

TOSHIBA INTELLIGENT POWER MODULE SILICON N CHANNEL IGBT

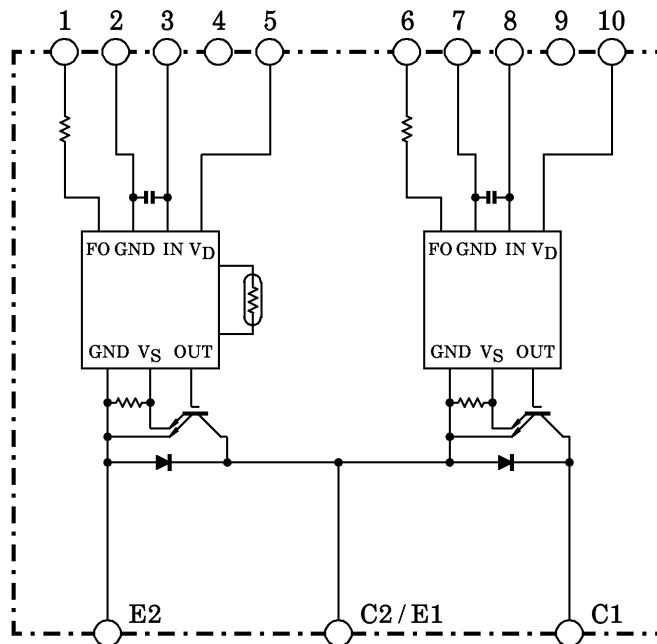
MIG150Q101H

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 : $V_{CE(sat)}=3.5V$ (Max.)
 $t_{off}=3.8\mu s$ (Max.)
 $t_{rr}=0.24\mu s$ (Max.)
- Outline : TOSHIBA 2-121A1A
- Weight : 510g

EQUIVALENT CIRCUIT



- | | | | | |
|-----------|------------|-----------|---------|------------------------|
| 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) |

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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	1200	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	—	TC	-20 ~ +100	$^\circ\text{C}$
	Storage Temperature Range	—	T_{stg}	-40 ~ +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}	$V_{CEX} = 1200\text{V}$	$T_j = 25^\circ\text{C}$	—	—	2	mA
			$T_j = 125^\circ\text{C}$	—	—	40	
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{V}$, $I_C = 150\text{A}$ $V_{IN} = 3\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.7	3.5	V
			$T_j = 125^\circ\text{C}$	—	2.6	—	
Forward Voltage	V_F	$I_F = 150\text{A}$	—	2.0	2.5	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 (Attached 1)	0.8	1.5	2.2	μs	
	$t_c(\text{on})$		—	0.5	1.0		
	t_{rr}		—	0.16	0.24		
	t_{off}		—	3.3	3.8		
	$t_c(\text{off})$		—	0.4	0.8		

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

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current		I_D	$V_D = 15\text{V}$	—	20	30	mA
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	12	mA
	Normal	$I_{FO}(\text{off})$		—	—	1	
Over Current Protection Trip Level		OC	$V_D = 15\text{V}, T_j = 125^\circ\text{C}$	210	300	—	A
Short Circuit Protection Trip Level		SC	$V_D = 15\text{V}, T_j = 125^\circ\text{C}$	315	450	—	A
Over Current Cut-Off Time		$t_{\text{off}}(\text{OC})$	$V_D = 15\text{V}$	—	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

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

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance		$R_{th(j-c)}$	IGBT	—	—	0.104	$^\circ\text{C}/\text{W}$
			FRD	—	—	0.25	
Case to Fin Thermal Resistance		$R_{th(c-f)}$	Compound is applied	—	0.03	—	$^\circ\text{C}/\text{W}$

Note 1 : Switching time test circuit & timing chart

