

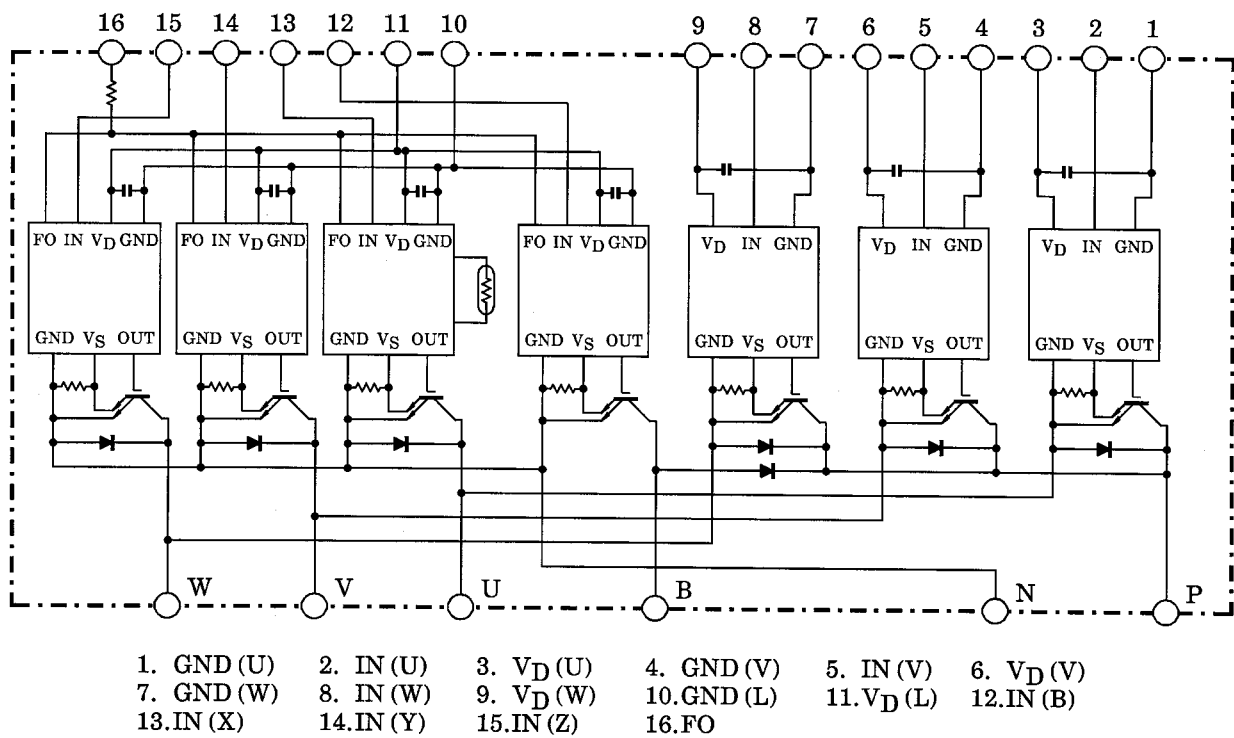
MIG150Q201H

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.

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}	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	—	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	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	3.5	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	2.1	μs	
	$t_{c(on)}$		—	0.7	1.4		
	t_{rr}		—	0.18	0.25		
	t_{off}		—	1.3	2.2		
	$t_{c(off)}$		—	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	$V_{CE(sat)}$	$V_D = 15\text{V}, I_C = 50\text{A}$ $V_{IN} = 3\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.7	3.5	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	1.4	2.0	μs	
	$t_{c(on)}$		—	0.85	1.6		
	t_{rr}		—	0.42	0.5		
	t_{off}		—	1.9	2.6		
	$t_{c(off)}$		—	0.4	0.8		

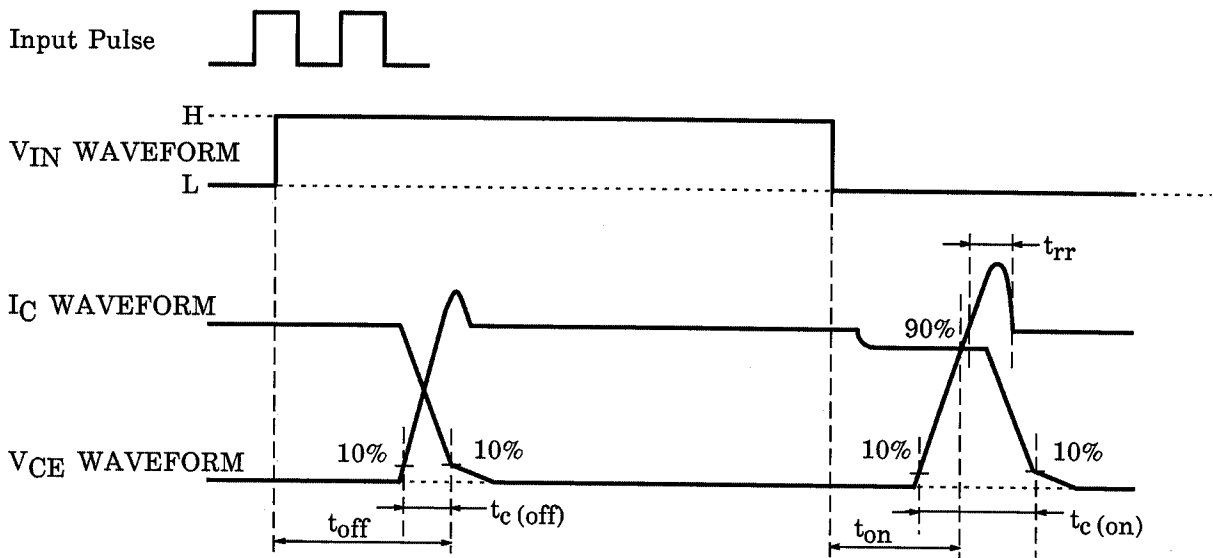
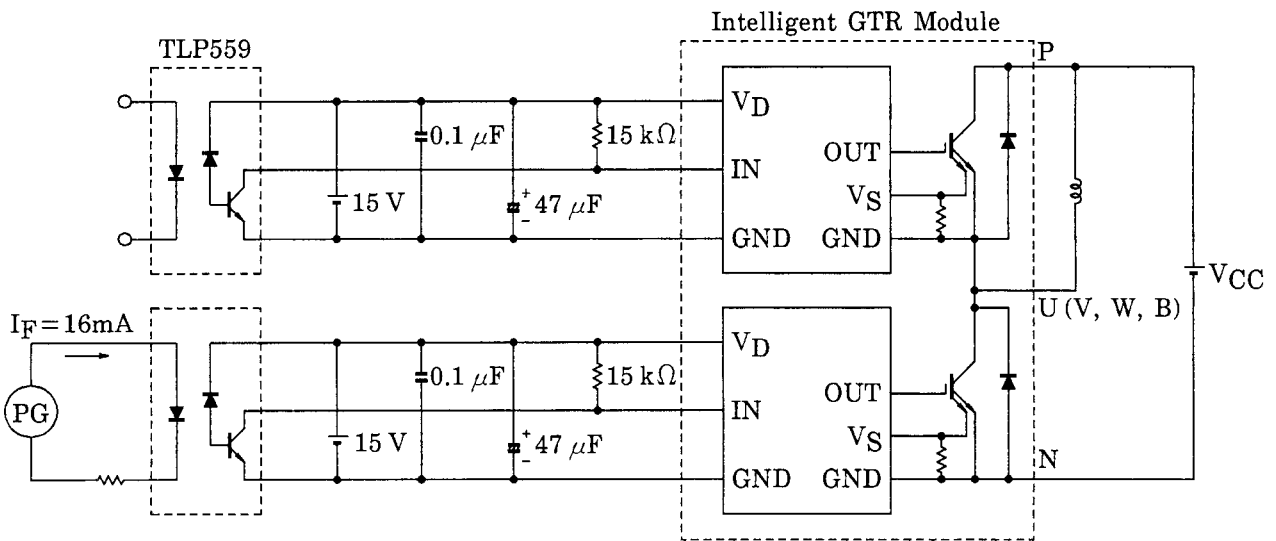
c. Control Stage ($T_j = 25^\circ\text{C}$)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Control circuit current	High side	$V_D = 15\text{V}$	—	20	30	mA
	Low side		—	80	120	
Input-on signal voltage	$V_{IN(on)}$	$V_D = 15\text{V}, I_C = 150\text{mA}$	0.9	1.1	1.3	V
Fault output current	Protection	$V_D = 15\text{V}$	8	10	12	mA
	Normal		—	—	0.1	
Over current protection trip level	Inverter	$V_D = 15\text{V}, T_j \leq 125^\circ\text{C}$	230	320	—	A
	Brake		80	110	—	
Short current protection trip level	Inverter	$V_D = 15\text{V}, T_j \leq 125^\circ\text{C}$	320	400	—	A
	Brake		120	150	—	
Over current cut-off time	$t_{off(OC)}$	$V_D = 15\text{V}$	—	5	—	μs
Over temperature protection	Trip level	Case temperature	111	118	125	$^\circ\text{C}$
	Reset level		—	98	—	
Control supply under voltage protection	Trip level	—	11.3	12.0	12.7	V
	Reset level		11.8	12.5	13.2	
Fault output pulse width	t_{FO}	$V_D = 15\text{V}$	1	2	3	ms

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

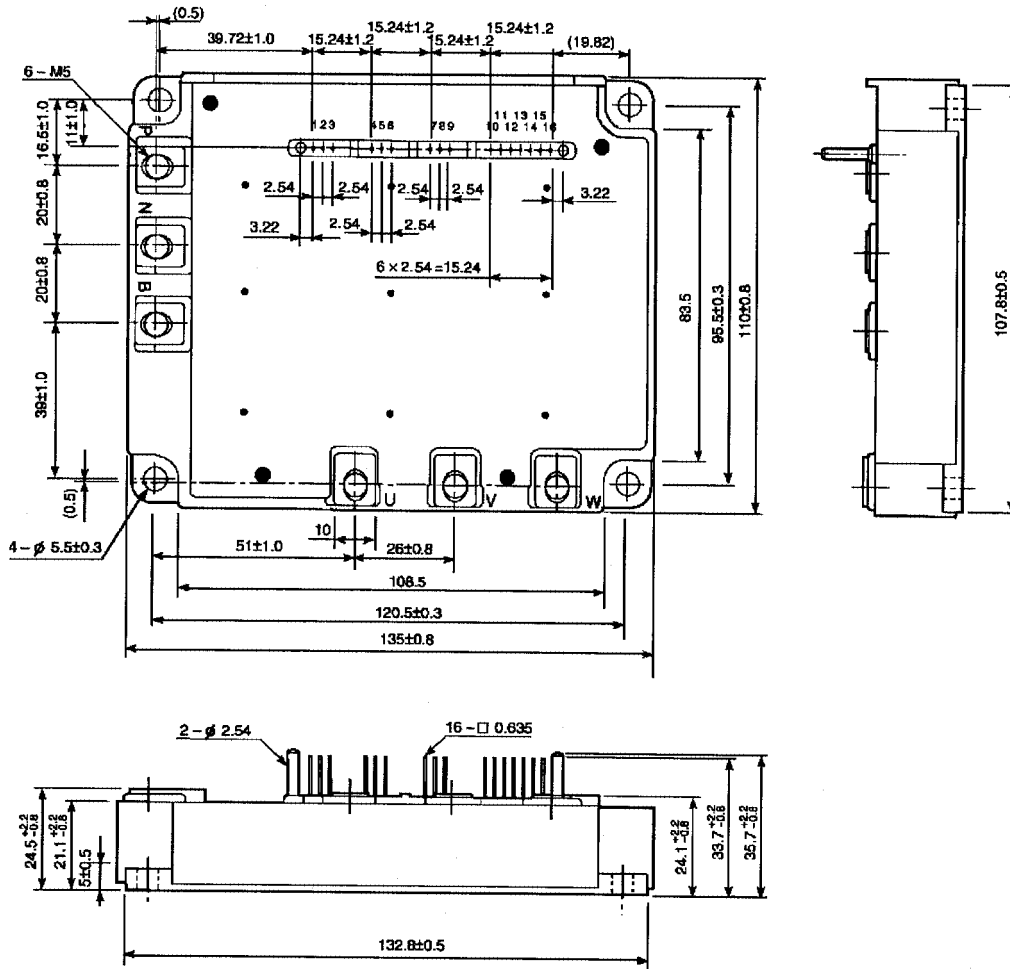
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Junction to case thermal resistance	$R_{th(j-c)}$	Inverter IGBT	—	—	0.156	$^\circ\text{C/W}$
		Inverter FRD	—	—	0.5	
		Brake IGBT	—	—	0.36	
		Brake FRD	—	—	1.0	
Case to fin thermal resistance	$R_{th(c-f)}$	Compound is applied	—	0.04	—	$^\circ\text{C/W}$

Note 1: Switching time test circuit & timing chart



Package Dimensions: TOSHIBA 2-136A1A

Unit: mm



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