

TOSHIBA INTELLIGENT GTR MODULE SILICON N CHANNEL IGBT

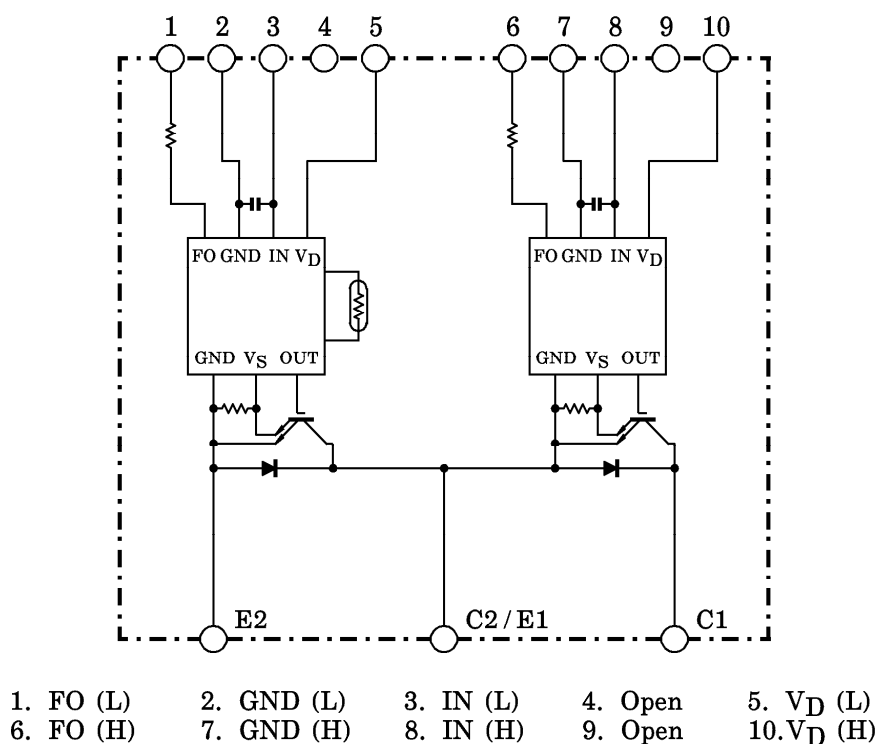
MIG400J101H

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter Power Circuits & Control Circuits (IGBT drive units, Protection units for Over-Current, Under-Voltage & Over Temperature) in One Package.
- The Electrodes are Isolated from Case.
- High Speed Type IGBT : $V_{CE(sat)} = 2.5V$ (Max.)
 $t_{off} = 2.0\mu s$ (Max.)
 $t_{rr} = 0.15\mu s$ (Max.)
- Outline : TOSHIBA 2-121A1A
- Weight : 510g

EQUIVALENT CIRCUIT



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MAXIMUM RATINGS ($T_j = 25^\circ\text{C}$)

STAGE	CHARACTERISTIC	CONDITION	SYMBOL	RATINGS	UNIT
Inverter	Supply Voltage	P-N power terminal	V_{CC}	450	V
	Collector-Emitter Voltage	—	V_{CES}	600	V
	Collector Current	$T_c = 25^\circ\text{C}$, DC	I_C	400	A
	Forward Current	$T_c = 25^\circ\text{C}$, DC	I_F	400	A
	Collector Power Dissipation	$T_c = 25^\circ\text{C}$	P_C	1600	W
	Junction Temperature	—	T_j	150	$^\circ\text{C}$
Control	Control Supply Voltage	V_D -GND terminal	V_D	20	V
	Input Voltage	IN-GND terminal	V_{IN}	20	V
	Fault Output Voltage	FO-GND (L) terminal	V_{FO}	20	V
	Fault Output Current	FO sink current	I_{FO}	14	mA
Module	Operating Temperature	—	T_C	$-20 \sim +100$	$^\circ\text{C}$
	Storage Temperature Range	—	T_{stg}	$-40 \sim +125$	$^\circ\text{C}$
	Isolation Voltage	AC 1 minute,	V_{ISO}	2500	V
	Screw Torque	M6	—	3	Nm

ELECTRICAL CHARACTERISTICS ($T_j = 25^\circ\text{C}$)

a. Inverter stage

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Collector Cut-Off Current	I_{CEX}	$V_{CEX} = 600\text{V}$	$T_j = 25^\circ\text{C}$	—	—	2	mA
			$T_j = 125^\circ\text{C}$	—	—	40	
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{V}$, $I_C = 400\text{A}$ $V_{IN} = 3\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.0	2.5	V
			$T_j = 125^\circ\text{C}$	—	2.0	—	
Forward Voltage	V_F	$I_F = 400\text{A}$		—	2.1	2.7	V
Switching Time	t_{on}	$V_{CC} = 300\text{V}$, $I_C = 400\text{A}$ $V_D = 15\text{V}$, $V_{IN} = 3\text{V} \leftrightarrow 0\text{V}$ Inductive load (Note 1)		1.4	2.1	2.8	μs
	$t_c(\text{on})$			—	1.2	1.8	
	t_{rr}			—	0.08	0.15	
	t_{off}			—	1.2	2.0	
	$t_c(\text{off})$			—	0.3	0.6	

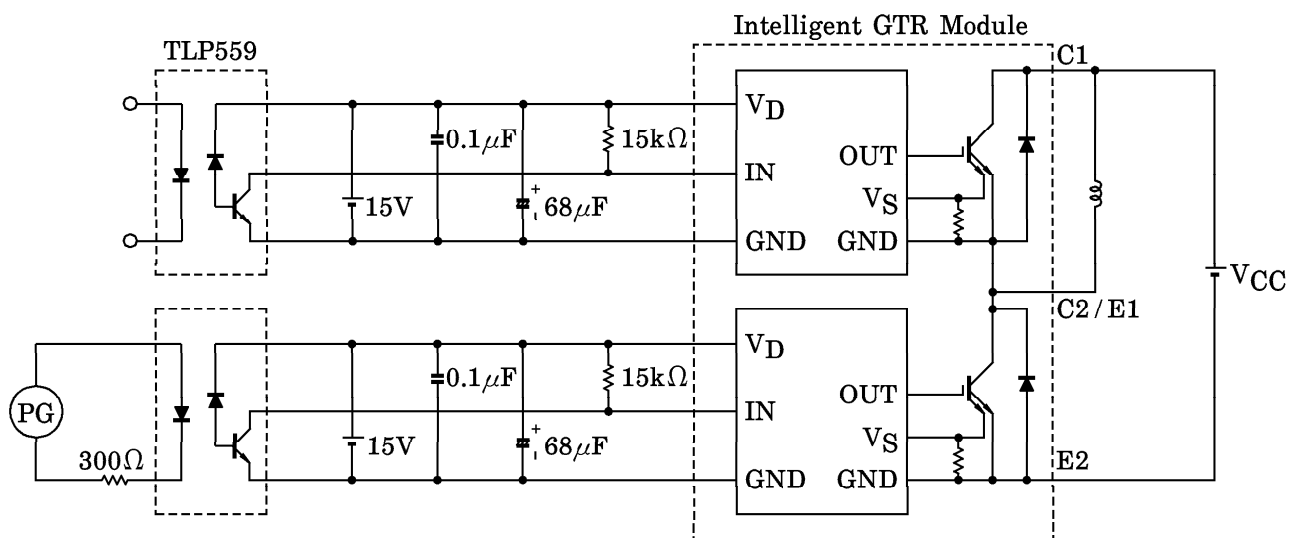
b. Control stage ($T_j = 25^\circ\text{C}$)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current High Side		I_D	$V_D = 15\text{V}$	—	20	30	mA
Input On Signal voltage		$V_{IN(on)}$	$V_D = 15\text{V}$, $I_C = 400\text{mA}$	0.9	1.1	1.3	V
Fault Output Current	Protection	$I_{FO(on)}$	$V_D = 15\text{V}$	8	10	12	mA
	Normal	$I_{FO(off)}$		—	—	1	
Over Current Protection Trip Level		OC	$V_D = 15\text{V}$, $T_j = 125^\circ\text{C}$	560	640	—	A
Short Circuit Protection Trip Level		SC	$V_D = 15\text{V}$, $T_j = 125^\circ\text{C}$	840	960	—	A
Over Current Cut-Off Time		$t_{off(OC)}$	$V_D = 15\text{V}$	—	10	—	μs
Over Temperature Protection	Trip Level	OT	Case temperature	111	118	125	$^\circ\text{C}$
	Reset Level	OTr		93	100	107	
Control Supply Under Voltage Protection	Trip Level	UV	—	11.3	12.0	12.7	V
	Reset Level	UVr		11.8	12.5	13.2	
Fault Output Pulse Width		t_{FO}	$V_D = 15\text{V}$	1	2	3	ms

c. Thermal resistance ($T_j = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th(j-c)}$	IGBT	—	—	0.078	$^\circ\text{C/W}$
		FRD	—	—	0.208	
Case to Fin Thermal Resistance	$R_{th(c-f)}$	Compound is applied	—	0.03	—	$^\circ\text{C/W}$

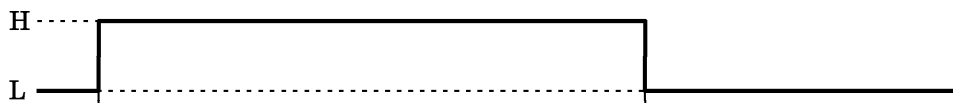
Note 1 : Switching time test circuit & timing chart



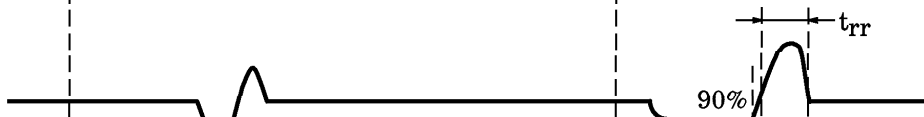
Input Pulse



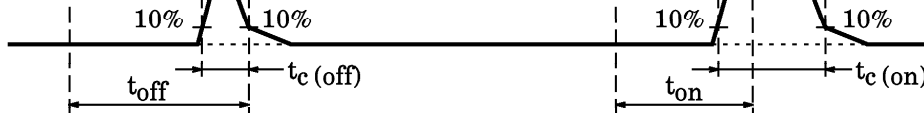
V_{IN} WAVEFORM

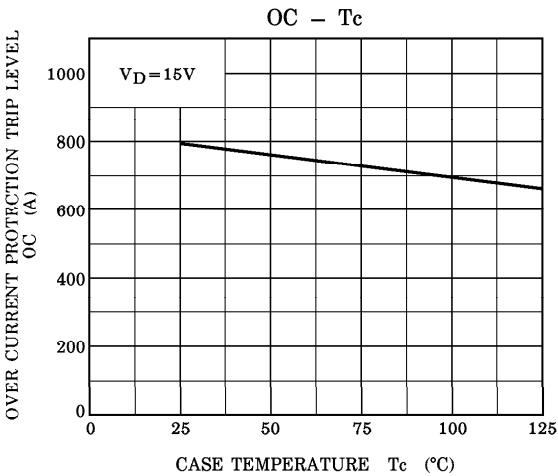
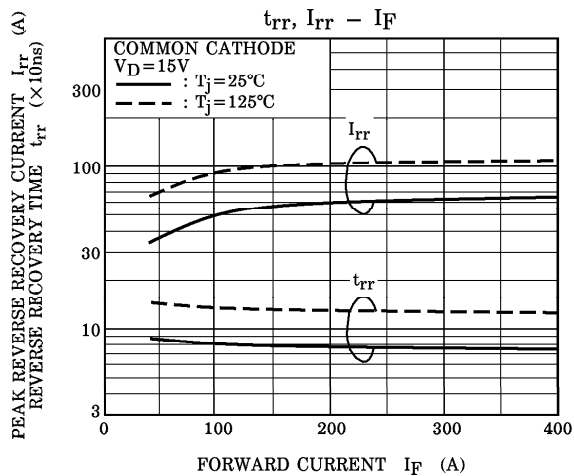
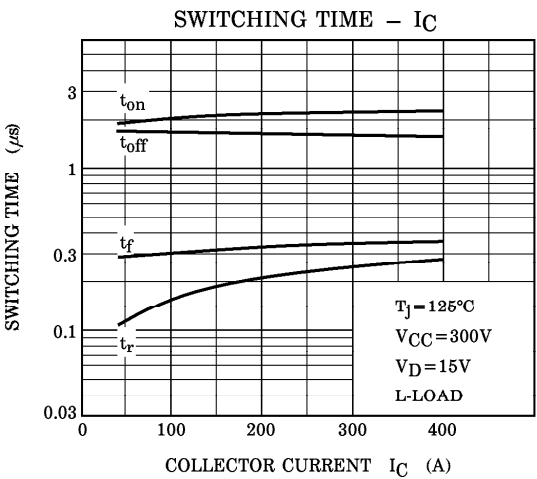
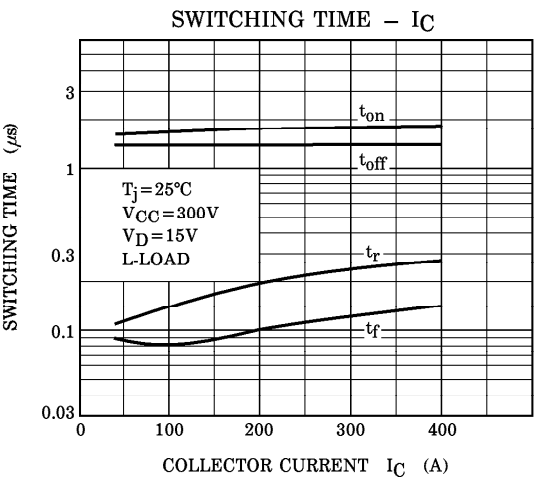
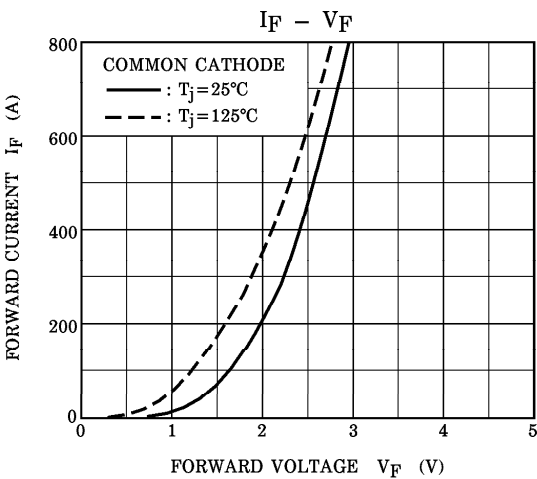
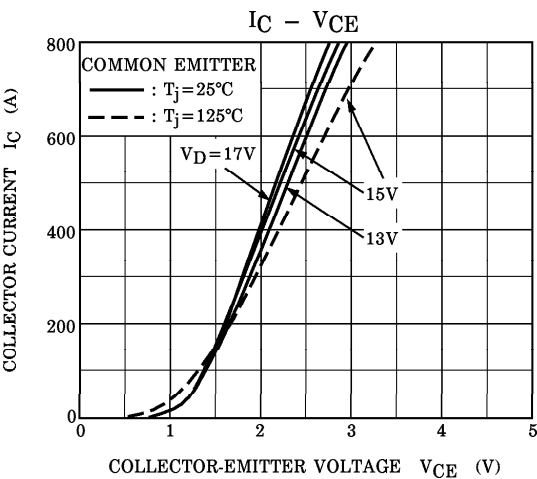


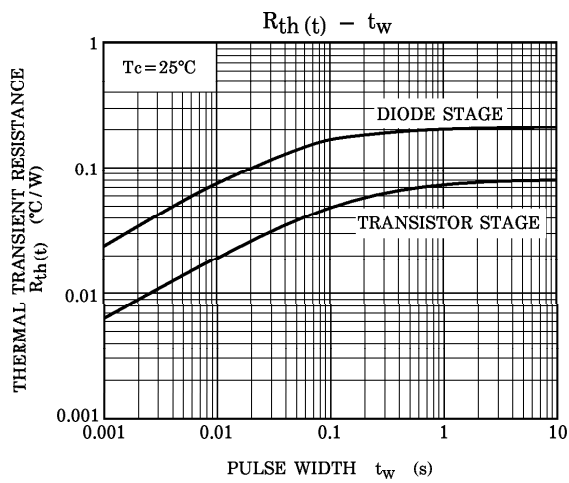
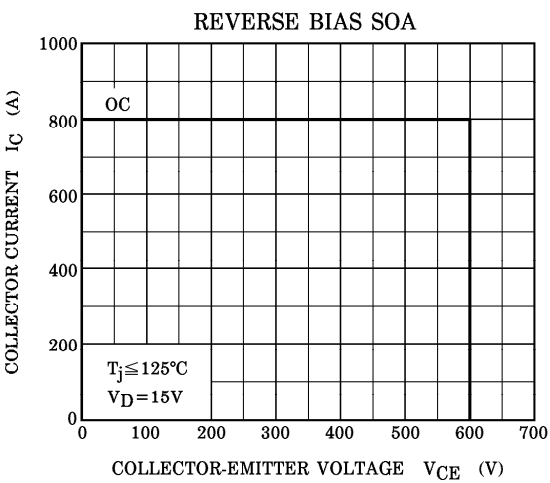
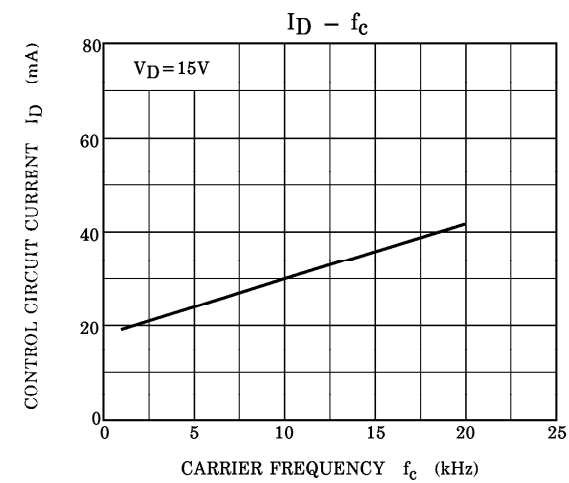
I_C WAVEFORM



V_{CE} WAVEFORM

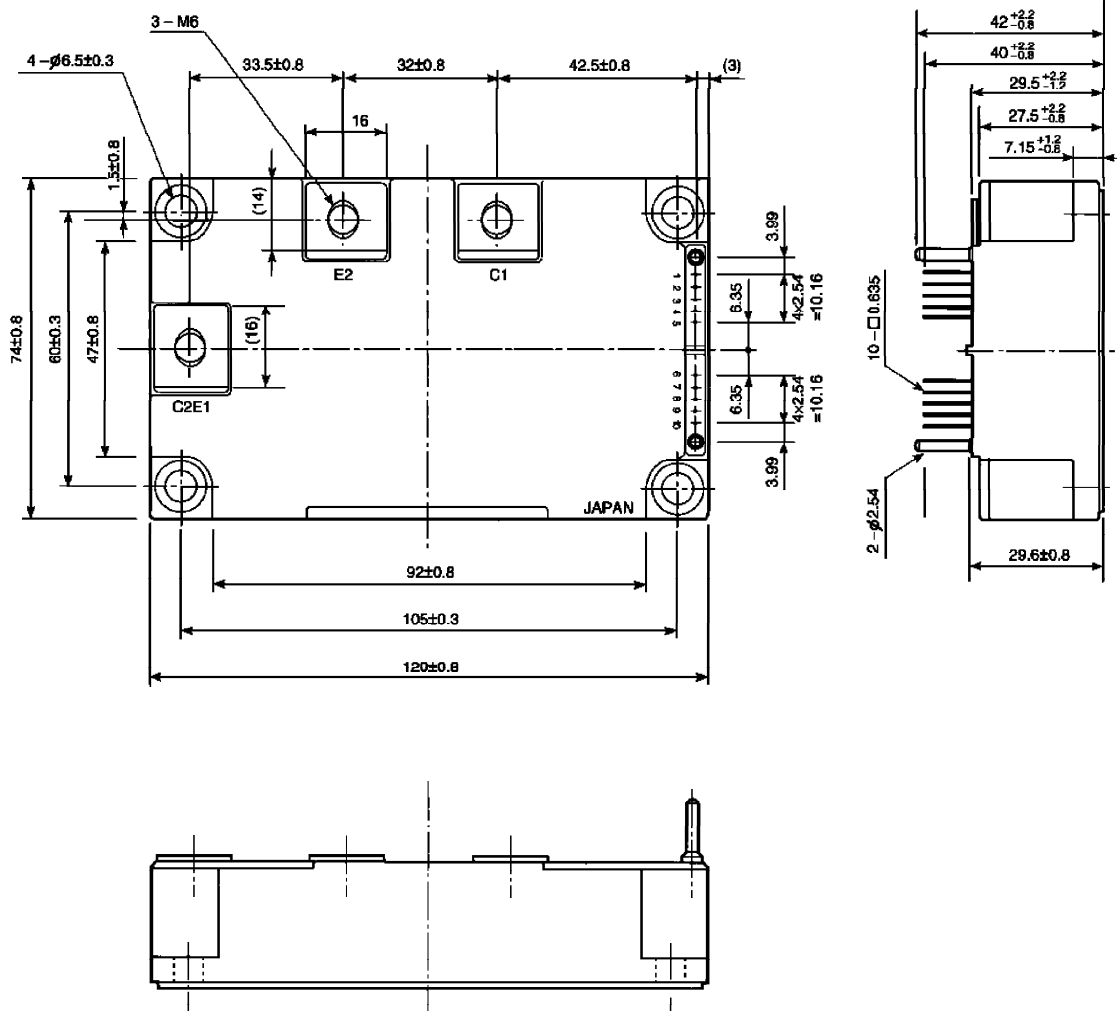






OUTLINE

Unit : mm



- | | | | | |
|-----------|------------|-----------|---------|---------------|
| 1. FO (L) | 2. GND (L) | 3. IN (L) | 4. Open | 5. V_D (L) |
| 6. FO (H) | 7. GND (H) | 8. IN (H) | 9. Open | 10. V_D (H) |