

TOSHIBA INTELLIGENT POWER MODULE SILICON N CHANNEL IGBT

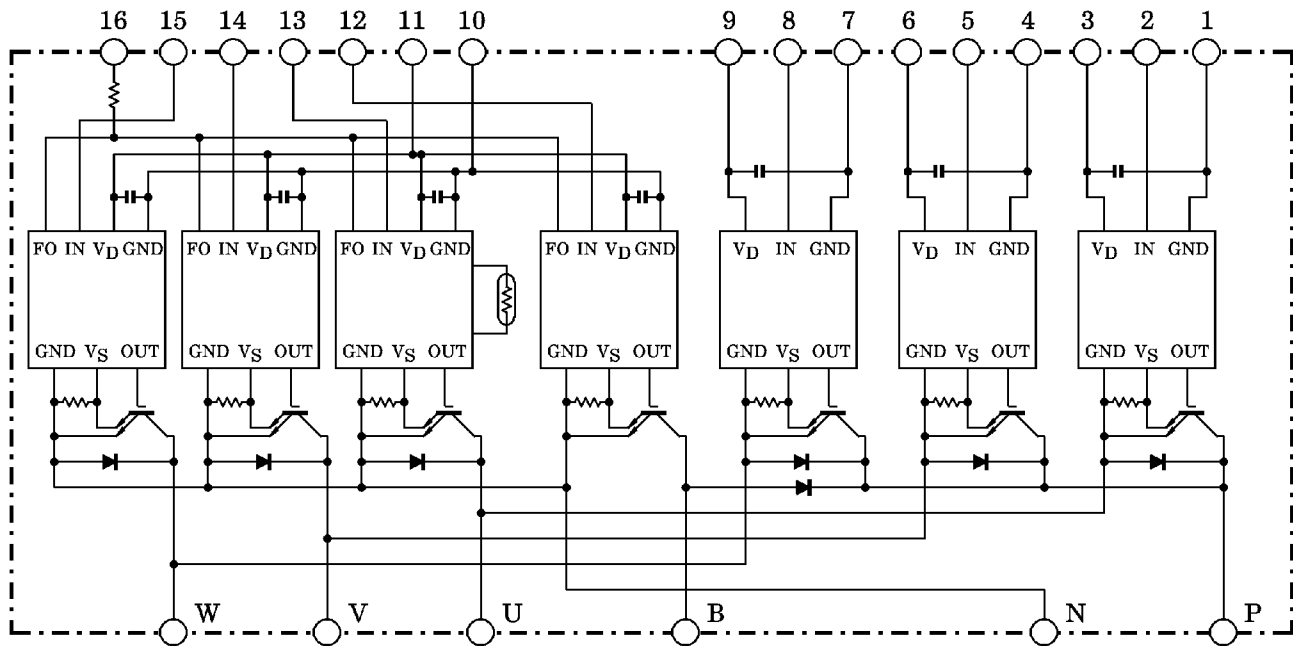
MIG100Q201H

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 : $V_{CE(sat)}=3.5V$ (Max.)
 $t_{off}=2.5\mu s$ (Max.)
 $t_{rr}=0.21\mu s$ (Max.)
- Outline : TOSHIBA 2-136A1A
- Weight :

EQUIVALENT CIRCUIT



- | | | | | | |
|------------|------------|-----------------------|-------------|------------------------|-----------------------|
| 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 | | |

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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	100	A
	Forward Current	$T_c = 25^\circ\text{C}$, DC	I_F	100	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	400	W
Control	Junction Temperature	—	T_j	150	$^\circ\text{C}$
	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	$-20 \sim +100$
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}	$V_{CEX} = 1200\text{V}$	$T_j = 25^\circ\text{C}$	—	—	1	mA
			$T_j = 125^\circ\text{C}$	—	—	20	
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{V}$, $I_C = 100\text{A}$ $V_{IN} = 3\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.7	3.5	V
			$T_j = 125^\circ\text{C}$	—	2.6	—	
Forward Voltage	V_F	$I_F = 100\text{A}$	—	2.0	2.7	V	
Switching Time	t_{on}	$V_{CC} = 600\text{V}$, $I_C = 100\text{A}$ $V_D = 15\text{V}$, $V_{IN} = 3\text{V} \leftrightarrow 0\text{V}$ Inductive load (Note 1)	0.8	1.5	2.2	μs	
	$t_c(\text{on})$		—	0.5	1.0		
	t_{rr}		—	0.14	0.21		
	t_{off}		—	1.5	2.5		
	$t_c(\text{off})$		—	0.3	0.6		

b. Brake stage

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Collector Cut-Off Current	ICEX	VCEX = 1200V	T _j = 25°C	—	—	1	mA
			T _j = 125°C	—	—	20	
Collector-Emitter Saturation Voltage	V _{CE} (sat)	V _D = 15V, I _C = 50A V _{IN} = 3V → 0V	T _j = 25°C	—	2.7	3.5	V
			T _j = 125°C	—	2.6	—	
Reverse Current	I _R	V _R = 1200V	T _j = 25°C	—	—	1	mA
			T _j = 125°C	—	—	20	
Forward Voltage	V _F	I _F = 50A	—	2.0	2.7	V	
Switching Time	t _{on}	V _{CC} = 600V, I _C = 50A V _D = 15V, V _{IN} = 3V ↔ 0V Inductive load (Note 1)	0.8	1.5	2.2	μs	
	t _c (on)		—	0.5	1.0		
	t _{rr}		—	0.30	0.45		
	t _{off}		—	1.5	2.5		
	t _c (off)		—	0.3	0.6		

c. Control stage (T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Control Circuit Current	High Side	I _D (H)	V _D = 15V	—	20	30	mA
	Low Side			I _D (L)	—	80	
Input On Signal Voltage	V _{IN} (on)	V _D = 15V, I _C = 100mA	0.9	1.1	1.3	V	
Fault Output Current	Protection	I _{FO} (on)	V _D = 15V	8	10	12	mA
	Normal			I _{FO} (off)	—	—	
Over Current Protection Trip Level	Inverter	OC	V _D = 15V, T _j = 125°C	160	200	—	A
	Brake			70	100	—	
Short Circuit Protection Trip Level	Inverter	SC	V _D = 15V, T _j = 125°C	240	300	—	A
	Brake			105	150	—	
Over Current Cut-Off Time	t _{off} (OC)	V _D = 15V	—	10	—	μs	
Over Temperature Protection	Trip Level	OT	Case temperature	111	118	125	°C
	Reset Level			OTr	93	100	
Control Supply Under Voltage Protection	Trip Level	UV	—	11.3	12.0	12.7	V
	Reset Level			UVr	11.8	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	—	—	0.156	$^\circ\text{C/W}$
		Inverter FRD	—	—	0.50	
		Brake IGBT	—	—	0.312	
		Brake FRD	—	—	1.00	
Case to Fin Thermal Resistance	$R_{th(c-f)}$	Compound is applied	—	0.04	—	$^\circ\text{C/W}$

Attached 1 : Switching time test circuit & timing chart

