

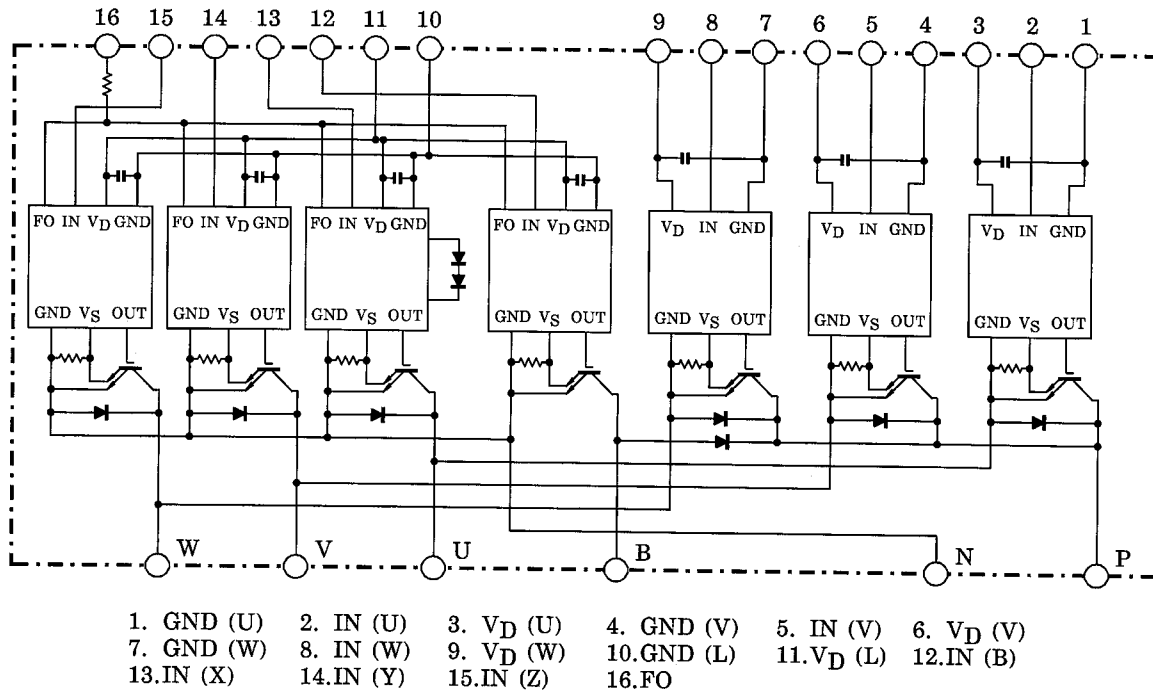
# MIG100J201HC

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

## Equivalent Circuit



## 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	$I_C$	100	A
	Forward current	$T_c = 25^\circ\text{C}$ , DC	$I_F$	100	A
	Collector power dissipation	$T_c = 25^\circ\text{C}$	$P_C$	300	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	$I_C$	30	A
	Reverse voltage	—	$V_R$	600	V
	Forward current	$T_c = 25^\circ\text{C}$ , DC	$I_F$	30	A
	Collector power dissipation	$T_c = 25^\circ\text{C}$	$P_C$	80	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	$-20 \sim +100$	$^\circ\text{C}$
	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	$I_{CEX}$	$V_{CE} = 600\text{ V}$	$T_j = 25^\circ\text{C}$	—	1	mA
			$T_j = 125^\circ\text{C}$	—	20	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_D = 15\text{ V}$ , $I_C = 100\text{ A}$ $V_{IN} = 15\text{ V} \rightarrow 0\text{ V}$	$T_j = 25^\circ\text{C}$	—	2.3	V
			$T_j = 125^\circ\text{C}$	—	—	
Forward voltage	$V_F$	$I_F = 100\text{ A}$	—	2.1	3.3	V
Switching time	$t_{on}$	$V_{CC} = 300\text{ V}$ , $I_C = 100\text{ A}$ $V_D = 15\text{ V}$ , $V_{IN} = 15\text{ V} \leftrightarrow 0\text{ V}$ Inductive load (Note 1)	—	1.0	2.0	$\mu\text{s}$
	$t_{off}$		—	1.7	3.0	
	$t_f$		—	0.2	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	$V_{CE (sat)}$	$V_D = 15V, I_C = 30A$ $V_{IN} = 15V \rightarrow 0V$	$T_j = 25^{\circ}C$	—	1.7	V
			$T_j = 125^{\circ}C$	—	1.6	
Reverse current	$I_R$	$V_R = 600V$	$T_j = 25^{\circ}C$	—	1	mA
			$T_j = 125^{\circ}C$	—	20	
Forward voltage	$V_F$	$I_F = 30A$	—	2.0	2.5	V
Switching time	$t_{on}$	$V_{CC} = 300V, I_C = 30A$ $V_D = 15V, V_{IN} = 15V \leftrightarrow 0V$ Inductive load  (Note 1)	—	0.9	2.0	$\mu s$
	$t_{off}$		—	1.7	3.0	
	$t_f$		—	0.25	0.5	
	$t_{rr}$		—	0.15	0.3	

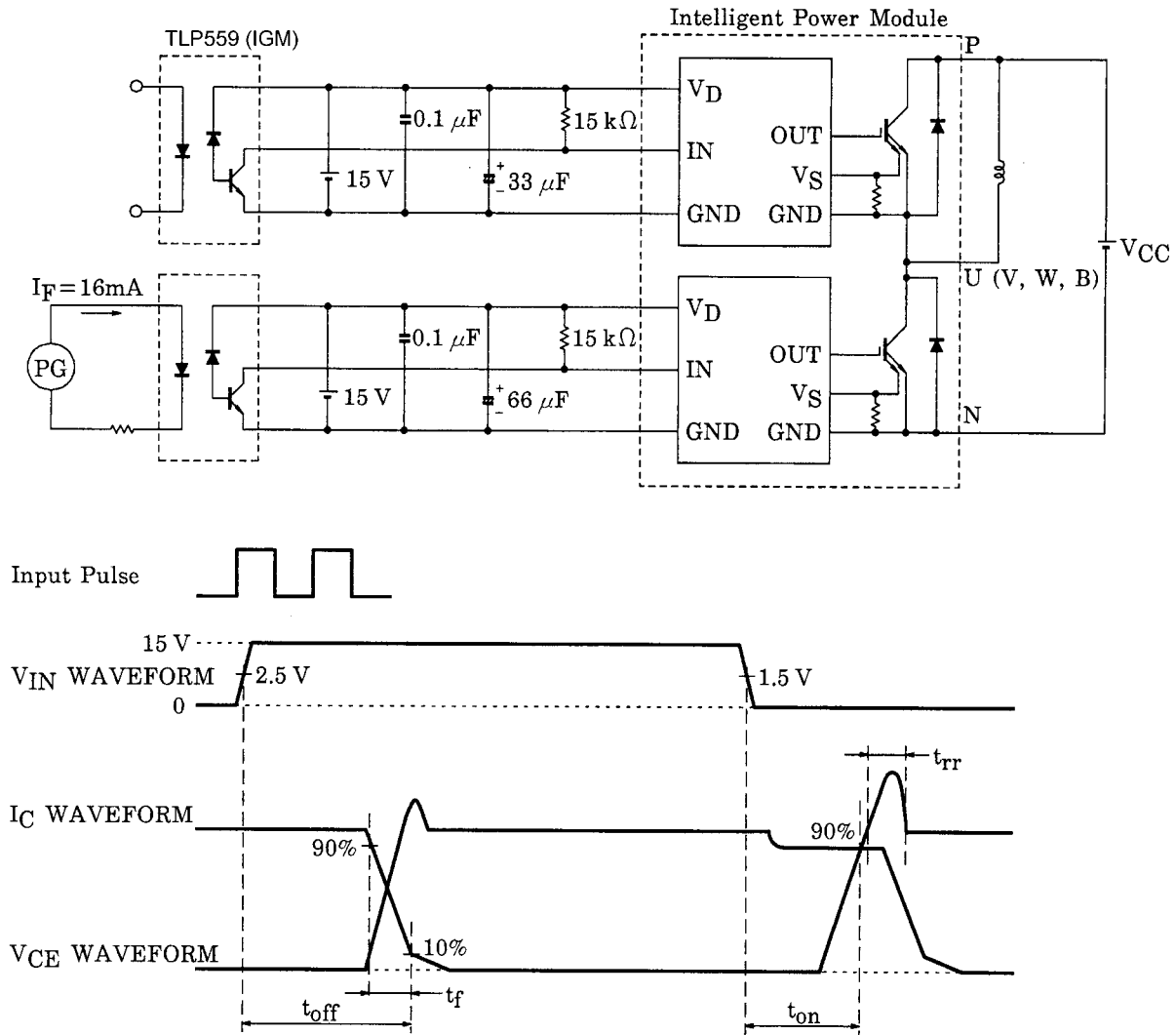
**c. Control Stage ( $T_j = 25^{\circ}C$ )**

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Control circuit current	High side $I_D (H)$	$V_D = 15 V$	—	8	—	mA
	Low side $I_D (L)$		—	35	—	
Input-on signal voltage	$V_{IN (on)}$	$V_D = 15 V, I_C = 100 mA$	1.3	1.5	1.7	V
Input-off signal voltage	$V_{IN (off)}$	$V_D = 15 V, I_C = 100 mA$	2.2	2.5	2.8	V
Fault output current	Protection $I_{FO (on)}$	$V_D = 15 V$	8	10	12	mA
	Normal $I_{FO (off)}$		—	—	1	
Over current protection trip level	Inverter OC	$V_D = 15 V, T_j = 125^{\circ}C$	160	200	—	A
	Brake		40	—	—	
Short current protection trip level	Trip level SC	$V_D = 15 V, T_j = 125^{\circ}C$	240	300	—	A
	Reset level		60	—	—	
Over current cut-off time	$t_{off (OC)}$	$V_D = 15 V$	—	5	—	$\mu s$
Over temperature protection	Trip level OT	Case temperature	110	118	125	$^{\circ}C$
	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	$t_{FO}$	$V_D = 15 V$	1	2	3	ms

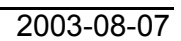
## d. Thermal Resistance ( $T_j = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Junction to case thermal resistance	$R_{th(j-c)}$	Inverter IGBT stage	—	—	0.418	$^\circ\text{C} / \text{W}$
		Inverter FRD stage	—	—	1.000	
		Brake IGBTstage	—	—	1.562	
		Brake FRD stage	—	—	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



## Unit: mm



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