

TOSHIBA INTELLIGENT GTR MODULE SILICON N CHANNEL IGBT

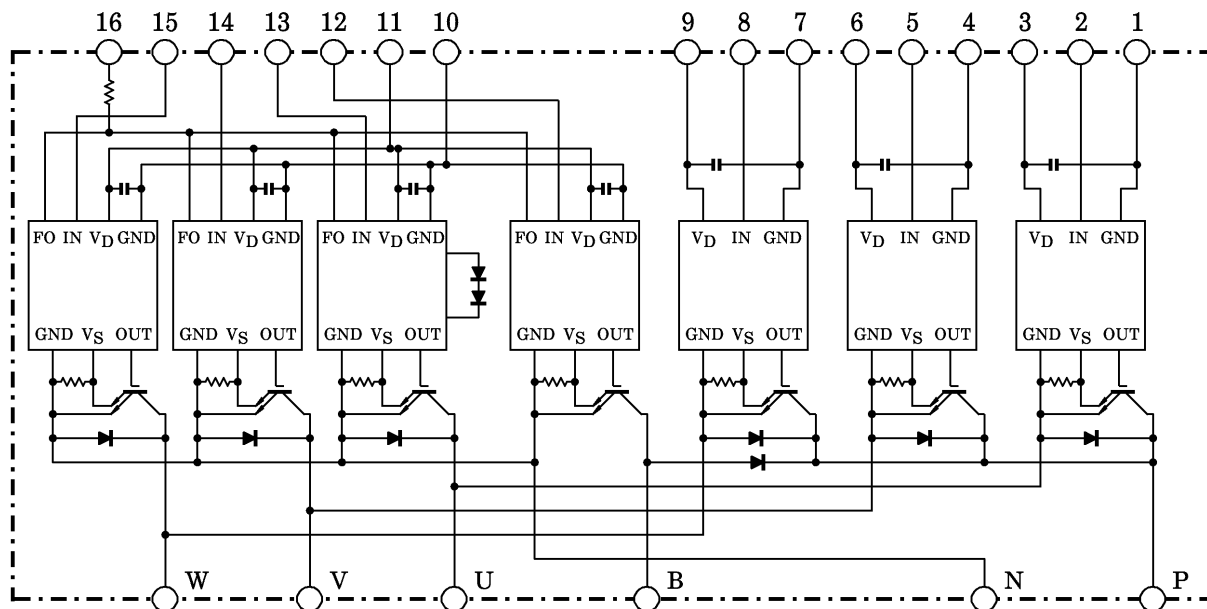
# MIG150J202HC

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter, Brake 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.
- Outline : TOSHIBA 2-110A1A
- Weight : 520 g

EQUIVALENT CIRCUIT



- |            |            |                       |             |                        |                       |
|------------|------------|-----------------------|-------------|------------------------|-----------------------|
| 1. GND (U) | 2. IN (U)  | 3. V <sub>D</sub> (U) | 4. GND (V)  | 5. IN (V)              | 6. V <sub>D</sub> (V) |
| 7. GND (W) | 8. IN (W)  | 9. V <sub>D</sub> (W) | 10. GND (L) | 11. V <sub>D</sub> (L) | 12. IN (B)            |
| 13. IN (X) | 14. IN (Y) | 15. IN (Z)            | 16. FO      |                        |                       |

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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	$I_C$	150	A
	Forward Current	$T_c = 25^\circ\text{C}$ , DC	$I_F$	150	A
	Collector Power Dissipation	$T_c = 25^\circ\text{C}$	$P_C$	400	W
	Junction Temperature	—	$T_j$	150	$^\circ\text{C}$
Brake	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	$I_C$	50	A
	Reverse Voltage	—	$V_R$	600	V
	Forward Current	$T_c = 25^\circ\text{C}$ , DC	$I_F$	50	A
	Collector Power Dissipation	$T_c = 25^\circ\text{C}$	$P_C$	120	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	M5	—	3	N·m

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

a. Inverter stage

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Collector Cut-Off Current	$I_{CEX}$	$V_{CEX} = 600\text{ V}$	$T_j = 25^\circ\text{C}$	—	—	1	mA
			$T_j = 125^\circ\text{C}$	—	—	20	
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{ V}$ , $I_C = 150\text{ A}$ $V_{IN} = 15\text{ V} \rightarrow 0\text{ V}$	$T_j = 25^\circ\text{C}$	—	2.5	3.0	V
			$T_j = 125^\circ\text{C}$	—	2.5	—	
Forward Voltage	$V_F$	$I_F = 150\text{ A}$	—	2.5	3.5	V	
Switching Time	$t_{on}$	$V_{CC} = 300\text{ V}$ , $I_C = 150\text{ A}$ $V_D = 15\text{ V}$ , $V_{IN} = 15\text{ V} \leftrightarrow 0\text{ V}$	—	1.2	2.0	$\mu\text{s}$	
	$t_{off}$		—	2.0	3.0		
	$t_f$	Inductive load	—	0.25	0.5		
	$t_{rr}$	(Note 1)	—	0.1	0.3		

## b. Brake stage

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Collector Cut-Off Current	I <sub>C</sub> EX	V <sub>C</sub> EX = 600 V	T <sub>j</sub> = 25°C	—	—	1	mA
			T <sub>j</sub> = 125°C	—	—	20	
Collector-Emitter Saturation Voltage	V <sub>C</sub> E (sat)	V <sub>D</sub> = 15 V, I <sub>C</sub> = 50 A V <sub>I</sub> N = 15 V → 0 V	T <sub>j</sub> = 25°C	—	2.0	3.0	V
			T <sub>j</sub> = 125°C	—	2.0	—	
Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 600 V	T <sub>j</sub> = 25°C	—	—	1	mA
			T <sub>j</sub> = 125°C	—	—	20	
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 50 A	—	2.2	2.5	V	
Switching Time	t <sub>on</sub>	V <sub>CC</sub> = 300 V, I <sub>C</sub> = 50 A	—	1.0	2.0	μs	
	t <sub>off</sub>	V <sub>D</sub> = 15 V, V <sub>I</sub> N = 15 V ↔ 0 V	—	2.0	3.0		
	t <sub>f</sub>	Inductive load	—	0.25	0.5		
	t <sub>rr</sub>	(Note 1)	—	0.15	0.3		

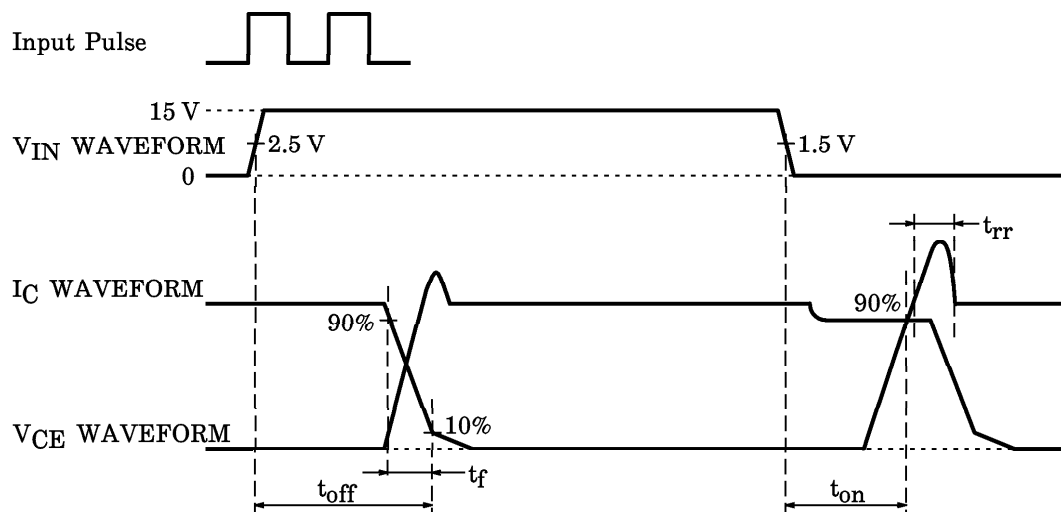
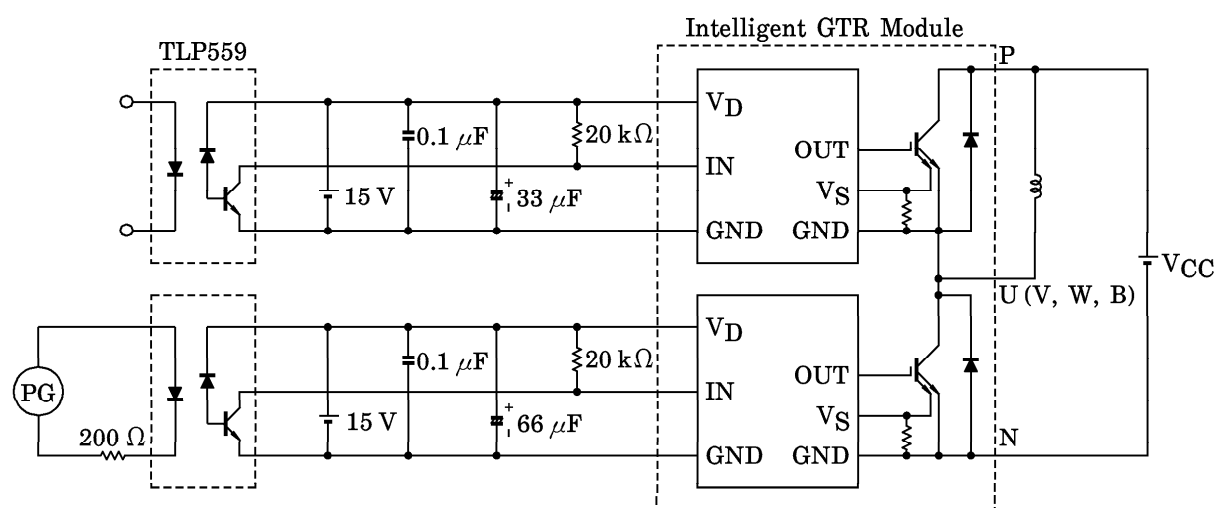
c. Control stage (T<sub>j</sub> = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Control Circuit Current	High Side	I <sub>D</sub> (H)	V <sub>D</sub> = 15 V	—	8	—	mA
	Low Side			I <sub>D</sub> (L)	—	35	
Input-On Signal Voltage	V <sub>I</sub> N (on)	V <sub>D</sub> = 15 V, I <sub>C</sub> = 150 mA	1.3	1.5	1.7	V	
Input-Off Signal Voltage	V <sub>I</sub> N (off)	V <sub>D</sub> = 15 V, I <sub>C</sub> = 150 mA	2.2	2.5	2.8	V	
Fault Output Current	Protection	I <sub>F</sub> O (on)	V <sub>D</sub> = 15 V	8	10	12	mA
	Normal			I <sub>F</sub> O (off)	—	—	
Over Current Protection Trip Level	Inverter	OC	V <sub>D</sub> = 15 V, T <sub>j</sub> = 125°C	190	300	—	A
	Brake			60	—	—	
Short Circuit Protection Trip Level	Inverter	SC	V <sub>D</sub> = 15 V, T <sub>j</sub> = 125°C	285	450	—	A
	Brake			90	—	—	
Over Current Cut-Off Time	t <sub>off</sub> (OC)	V <sub>D</sub> = 15 V	—	5	—	μs	
Over Temperature Protection	Trip Level	OT	Case temperature	110	118	125	°C
	Reset Level			OTr	—	80	
Control Supply Under Voltage Protection	Trip Level	UV	—	11.0	12.0	12.5	V
	Reset Level			UVr	—	12.5	
Fault Output Pulse Width	t <sub>F</sub> O	V <sub>D</sub> = 15 V	1	2	3	ms	

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

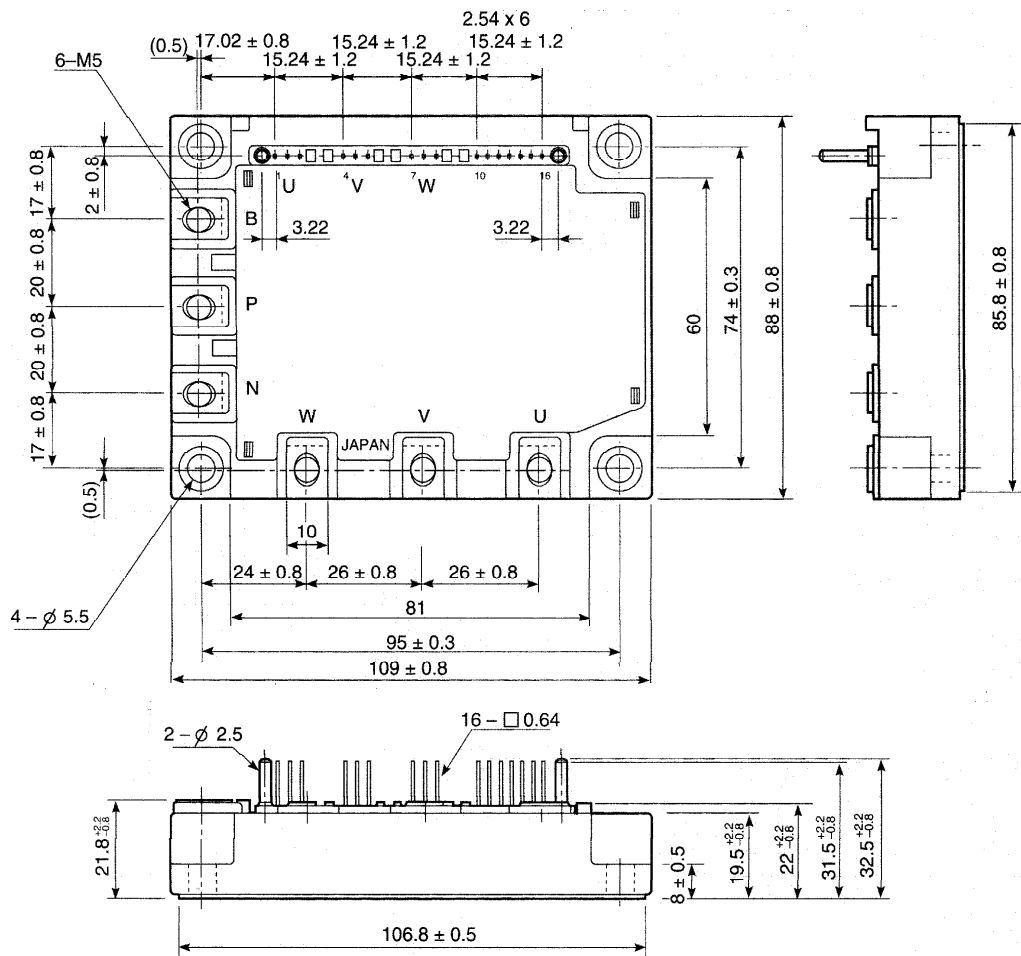
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th(j-c)}$	Inverter IGBT	—	—	0.31	$^\circ\text{C} / \text{W}$
		Inverter FRD	—	—	0.83	
		Brake IGBT	—	—	1.041	
		Brake FRD	—	—	2.000	
Case to Fin Thermal Resistance	$R_{th(c-f)}$	Compound is applied	—	0.05	—	$^\circ\text{C} / \text{W}$

(Note 1) Switching time test circuit & timing chart



OUTLINE

Unit : mm



	GND	IN	VD	GND	IN	VD	GND	IN	VD	GND	VD	IN	IN	IN	IN	FO
	(U)		(V)		(W)					(B)	(X)	(Y)	(Z)			
Signal Terminal	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16