TOSHIBA Intelligent Power Module Silicon N Channel IGBT

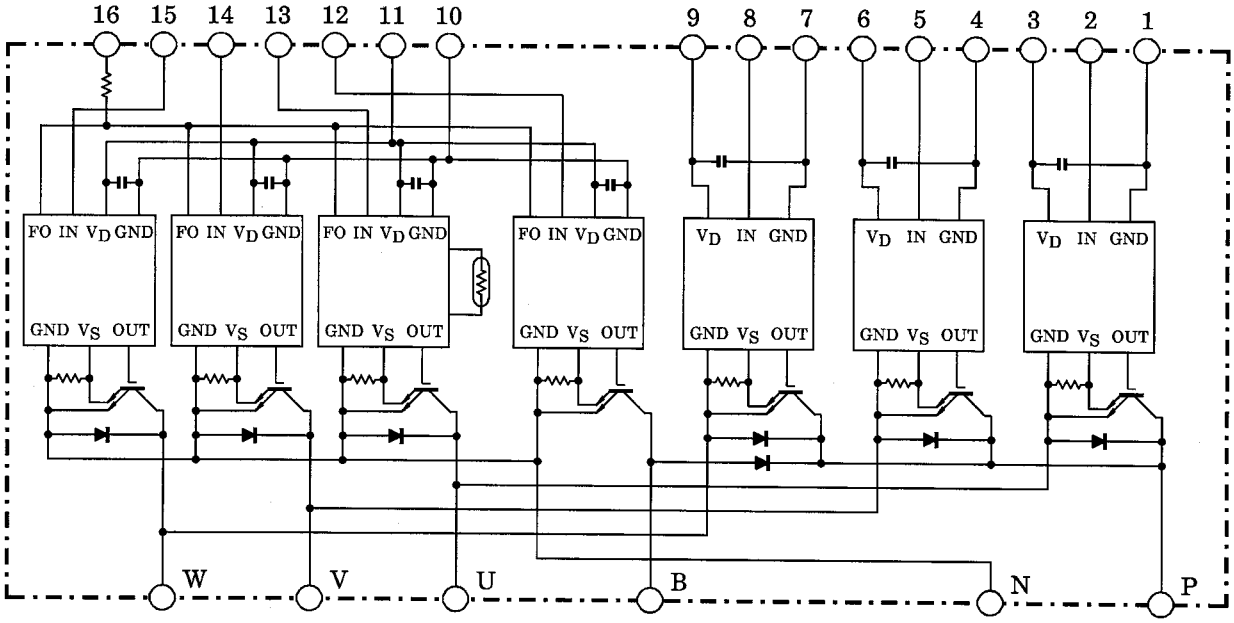
MIG150Q201H

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



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		

Maximum Ratings (T_j = 25°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	Tc = 25°C, DC	I_C	150	A
	Forward current	Tc = 25°C, DC	I_F	150	A
	Collector power dissipation	Tc = 25°C	P_C	800	W
	Junction temperature	—	T_j	150	°C
Brake	Supply voltage	P-N power terminal	V_{CC}	900	V
	Collector-emitter voltage	—	V_{CES}	1200	V
	Collector current	Tc = 25°C, DC	I_C	50	A
	Reverse voltage	—	V_R	1200	V
	Forward current	Tc = 25°C, DC	I_F	50	A
	Collector power dissipation	Tc = 25°C	P_C	350	W
	Junction temperature	—	T_j	150	°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	°C
	Storage temperature range	—	T_{stg}	−40 ~ +125	°C
	Isolation voltage	AC 1 minute	V_{ISO}	2500	V
	Screw torque	M5	—	3	N·m

Electrical Characteristics (T_j = 25°C)

a. Inverter Stage

Characteristic	Symbol	Test Condition		Min	Typ.	Max	Unit
Collector cut-off current	I_{CEX}	V_{CE} = 1200 V	T_j = 25°C	—	—	1	mA
			T_j = 125°C	—	—	20	
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	V_D = 15 V, I_C = 150 A V_{IN} = 3 V → 0 V	T_j = 25°C	—	2.6	3.5	V
			T_j = 125°C	—	2.5	—	
Forward voltage	V_F	I_F = 150 A		—	2.2	3.0	V
Switching time	t_{on}	V_{CC} = 600 V, I_C = 150 A V_D = 15 V, V_{IN} = 3 V ↔ 0 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°C)

Characteristic	Symbol	Test Condition		Min	Typ.	Max	Unit
Collector cut-off current	I_{CEX}	V_{CE} = 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	—	2.5	—	
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		—	1.4	2.2	V
Switching time	t_{on}	V_{CC} = 600V, I_C = 50A V_D = 15V, V_{IN} = 3V↔ 0V Inductive load		0.7	1.4	2.0	μs
	$t_{c(on)}$			—	0.85	1.6	
	t_{rr}			—	0.42	0.5	
	t_{off}		(Note 1)	—	1.9	2.6	
	$t_{c(off)}$			—	0.4	0.8	

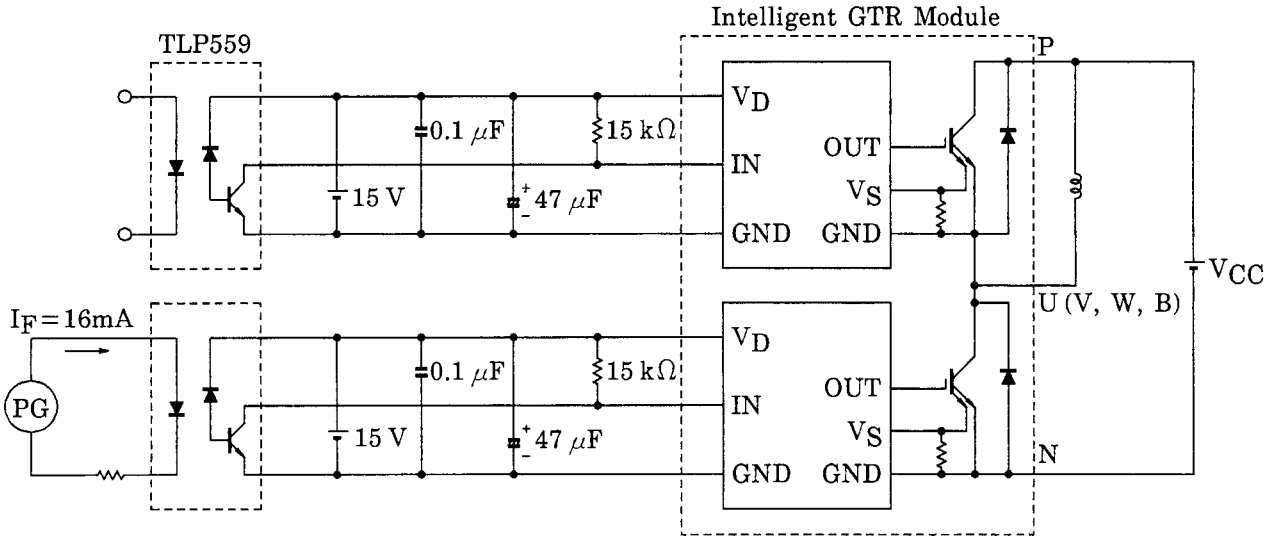
c. Control Stage (T_j = 25°C)

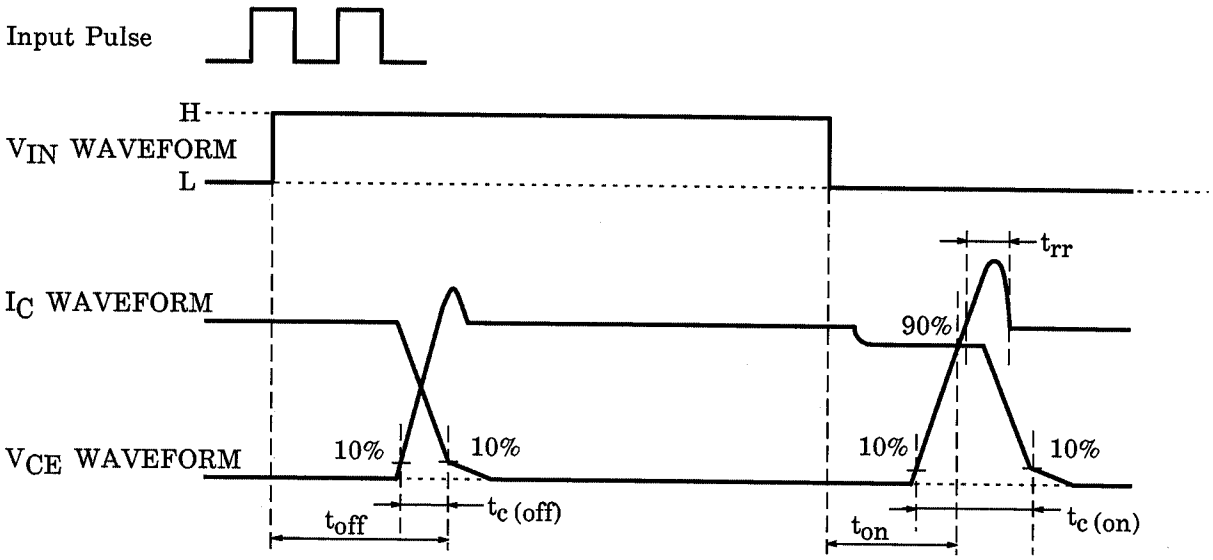
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Control circuit current	High side	$I_{D\ (H)}$	V_D = 15 V	—	20	30	mA
	Low side	$I_{D\ (L)}$		—	80	120	
Input-on signal voltage		$V_{IN\ (on)}$	V_D = 15 V, I_C = 150 mA	0.9	1.1	1.3	V
Fault output current	Protection	$I_{FO\ (on)}$	V_D = 15 V	8	10	12	mA
	Normal	$I_{FO\ (off)}$		—	—	0.1	
Over current protection trip level	Inverter	OC	V_D = 15 V, T_j ≤ 125°C	230	320	—	A
	Brake			80	110	—	
Short current protection trip level	Inverter	SC	V_D = 15 V, T_j ≤ 125°C	320	400	—	A
	Brake			120	150	—	
Over current cut-off time		$t_{off\ (OC)}$	V_D = 15 V	—	5	—	μs
Over temperature protection	Trip level	OT	Case temperature	111	118	125	°C
	Reset level	OTr		—	98	—	
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 V	1	2	3	ms

d. Thermal Resistance (T_j = 25°C)

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

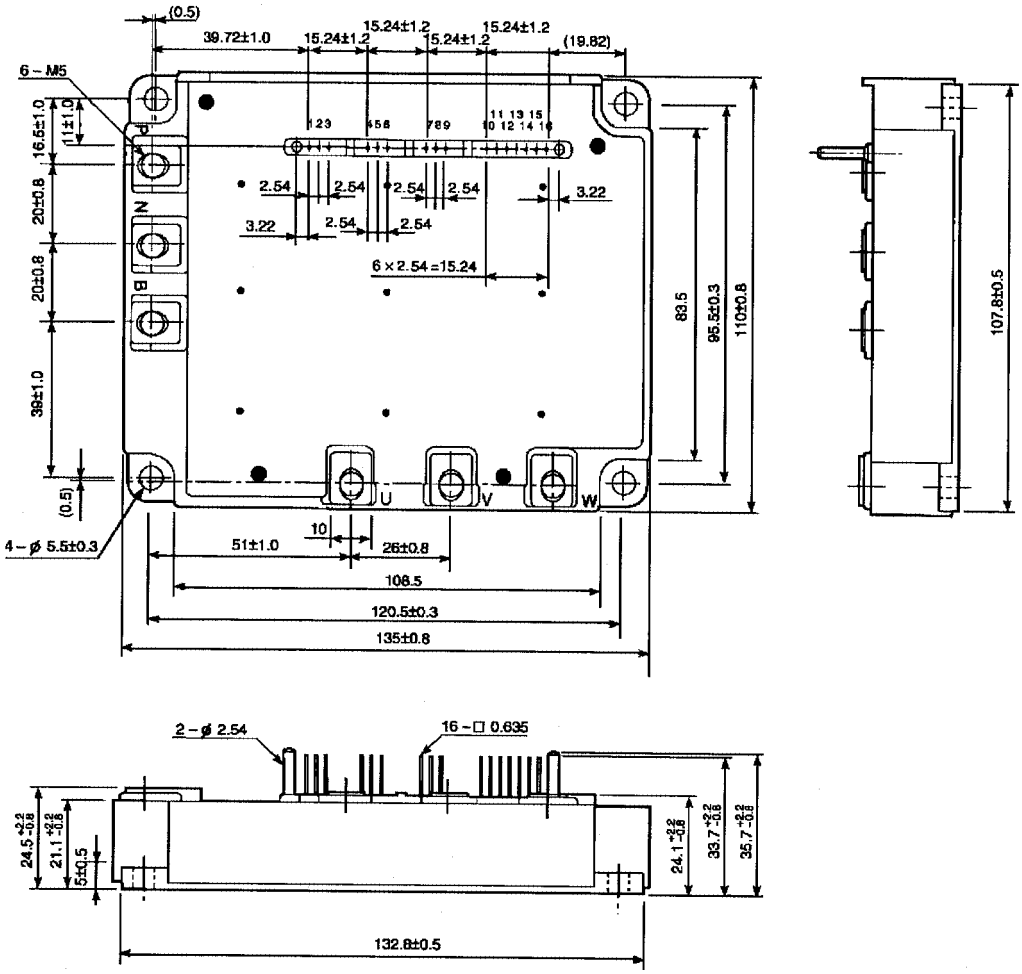
Note 1: Switching time test circuit & timing chart





Package Dimensions: TOSHIBA 2-136A1A

Unit: mm



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