

TOSHIBA Intelligent Power Module Silicon N Channel IGBT

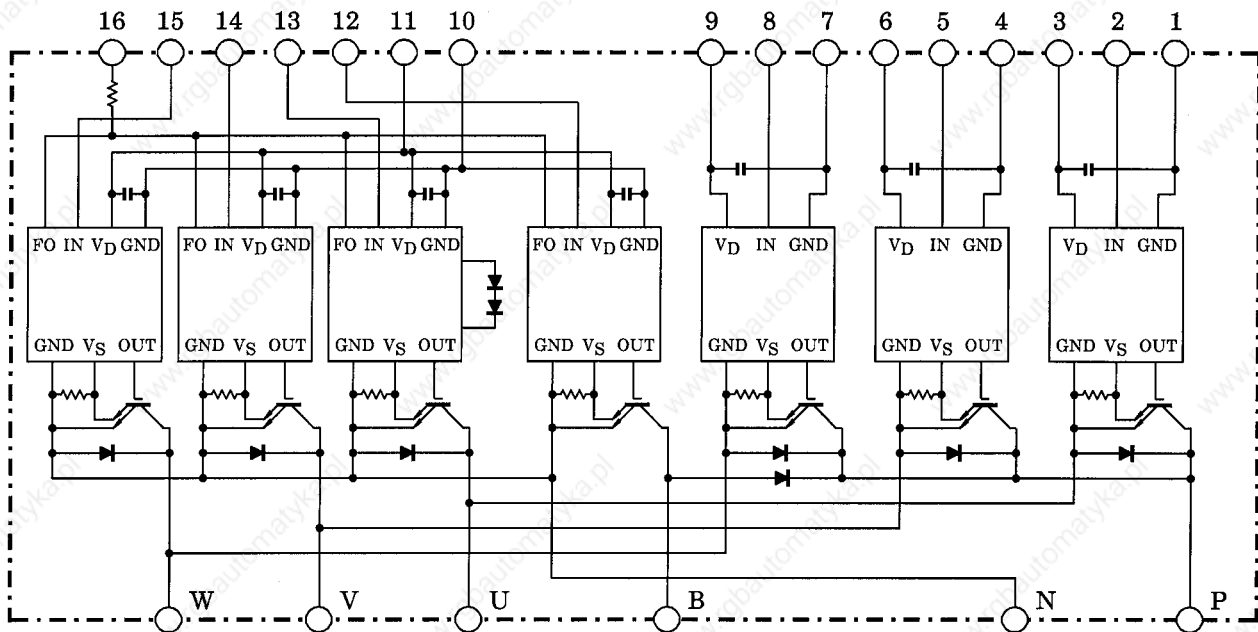
# MIG75Q202H

High Power Switching Applications

Motor Control Applications

- Integrates inverter, brake power circuits & control circuits (IGBT drive units, protection units) in one package.
- The electrodes are isolated from case.
- High speed type IGBT :  $V_{CE(sat)} = 3.5\text{ V (Max)}$   
 $t_{off} = 2.8\ \mu\text{s (Max)}$   
 $t_{rr} = 0.21\ \mu\text{s (Max)}$
- Package dimensions : TOSHIBA 2-110A1A
- Weight : 520g

## Equivalent Circuit



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		

## 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	$I_C$	75	A
	Forward current	$T_c = 25^\circ\text{C}$ , DC	$I_F$	75	A
	Collector power dissipation	$T_c = 25^\circ\text{C}$	$P_C$	400	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	$I_C$	25	A
	Reverse voltage	—	$V_R$	1200	V
	Forward current	$T_c = 25^\circ\text{C}$ , DC	$I_F$	25	A
	Collector power dissipation	$T_c = 25^\circ\text{C}$	$P_C$	140	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	Nm

## Electrical Characteristics

### 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
			$T_j = 125^\circ\text{C}$	—	—	10	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_D = 15\text{V}$ , $I_C = 75\text{A}$ $V_{IN} = 15\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.6	3.5	V
			$T_j = 125^\circ\text{C}$	—	2.5	—	
Forward voltage	$V_F$	$I_F = 75\text{A}$	—	2.2	3.0	V	
Switching time	$t_{on}$	$V_{CC} = 600\text{V}$ , $I_C = 75\text{A}$ $V_D = 15\text{V}$ , $V_{IN} = 15\text{V} \leftrightarrow 0\text{V}$ Inductive load	(Note 1)	—	1.0	1.7	$\mu\text{s}$
	$t_{c(on)}$			—	0.4	0.8	
	$t_{rr}$			—	0.16	0.21	
	$t_{off}$			—	1.9	2.6	
	$t_{c(off)}$			—	0.35	0.6	

## b. Brake Stage

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit	
Collector cut-off current	$I_{CEX}$	$V_{CE} = 1200V$	$T_j = 25^\circ C$	—	—	1	mA
			$T_j = 125^\circ C$	—	—	10	
Collector-emitter saturation voltage	$V_{CE} (sat)$	$V_D = 15V,$ $I_C = 25A$ $V_{IN} = 15V \rightarrow 0V$	$T_j = 25^\circ C$	—	2.6	3.5	V
			$T_j = 125^\circ C$	—	2.5	—	
Reverse current	$I_R$	$V_R = 1200V$		—	—	1	mA
				—	—	10	
Forward voltage	$V_F$	$I_F = 25A$	—	1.4	2.2	V	
Switching time	$t_{on}$	$V_{CC} = 600V, I_C = 25A$ $V_D = 15V, V_{IN} = 15V \leftrightarrow 0V$ Inductive load  (Note 1)		—	1.3	1.9	$\mu s$
	$t_c (on)$			—	0.85	1.6	
	$t_{rr}$			—	0.42	0.50	
	$t_{off}$			—	1.9	2.6	
	$t_c (off)$			—	0.3	0.6	

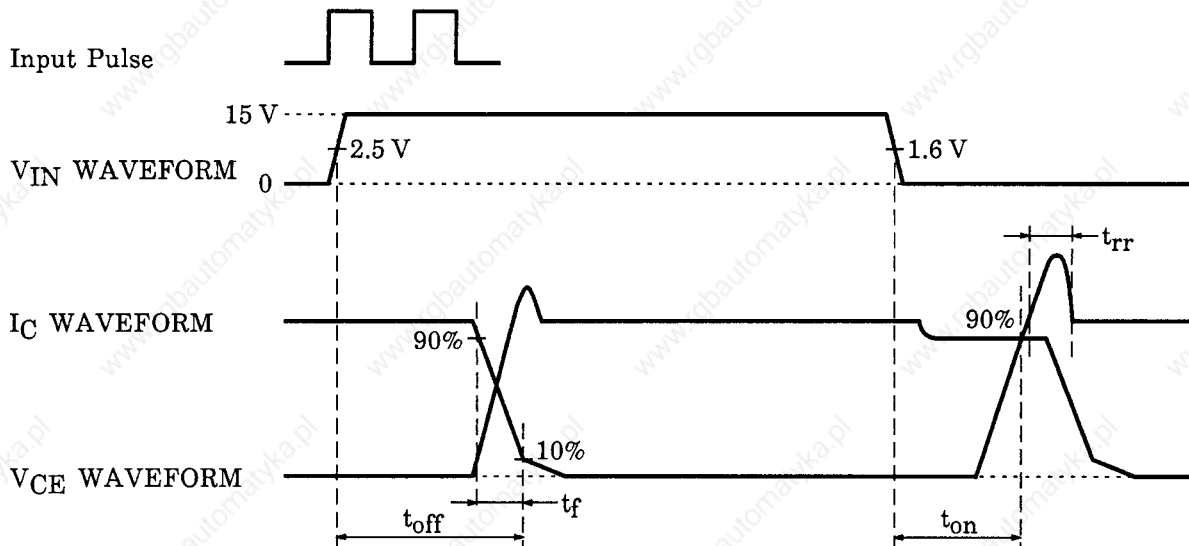
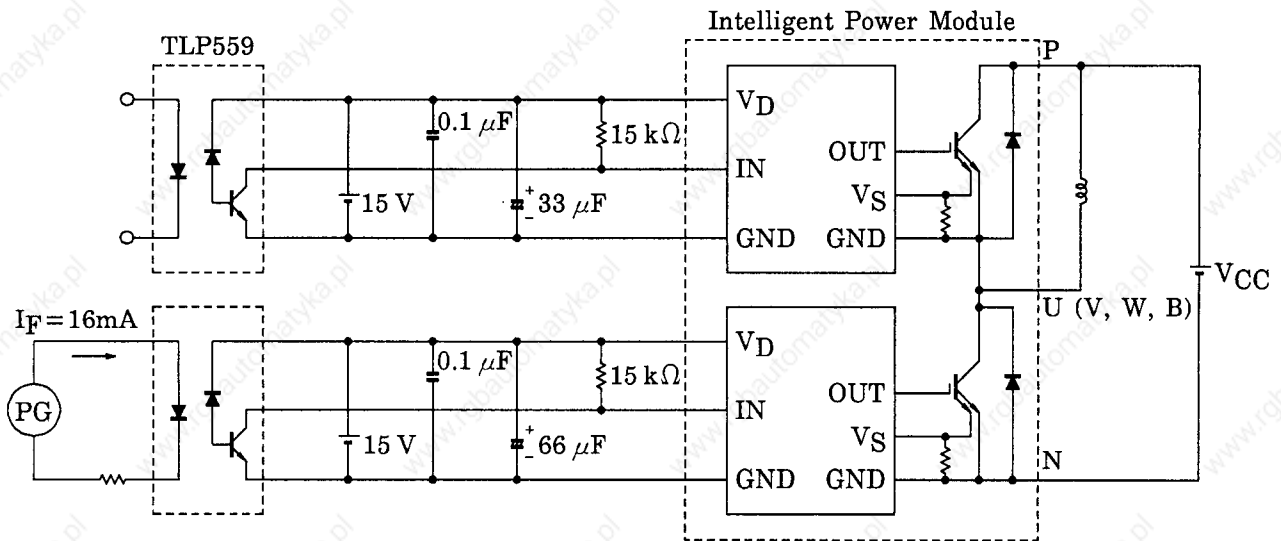
## c. Control Stage ( $T_j = 25^\circ C$ )

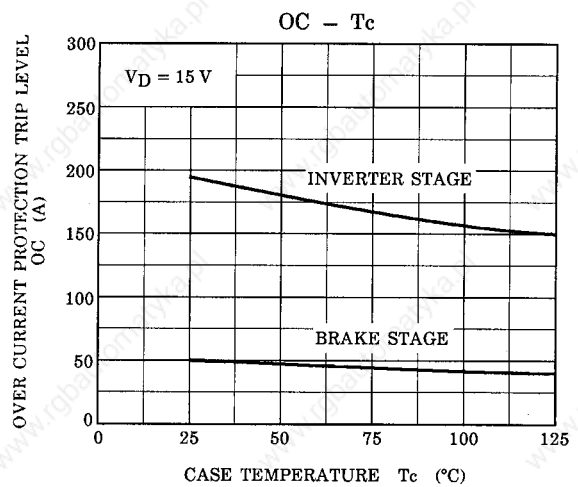
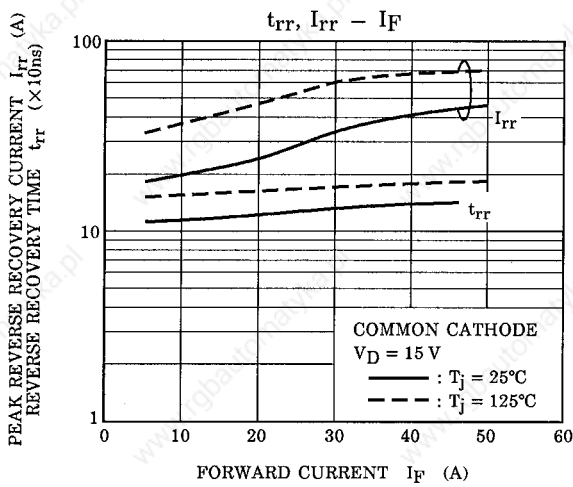
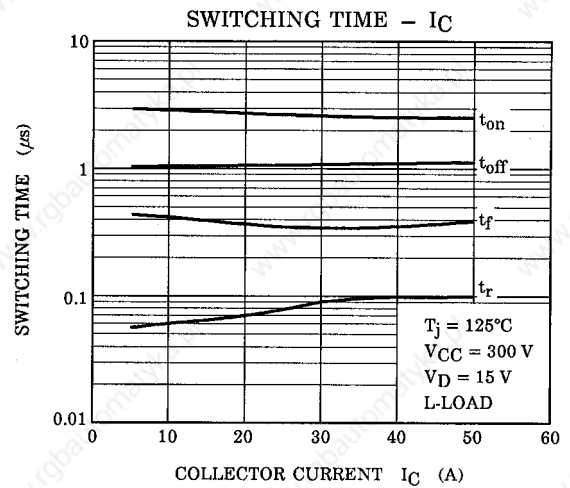
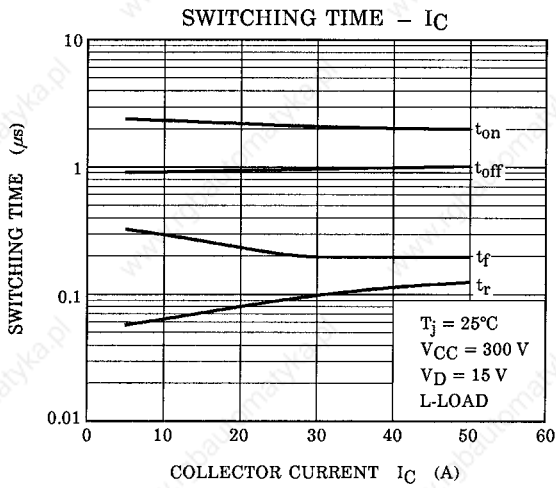
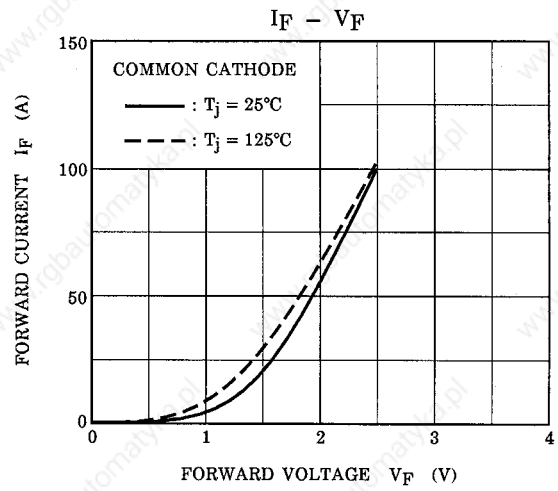
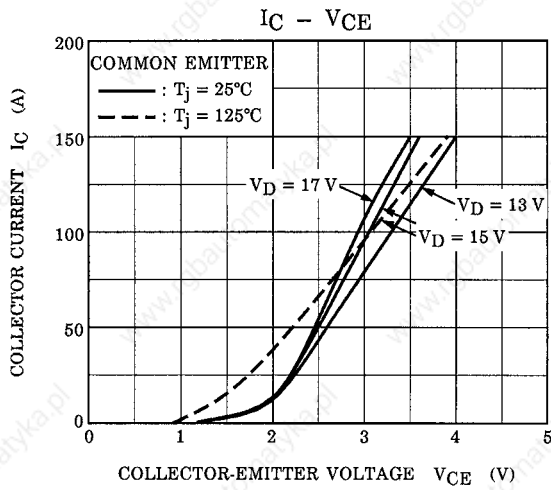
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit	
Control circuit current	High side	$I_D (H)$	$V_D = 15V$	—	8	12	mA
	Low side			$I_D (L)$	—	32	
Input-on signal voltage	$V_{IN} (on)$	$V_D = 15V, I_C = 75mA$	1.4	1.6	1.8	V	
Input-off signal voltage	$V_{IN} (off)$	—	2.2	2.5	2.8	V	
Fault output current	Protection	$I_{FO} (on)$	$V_D = 15V$	5.4	6.0	6.6	mA
	Normal			$I_{FO} (off)$	—	—	
Over current protection trip level	Inverter	OC	$V_D = 15V, T_j = 125^\circ C$	105	150	—	A
	Brake			40	50	—	
Short circuit protection trip level	Inverter	SC	$V_D = 15V, T_j = 125^\circ C$	150	250	—	A
	Brake			60	75	—	
Over current cut-off time	$t_{off} (OC)$	$V_D = 15V$	—	5	—	$\mu s$	
Over temperature protection	Trip level	OT	Case temperature	110	118	125	$^\circ C$
	Reset level			OTr	—	98	
Control supply under voltage protection	Trip level	UV	—	11.0	12.0	12.5	V
	Reset level			UVr	12.0	12.5	
Fault output pulse width	$t_{FO}$	$V_D = 15V$	1	2	3	ms	

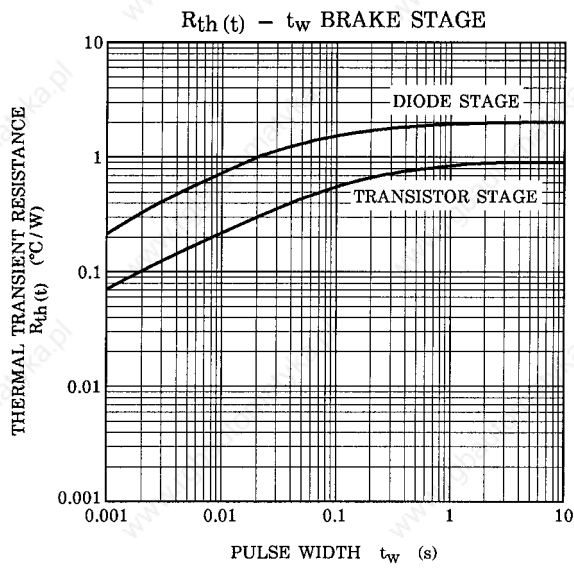
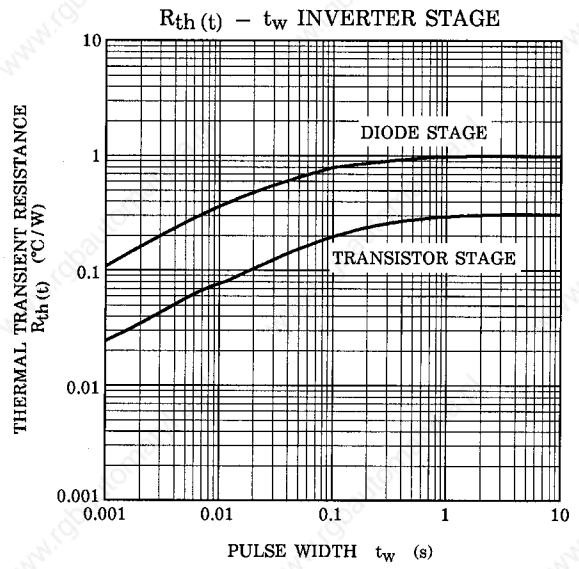
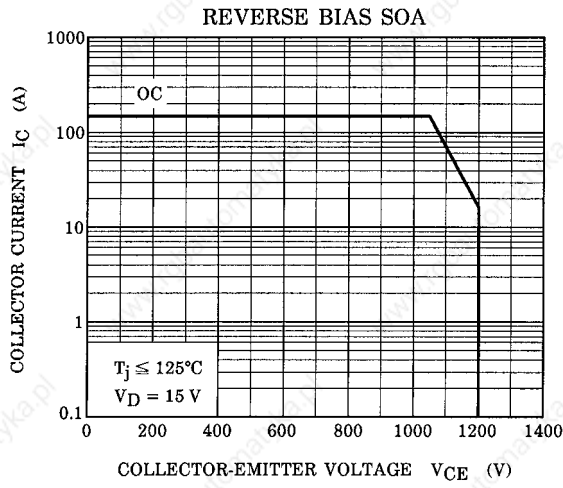
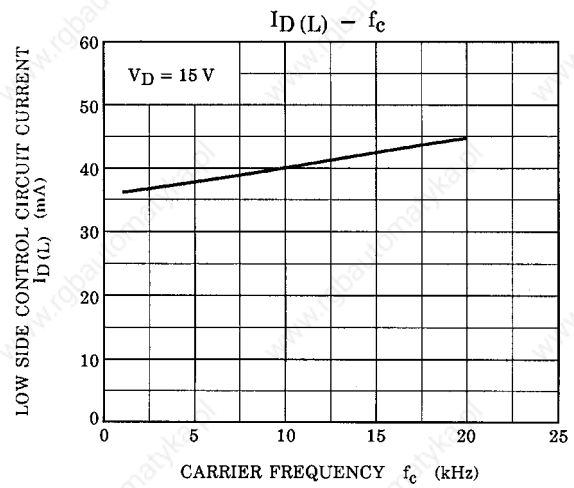
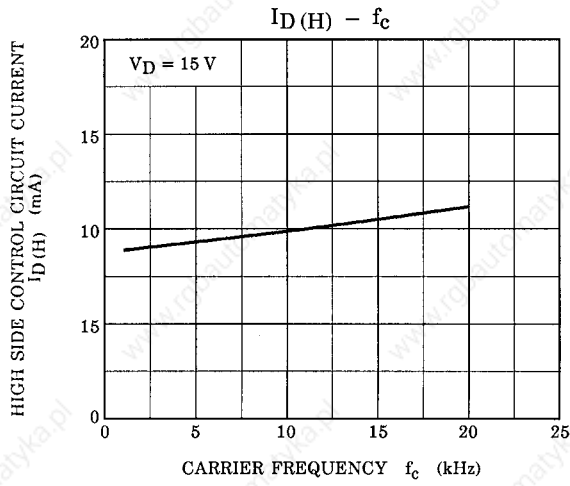
### d. Thermal Resistance ( $T_j = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Junction to case thermal resistance	$R_{th(j-c)}$	Inverter IGBT stage	—	—	0.312	$^\circ\text{C} / \text{W}$
		Inverter FRD stage	—	—	1.00	
		Brake IGBT stage	—	—	0.892	
		Brake FRD stage	—	—	2.00	
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

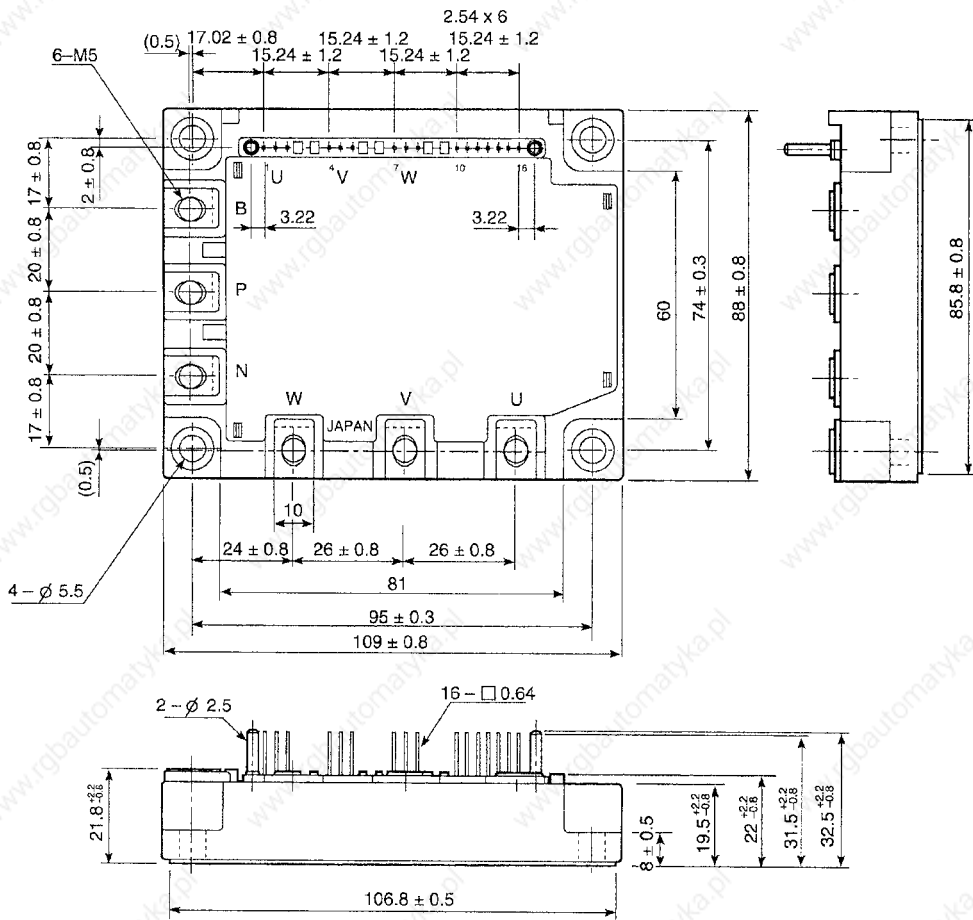






## Package Dimensions: TOSHIBA 2-110A1A

Unit: mm



	GND	IN	VD	GND	IN	VD	GND	VD	IN	IN	IN	FO				
	(U)		(V)		(W)		(B)	(X)	(Y)	(Z)						
Signal Terminal	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

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