

TOSHIBA INTELLIGENT GTR MODULE SILICON N CHANNEL IGBT

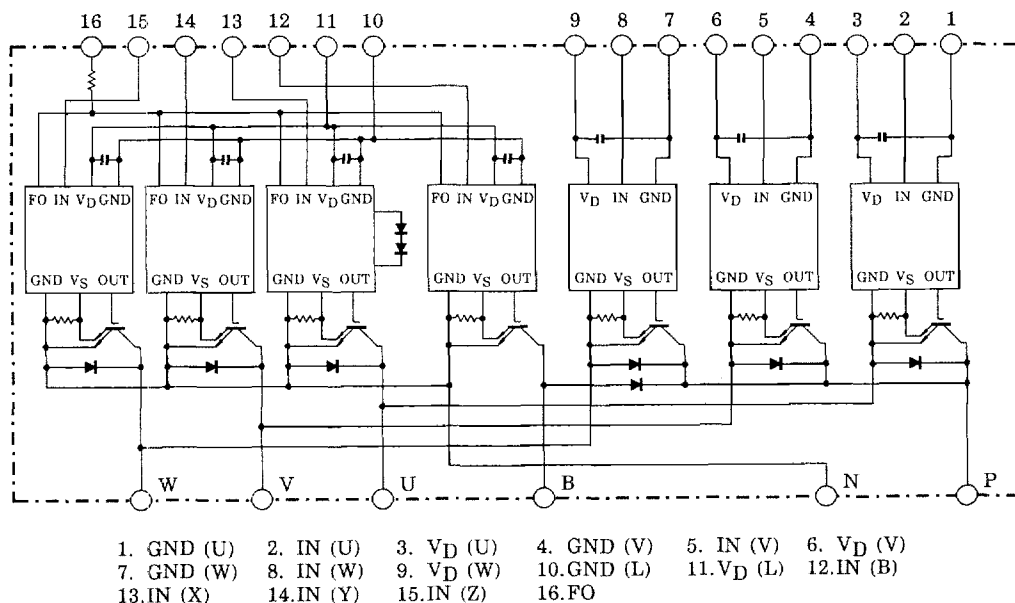
MIG150J202H

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.
- High Speed Type IGBT : $V_{CE(sat)}=2.8V$ (Max.)
 $t_{off}=3.0\mu s$ (Max.)
 $t_{rr}=0.30\mu s$ (Max.)
- Outline : TOSHIBA 2-110A1A
- Weight : 520g

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	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	320	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	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}	$V_{CEX} = 600\text{V}$	$T_j = 25^\circ\text{C}$	—	1	mA
			$T_j = 125^\circ\text{C}$	—	20	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}$, $I_C = 150\text{A}$ $V_{IN} = 15\text{V} \leftrightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.2	V
			$T_j = 125^\circ\text{C}$	—	2.3	
Forward Voltage	V_F	$I_F = 150\text{A}$	—	2.5	3.5	V
Switching Time	t_{on}	$V_{CC} = 300\text{V}$, $I_C = 150\text{A}$ $V_D = 15\text{V}$, $V_{IN} = 15\text{V} \leftrightarrow 0\text{V}$ Inductive load (Note 1)	—	1.2	2.0	μs
	t_{off}		—	2.0	3.0	
	t_f		—	0.25	0.5	
	t_{rr}		—	0.1	0.3	

b. Brake stage

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-Off Current	I_{CEX}	$V_{CEX}=600V$	$T_j=25^{\circ}C$	—	1	mA
			$T_j=125^{\circ}C$	—	20	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D=15V, I_C=50A$ $V_{IN}=15V \rightarrow 0V$	$T_j=25^{\circ}C$	—	2.0	V
			$T_j=125^{\circ}C$	—	2.0	
Reverse Current	I_R	$V_R=600V$	$T_j=25^{\circ}C$	—	1	mA
			$T_j=125^{\circ}C$	—	20	
Forward Voltage	V_F	$I_F=50A$	—	2.2	2.5	V
Switching Time	t_{on}	$V_{CC}=300V, I_C=50A$	—	1.0	2.0	μs
	t_{off}	$V_D=15V, V_{IN}=15V \leftrightarrow 0V$	—	2.0	3.0	
	t_f	Inductive load	—	0.25	0.5	
	t_{rr}	(Note 1)	—	0.15	0.3	

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current	High Side	$I_D(H)$	$V_D=15V$	8	—	mA
	Low Side			32	—	
Input-On Signal Voltage	$V_{IN(on)}$	$V_D=15V, I_C=150mA$	1.3	1.5	1.7	V
Input-Off Signal Voltage	$V_{IN(off)}$	$V_D=15V, I_C=150mA$	2.2	2.5	2.8	V
Fault Output Current	Protection	$I_{FO(on)}$	$V_D=15V$	8	10	mA
	Normal			—	1	
Over Current Protection Trip Level	Inverter	OC	$V_D=15V, T_j=125^{\circ}C$	190	300	A
	Brake			60	—	
Short Circuit Protection Trip Level	Inverter	SC	$V_D=15V, T_j=125^{\circ}C$	285	450	A
	Brake			90	—	
Over Current Cut-Off Time	$t_{off(OC)}$	$V_D=15V$	—	5	—	μs
Over Temperature Protection	Trip Level	Case temperature	110	118	125	$^{\circ}C$
	Reset Level		—	98	—	
Control Supply Under Voltage Protection	Trip Level	—	11.0	12.0	12.5	V
	Reset Level		—	12.5	—	
Fault Output Pulse Width	t_{FO}	$V_D=15V$	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	—	—	0.390	$^{\circ}\text{C} / \text{W}$
		Inverter FRD	—	—	1.041	
		Brake IGBT	—	—	1.041	
		Brake FRD	—	—	2.000	
Case to Fin Thermal Resistance	$R_{th(c-f)}$	Compound is applied	—	0.05	—	$^{\circ}\text{C} / \text{W}$

Attached 1 : Switching time test circuit & timing chart

