25°C / 40°C)
			1 ms	I <sub>CP</sub>	50 / 40	A	(25°C / 40°C)
	Collector Power Dissipation (T <sub>c</sub> = 25°C)		P <sub>C</sub>	90	W		
	FWD	Reverse Voltage		V <sub>R</sub>	600	V	
		Forward Current	DC	I <sub>F</sub>	20	A	
1 ms			I <sub>FM</sub>	40	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 <sub>GES</sub>	V <sub>GE</sub> = ±20 V, V <sub>CE</sub> = 0	—	—	±500	nA
Collector Cut-Off Current		I <sub>CES</sub>	V <sub>CE</sub> = 600 V, V <sub>GE</sub> = 0	—	—	1.0	mA
Gate-Emitter Cut-Off Voltage		V <sub>GE (off)</sub>	I <sub>C</sub> = 2 mA, V <sub>CE</sub> = 5 V	5.0	—	8.0	V
Collector-Emitter Saturation Voltage		V <sub>CE (sat)</sub>	I <sub>C</sub> = 20 A	—	2.3	2.8	V
			V <sub>GE</sub> = 15 V				
Input Capacitance		C <sub>ies</sub>	V <sub>CE</sub> = 10 V, V <sub>GE</sub> = 0, f = 1 MHz	—	—	—	pF
Switching Time	Rise Time	t <sub>r</sub>	V <sub>CC</sub> = 300 V I <sub>C</sub> = 20 A V <sub>GE</sub> = ±15 V R <sub>G</sub> = 62 Ω (Note 1)	—	0.10	0.20	μs
	Turn-On Time	t <sub>on</sub>		—	0.25	0.50	
	Fall Time	t <sub>f</sub>		—	0.15	0.30	
	Turn-Off Time	t <sub>off</sub>		—	0.50	0.80	
Forward Voltage		V <sub>F</sub>	I <sub>F</sub> = 20 A, V <sub>GE</sub> = 0	—	2.0	2.8	V
Reverse Recovery Time		t <sub>rr</sub>	I <sub>F</sub> = 20 A, V <sub>GE</sub> = -10 V, di/dt = 100 A/μs	—	0.08	0.15	μs
Thermal Resistance		R <sub>th (j-c)</sub>	Transistor	—	—	1.39	°C/W
			Diode	—	—	2.6	

## b. Converter stage

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Repetitive Peak Reverse Current		I <sub>RRM</sub>	V <sub>RRM</sub> = 800 V	—	—	50	μA
Peak Forward Voltage		V <sub>FM</sub>	I <sub>FM</sub> = 30 A	—	1.05	1.20	V
Peak One Cycle Surge Forward Current		I <sub>FSM</sub>	50 Hz sine-half-wave	400	—	—	A
Thermal Resistance		R <sub>th (j-c)</sub>	—	—	—	1.56	°C/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		$I_{CES}$	$V_{CE} = 600\text{ V}, V_{GE} = 0$	—	—	1.0	mA
Reverse Current		$I_R$	$V_R = 600\text{ V}$	—	—	1.0	mA
Gate-Emitter Cut-Off Voltage		$V_{GE}(\text{off})$	$I_C = 2\text{ mA}, V_{CE} = 5\text{ V}$	5.0	—	8.0	V
Collector-Emitter Saturation Voltage		$V_{CE}(\text{sat})$	$I_C = 20\text{ A}$	—	2.3	2.8	V
			$V_{GE} = 15\text{ V}$	—	—	—	
Input Capacitance		$C_{ies}$	$V_{CE} = 10\text{ V}, V_{GE} = 0,$ $f = 1\text{ MHz}$	—	1850	—	pF
Switching Time	Rise Time	$t_r$	$V_{CC} = 600\text{ V}$	—	0.10	0.20	$\mu\text{s}$
	Turn-On Time	$t_{on}$	$I_C = 20\text{ A}$	—	0.25	0.50	
	Fall Time	$t_f$	$V_{GE} = \pm 15\text{ V}$	—	0.15	0.30	
	Turn-Off Time	$t_{off}$	$R_G = 62\ \Omega$ (Note 1)	—	0.50	0.80	
Forward Voltage		$V_F$	$I_F = 20\text{ A}, V_{GE} = 0$	—	2.0	2.8	V
Thermal Resistance		$R_{th(j-c)}$	Transistor	—	—	1.39	$^{\circ}\text{C} / \text{W}$
			Diode	—	—	2.6	

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

