

TOSHIBA INTELLIGENT GTR MODULE SILICON N CHANNEL IGBT

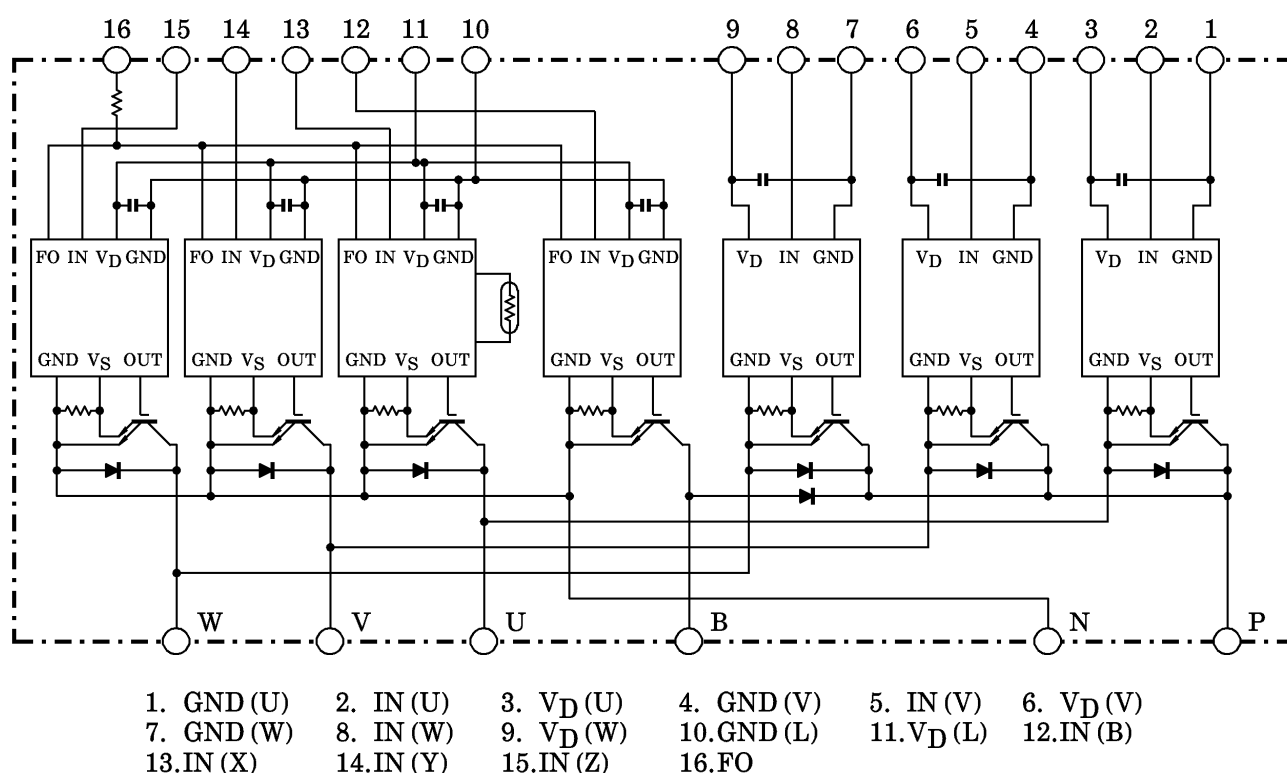
MIG150Q201H

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter Power Circuits & Brake Circuits & Control Circuits (IGBT drive unit, Protection units for Over-Current, Under-Voltage & Over-Temperature) in One Package.
- The Electrodes are Isolated from Case.

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}	900	V
	Collector-Emitter Voltage	—	V_{CES}	1200	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	800	W
	Junction Temperature	—	T_j	150	$^\circ\text{C}$
Brake	Supply Voltage	P-N power terminal	V_{CC}	900	V
	Collector-Emitter Voltage	—	V_{CES}	1200	V
	Collector Current	$T_c = 25^\circ\text{C}$, DC	I_C	50	A
	Reverse Voltage	—	V_R	1200	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	350	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}	10	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}	$V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	—	1	mA
			$T_j = 125^\circ\text{C}$	—	20	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{ V}$, $I_C = 150\text{ A}$ $V_{IN} = 3\text{ V} \rightarrow 0\text{ V}$	$T_j = 25^\circ\text{C}$	—	2.6	V
			$T_j = 125^\circ\text{C}$	—	2.5	
Forward Voltage	V_F	$I_F = 150\text{ A}$	—	2.2	3.0	V
Switching Time	t_{on}	$V_{CC} = 600\text{ V}$, $I_C = 150\text{ A}$ $V_D = 15\text{ V}$, $V_{IN} = 3\text{ V} \leftrightarrow 0\text{ V}$ Inductive load (Note 1)	—	0.8	1.5	μs
	$t_c(\text{on})$		—	—	0.7	
	t_{rr}		—	0.18	0.25	
	t_{off}		—	1.3	2.2	
	$t_c(\text{off})$		—	0.25	0.5	

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-Off Current	I_{CEX}	$V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	—	1	mA
			$T_j = 125^\circ\text{C}$	—	20	
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{ V}, I_C = 50\text{ A}$ $V_{IN} = 3\text{ V} \rightarrow 0\text{ V}$	$T_j = 25^\circ\text{C}$	—	2.7	V
			$T_j = 125^\circ\text{C}$	—	2.5	
Reverse Current	I_R	$V_R = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	—	1	mA
			$T_j = 125^\circ\text{C}$	—	20	
Forward Voltage	V_F	$I_F = 50\text{ A}$	—	1.4	2.2	V
Switching Time	t_{on}	$V_{CC} = 600\text{ V}, I_C = 50\text{ A}$ $V_D = 15\text{ V}, V_{IN} = 3\text{ V} \leftrightarrow 0\text{ V}$ Inductive load (Note 1)	—	0.7	2.0	μs
	$t_c(\text{on})$		—	0.85	1.6	
	t_{rr}		—	0.42	0.5	
	t_{off}		—	1.9	2.6	
	$t_c(\text{off})$		—	0.4	0.8	

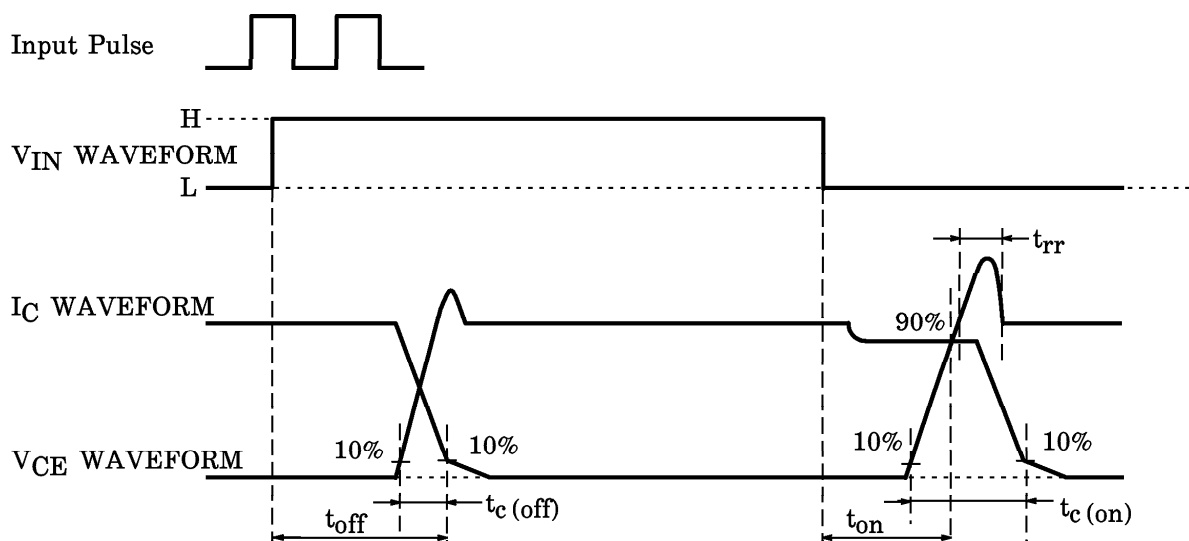
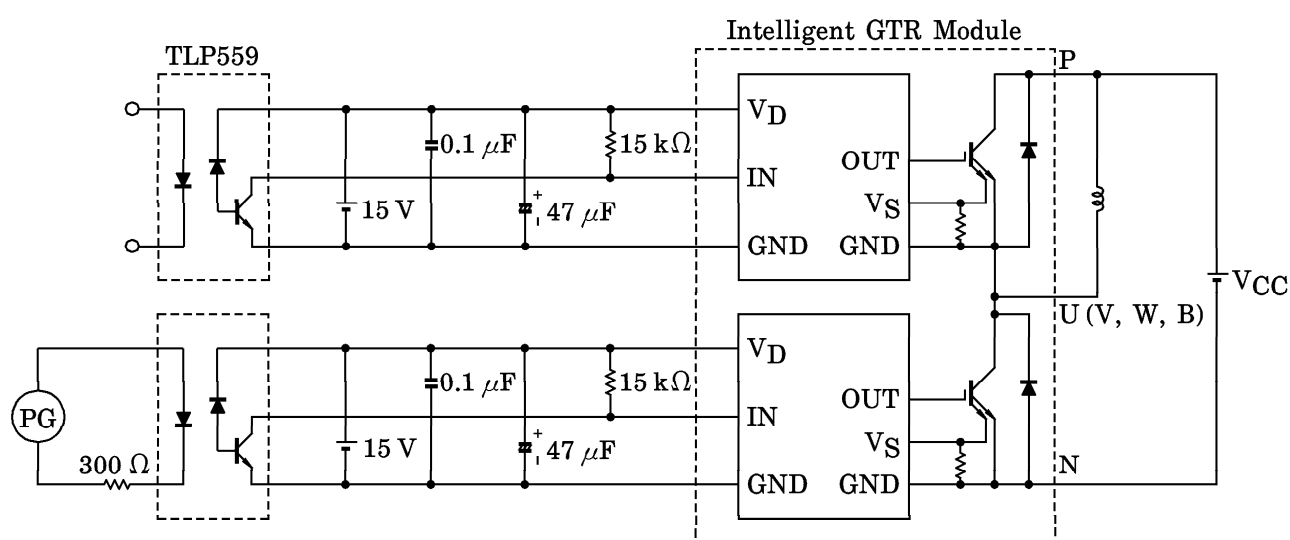
c. Control stage ($T_j = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current	High Side	$I_D(H)$	$V_D = 15\text{ V}$	—	20	mA
	Low Side			—	80	
Input-On Signal Voltage	$V_{IN}(\text{on})$	$V_D = 15\text{ V}, I_C = 150\text{ mA}$	0.9	1.1	1.3	V
Fault Output Current	Protection	$I_{FO}(\text{on})$	$V_D = 15\text{ V}$	8	10	mA
	Normal			—	0.1	
Over Current Protection Trip Level	Inverter	OC	$V_D = 15\text{ V}, T_j \leq 125^\circ\text{C}$	230	320	A
	Brake			80	110	
Short Circuit Protection Trip Level	Inverter	SC	$V_D = 15\text{ V}, T_j \leq 125^\circ\text{C}$	320	400	A
	Brake			120	150	
Over Current Cut-Off Time	$t_{off}(\text{OC})$	$V_D = 15\text{ V}$	—	5	—	μs
Over Temperature Protection	Trip Level	OT	Case temperature	111	118	$^\circ\text{C}$
	Reset Level			—	98	
Control Supply Under Voltage Protection	Trip Level	UV	—	11.3	12.0	V
	Reset Level	UVr		11.8	12.5	
Fault Output Pulse Width	t_{FO}	$V_D = 15\text{ V}$	1	2	3	ms

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

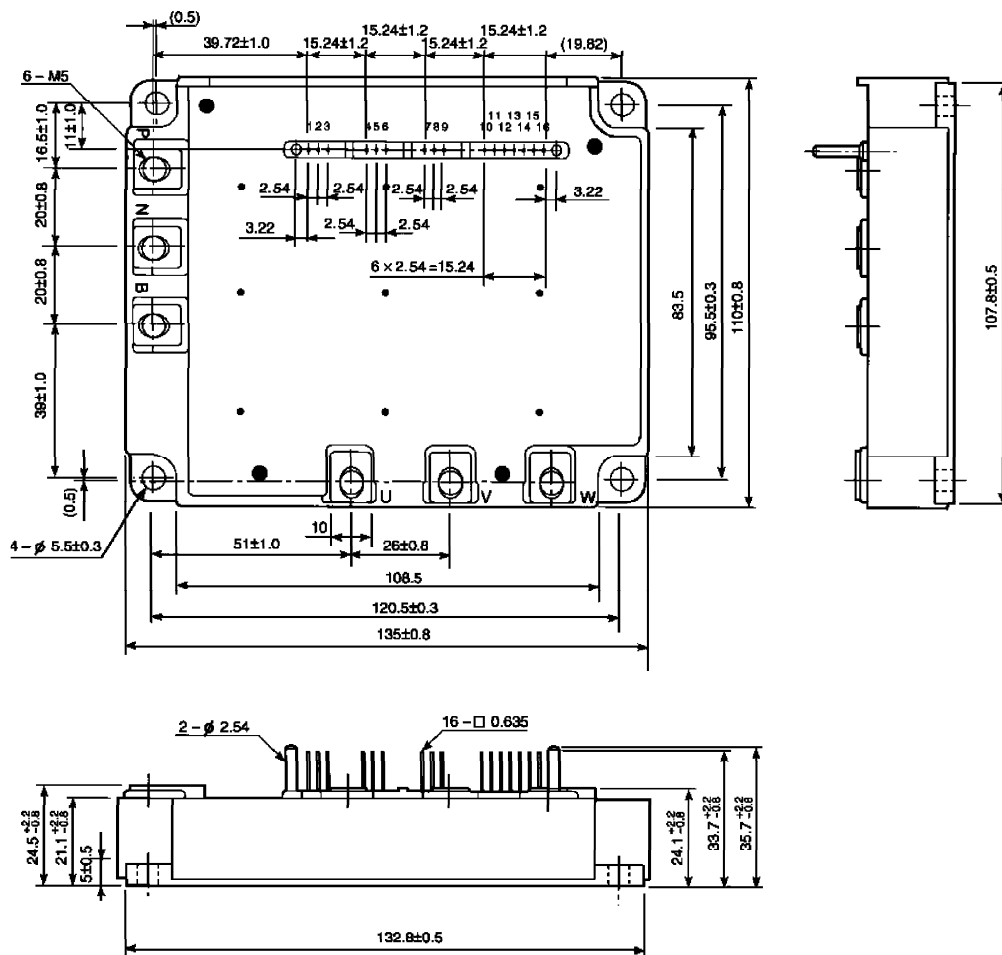
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th(j-c)}$	Inverter IGBT	—	—	0.156	$^\circ\text{C/W}$
		Inverter FRD	—	—	0.5	
		Brake IGBT	—	—	0.36	
		Brake FRD	—	—	1.0	
Case to Fin Thermal Resistance	$R_{th(c-f)}$	Compound is applied	—	0.04	—	$^\circ\text{C/W}$

(Note 1) Switching time test circuit & timing chart



OUTLINE

Unit : mm



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