

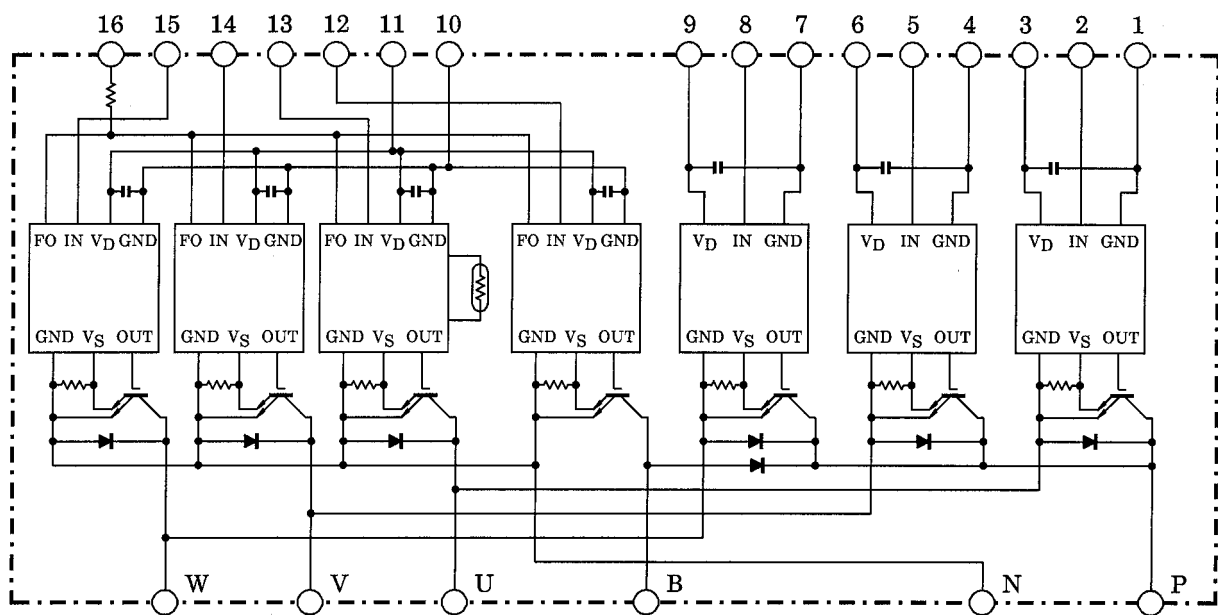
# MIG200J201H

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 :  $V_{CE(sat)} = 2.5V$  (max)  
 $t_{off} = 2.0\mu s$  (max)  
 $t_{rr} = 0.15\mu s$  (max)
- Package dimensions : 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      |               |              |

## 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	$I_C$	200	A
	Forward current	$T_c = 25^\circ\text{C}$ , DC	$I_F$	200	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	$V_{CC}$	450	V
	Collector-emitter voltage	—	$V_{CES}$	600	V
	Collector current	$T_c = 25^\circ\text{C}$ , DC	$I_C$	100	A
	Reverse voltage	—	$V_R$	600	V
	Forward current	$T_c = 25^\circ\text{C}$ , DC	$I_F$	100	A
	Collector power dissipation	$T_c = 25^\circ\text{C}$	$P_C$	400	W
	Junction temperature	—	$T_j$	150	$^\circ\text{C}$
Control	Control supply voltage	VD-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~+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	$I_{CEX}$	$V_{CE} = 600\text{V}$	$T_j = 25^\circ\text{C}$	—	—	1	mA
			$T_j = 125^\circ\text{C}$	—	—	10	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_D = 15\text{V}$ , $I_C = 200\text{A}$ $V_{IN} = 3\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.0	2.5	V
			$T_j = 125^\circ\text{C}$	—	2.0	—	
Forward voltage	$V_F$	$I_F = 200\text{A}$	—	2.1	2.7	V	
Switching time	$t_{on}$	$V_{CC} = 300\text{V}$ , $I_C = 200\text{A}$ $V_D = 15\text{V}$ , $V_{IN} = 3\text{V} \leftrightarrow 0\text{V}$ Inductive load  (Note 1)	0.8	1.5	2.2	$\mu\text{s}$	
	$t_c(\text{on})$		—	0.5	1.0		
	$t_{rr}$		—	0.08	0.15		
	$t_{off}$		—	1.2	2.0		
	$t_c(\text{off})$		—	0.3	0.6		

**b. Brake stage**

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit	
Collector cut-off current	I <sub>CEX</sub>	V <sub>CE</sub> = 600V	T <sub>j</sub> = 25°C	—	—	1	mA
			T <sub>j</sub> = 125°C	—	—	10	
Collector-emitter saturation voltage	V <sub>CE (sat)</sub>	V <sub>D</sub> = 15V, I <sub>C</sub> = 100A V <sub>IN</sub> = 3V → 0V	T <sub>j</sub> = 25°C	—	2.0	2.5	V
			T <sub>j</sub> = 125°C	—	2.0	—	
Reverse current	I <sub>R</sub>	V <sub>R</sub> = 600V	T <sub>j</sub> = 25°C	—	—	1	mA
			T <sub>j</sub> = 125°C	—	—	10	
Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 100A	—	2.1	3.0	V	
Switching time	t <sub>on</sub>	V <sub>CC</sub> = 300V, I <sub>C</sub> = 100A V <sub>D</sub> = 15V, V <sub>IN</sub> = 3V ↔ 0V Inductive load  (Note 1)	0.8	1.5	2.2	μs	
	t <sub>c (on)</sub>		—	0.5	1.0		
	t <sub>rr</sub>		—	0.30	0.50		
	t <sub>off</sub>		—	1.2	2.0		
	t <sub>c (off)</sub>		—	0.3	0.6		

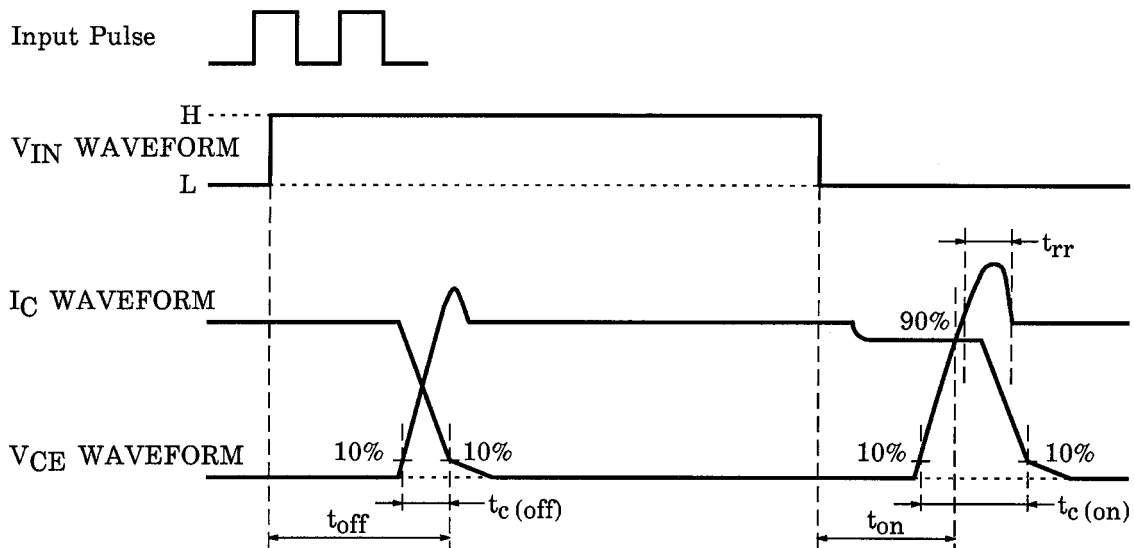
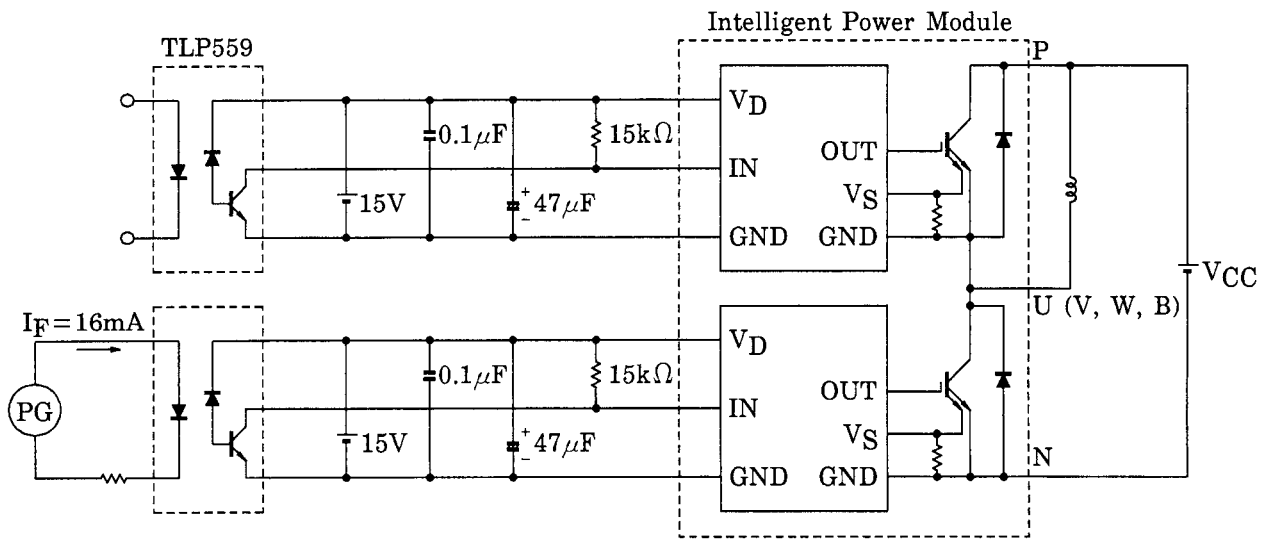
**c. Control stage (T<sub>j</sub> = 25°C)**

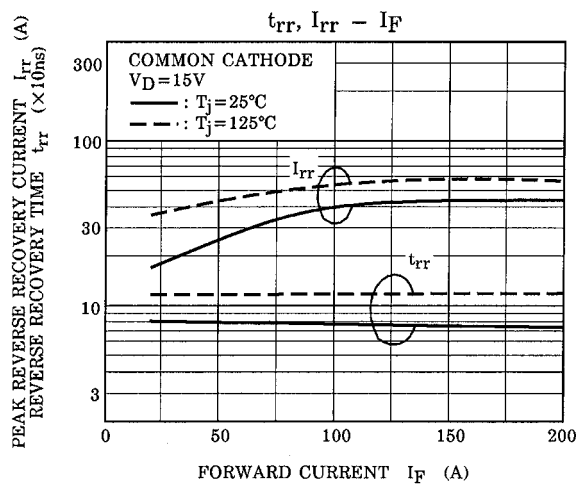
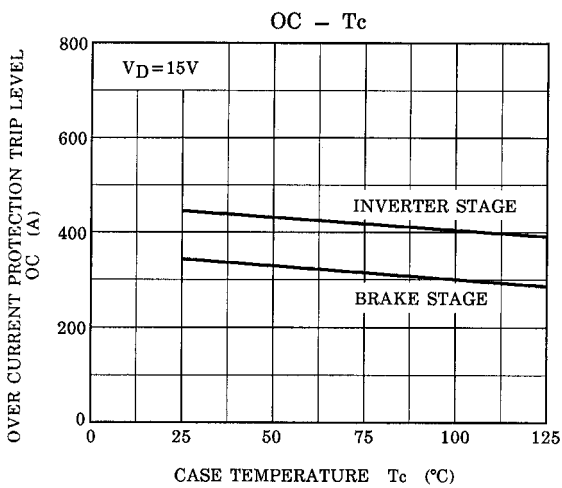
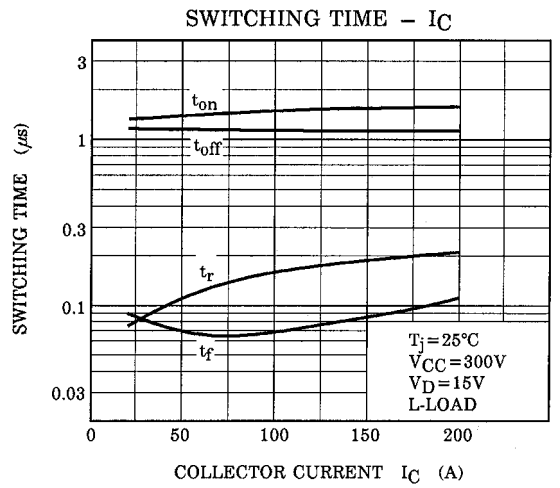
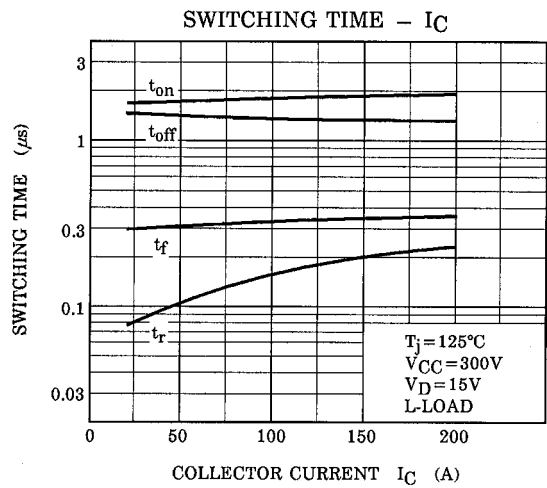
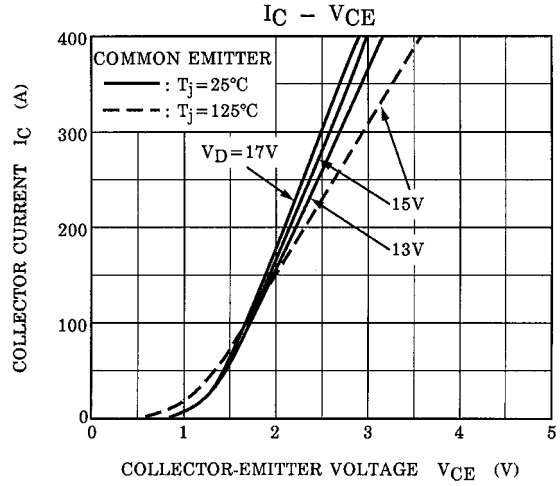
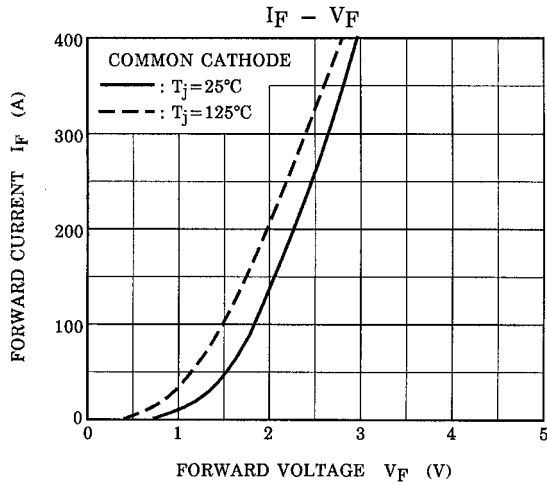
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit	
Control circuit current	High side	I <sub>D (H)</sub>	V <sub>D</sub> = 15V	—	20	30	mA
	Low side			I <sub>D (L)</sub>	—	80	
Input on signal voltage	V <sub>IN (on)</sub>	V <sub>D</sub> = 15V, I <sub>C</sub> = 200mA	0.9	1.1	1.3	V	
Fault output current	Protection	I <sub>FO (on)</sub>	V <sub>D</sub> = 15V	8	10	12	mA
	Normal	I <sub>FO (off)</sub>		—	—	1	
Over current protection trip level	Inverter	OC	V <sub>D</sub> = 15V, T <sub>j</sub> = 125°C	320	400	—	A
	Brake			210	300	—	
Short circuit protection trip level	Inverter	SC	V <sub>D</sub> = 15V, T <sub>j</sub> = 125°C	480	600	—	A
	Brake			315	450	—	
Over current cut-off time	t <sub>off (OC)</sub>	V <sub>D</sub> = 15V	—	10	—	μs	
Over temperature protection	Trip level	OT	Case temperature	111	118	125	°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 <sub>FO</sub>	V <sub>D</sub> = 15V	1	2	3	ms	

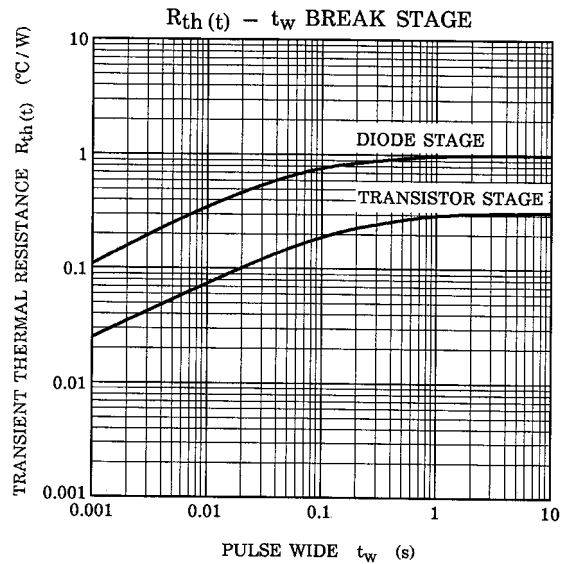
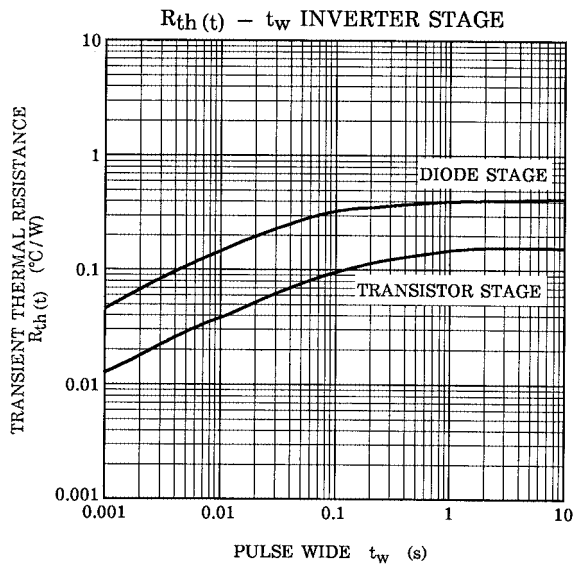
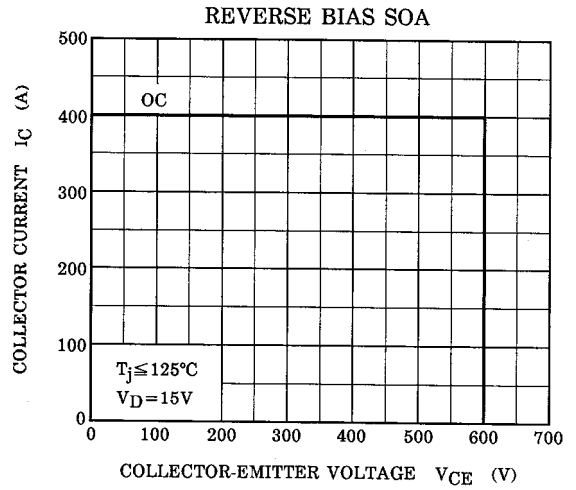
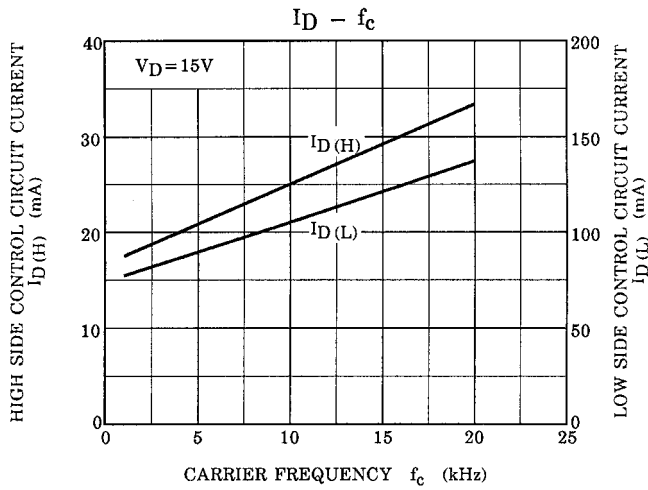
**d. Thermal resistance ( $T_j = 25^\circ\text{C}$ )**

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Junction to case thermal resistance	Rth (j-c)	Inverter IGBT	—	—	0.156	$^\circ\text{C} / \text{W}$
		Inverter FRD	—	—	0.416	
		Brake IGBT	—	—	0.312	
		Brake FRD	—	—	1.00	
Case to fin thermal resistance	Rth (c-f)	Compound is applied	—	0.04	—	$^\circ\text{C} / \text{W}$

Note 1: Switching time test circuit & timing char

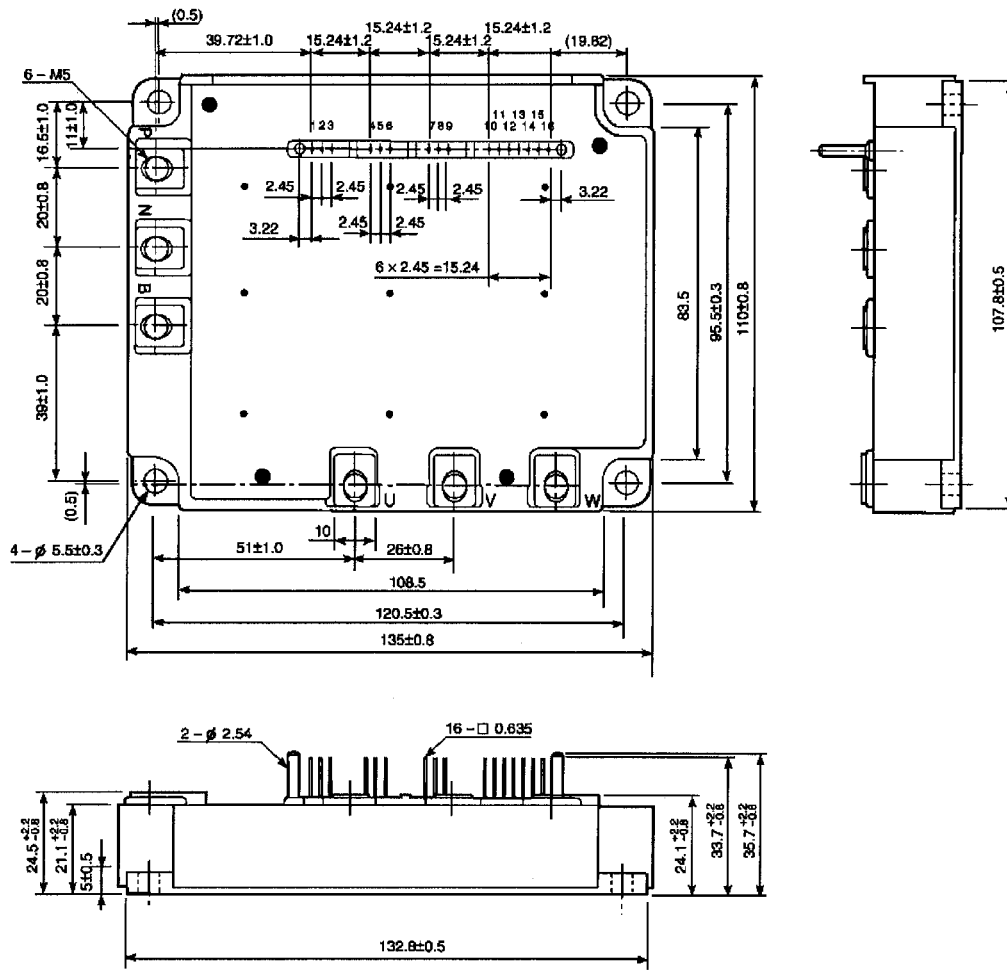






## Package Dimensions: TOSHIBA 2-136A1A

Unit: mm



- |            |            |                       |             |                        |                       |
|------------|------------|-----------------------|-------------|------------------------|-----------------------|
| 1. GND (U) | 2. IN (U)  | 3. V <sub>D</sub> (U) | 4. GND (V)  | 5. IN (V)              | 6. V <sub>D</sub> (V) |
| 7. GND (W) | 8. IN (W)  | 9. V <sub>D</sub> (W) | 10. GND (L) | 11. V <sub>D</sub> (L) | 12. IN (B)            |
| 13. IN (X) | 14. IN (Y) | 15. IN (Z)            | 16. FO      |                        |                       |

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