

TOSHIBA Intelligent Power Module Silicon N Channel IGBT

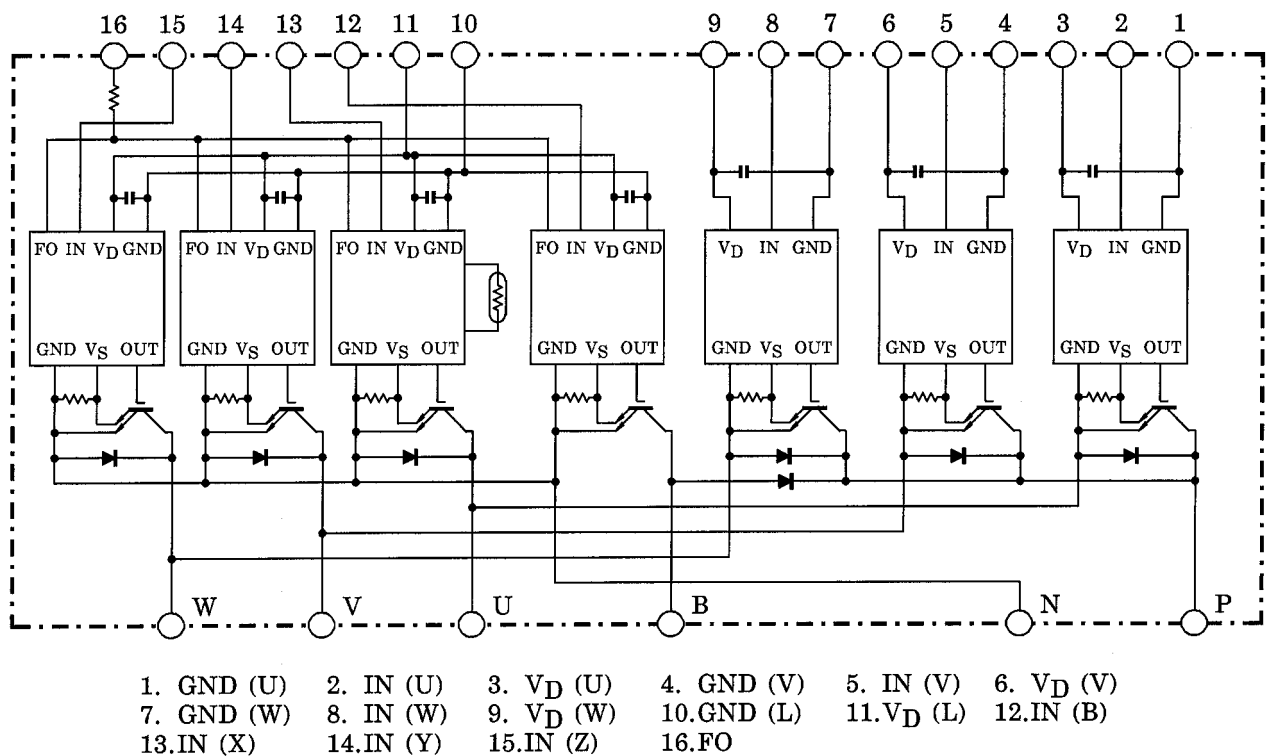
MIG75Q201H

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 : $V_{CE(sat)} = 3.5 \text{ V (Max)}$
 $t_{off} = 2.5 \mu\text{s (Max)}$
 $t_{rr} = 0.21 \mu\text{s (Max)}$
- Package dimensions : TOSHIBA 2-136A1A
- Weight :

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	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	600	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	400	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	—	T_C	$-20 \sim +100$	$^\circ\text{C}$
	Storage temperature range	—	T_{stg}	$-40 \sim +125$	$^\circ\text{C}$
	Isolation voltage	AC 1 minute	V_{ISO}	2500	V
	Screw torque	M5	—	3	Nm

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	$V_{CE(sat)}$	$V_D = 15\text{V}$, $I_C = 75\text{A}$ $V_{IN} = 3\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.7	3.5	V
			$T_j = 125^\circ\text{C}$	—	2.6	—	
Forward voltage	V_F	$I_F = 75\text{A}$		—	2.0	2.5	V
Switching time	t_{on}	$V_{CC} = 600\text{V}$, $I_C = 75\text{A}$ $V_D = 15\text{V}$, $V_{IN} = 3\text{V} \leftrightarrow 0\text{V}$ Inductive load (Note 1)		0.8	1.5	2.2	μs
	$t_{c(on)}$			—	0.3	0.6	
	t_{rr}			—	0.14	0.21	
	t_{off}			—	1.5	2.5	
	$t_{c(off)}$			—	0.25	0.5	

b. Brake Stage

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 = 15 V, I _C = 50 A V _{IN} = 3 V → 0 V	T _j = 25°C	—	2.7	3.5	V
			T _j = 125°C	—	2.6	—	
Reverse current	I _R	VR = 1200 V		—	—	1	mA
				—	—	20	
Forward voltage	V _F	I _F = 50A		—	2.0	2.7	V
Switching time	t _{on}	V _{CC} = 600 V, I _C = 50 A V _D = 15 V, V _{IN} = 3 V ↔ 0 V Inductive load (Note 1)		0.8	1.5	2.2	μs
	t _{c (on)}			—	0.5	1.0	
	t _{rr}			—	0.30	0.45	
	t _{off}			—	1.5	2.5	
	t _{c (off)}			—	0.3	0.6	

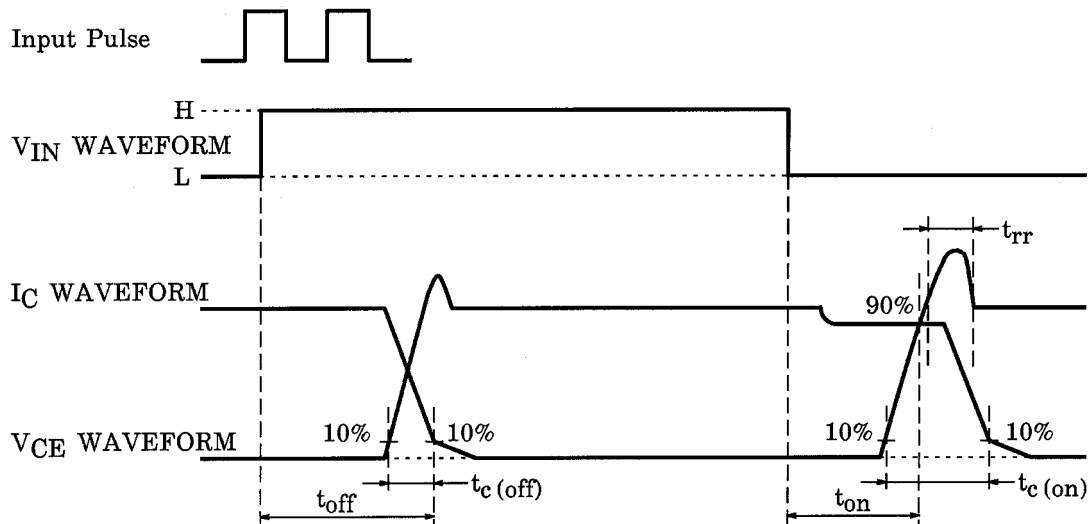
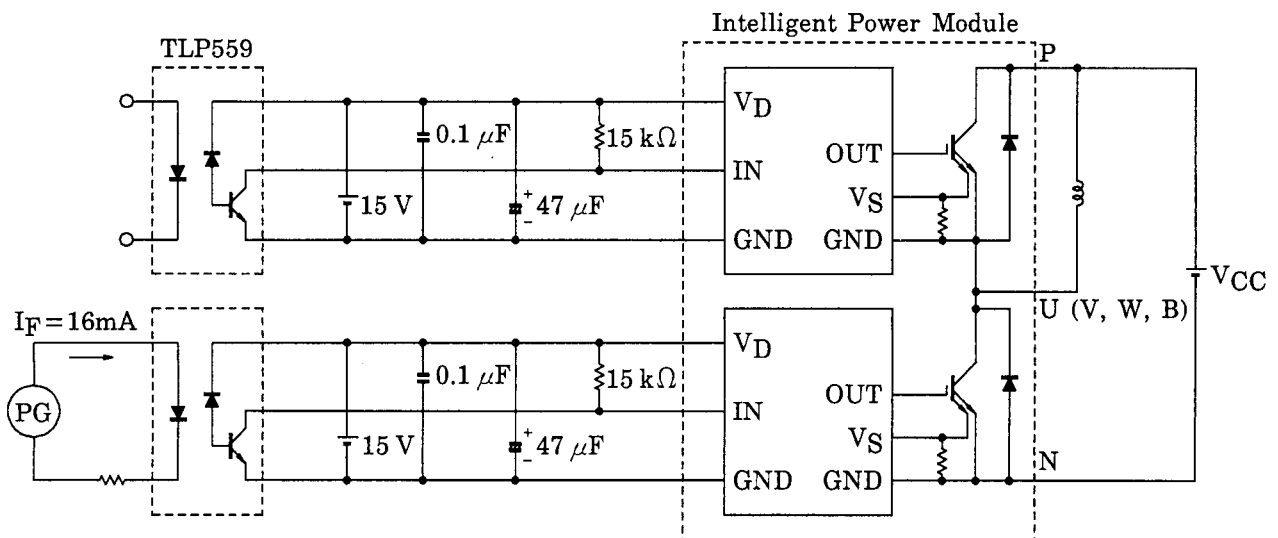
c. Control Stage ($T_j = 25^{\circ}C$)

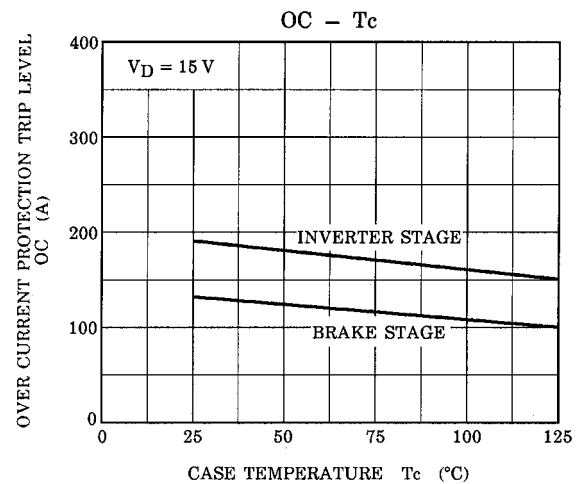
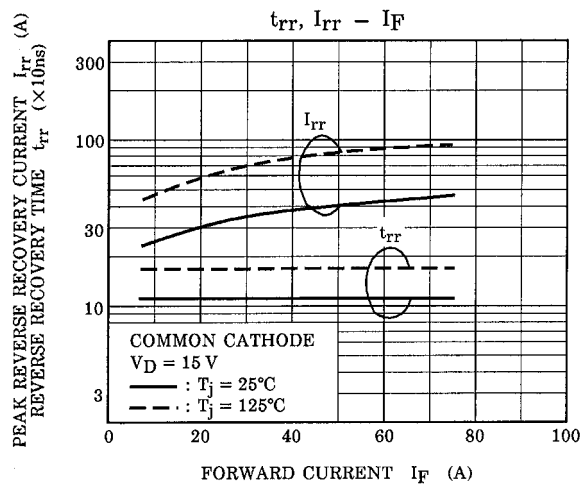
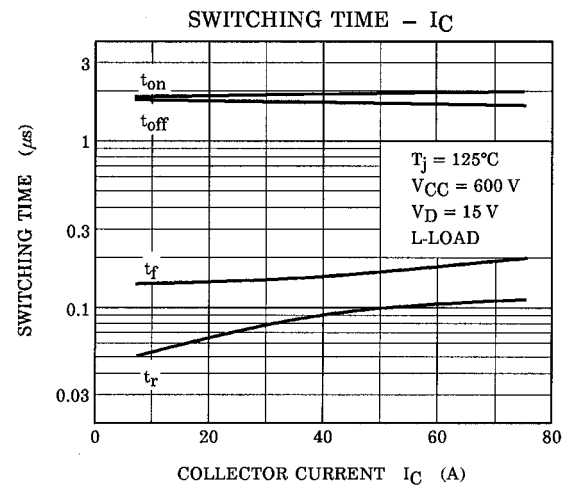
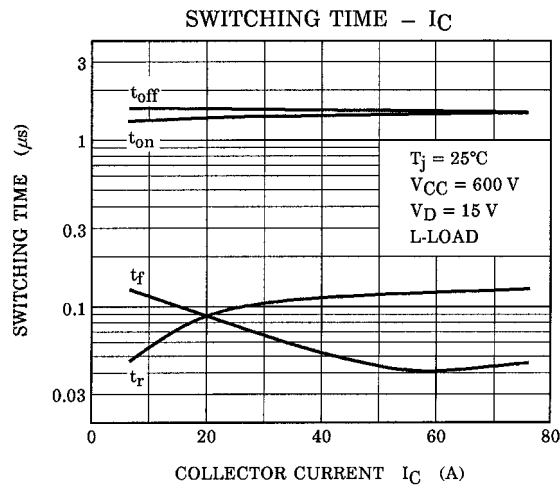
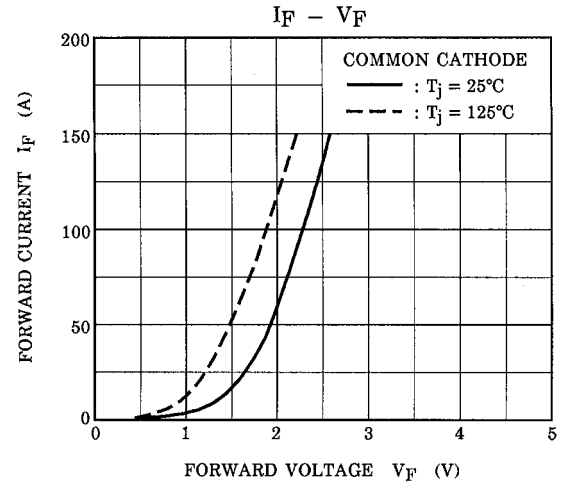
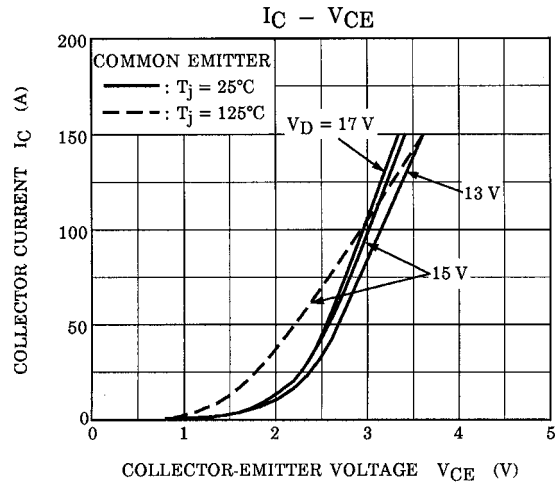
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Control circuit current	High side	$V_D = 15V$	—	20	30	mA
	Low side		—	80	120	
Input-on signal voltage	$V_{IN(on)}$	$V_D = 15V, I_C = 75mA$	0.9	1.1	1.3	V
Fault output current	Protection	—	8	10	12	mA
	Normal		—	—	1	
Over current protection trip level	Inverter	$V_D = 15V, T_j = 125^{\circ}C$	105	150	—	A
	Brake		70	100	—	
Short circuit protection trip level	Inverter	$V_D = 15V, T_j = 125^{\circ}C$	157	225	—	A
	Brake		105	150	—	
Over current cut-off time	$t_{off(OC)}$	$V_D = 15V$	—	10	—	μs
Over temperature protection	Trip level	Case temperature	111	118	125	$^{\circ}C$
	Reset level		93	100	107	
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}	$V_D = 15V$	1	2	3	ms

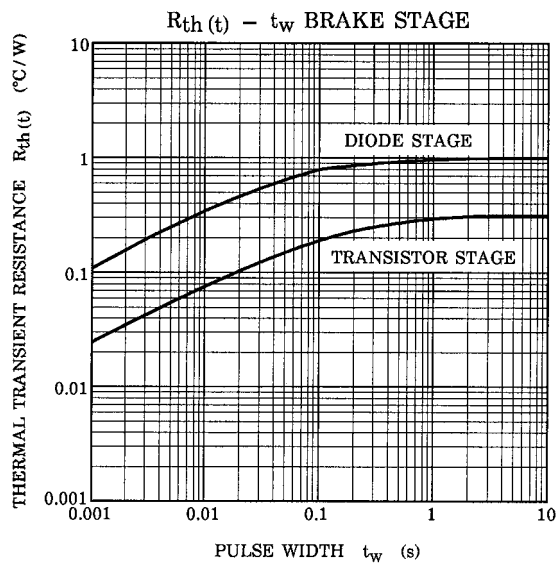
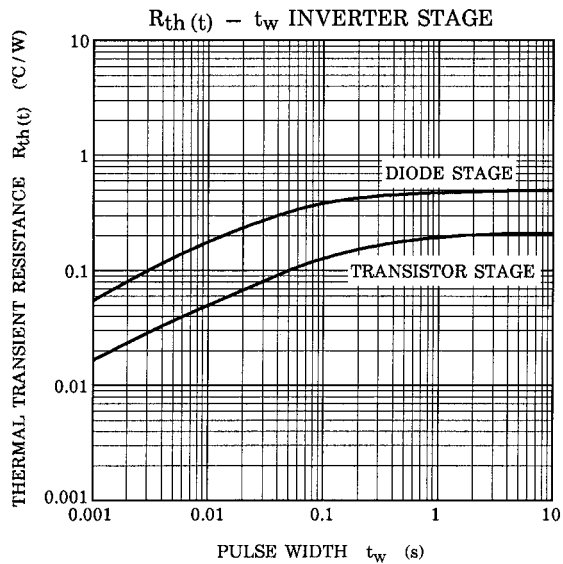
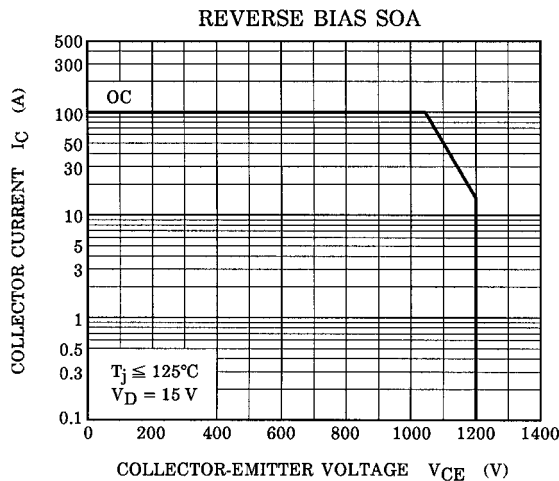
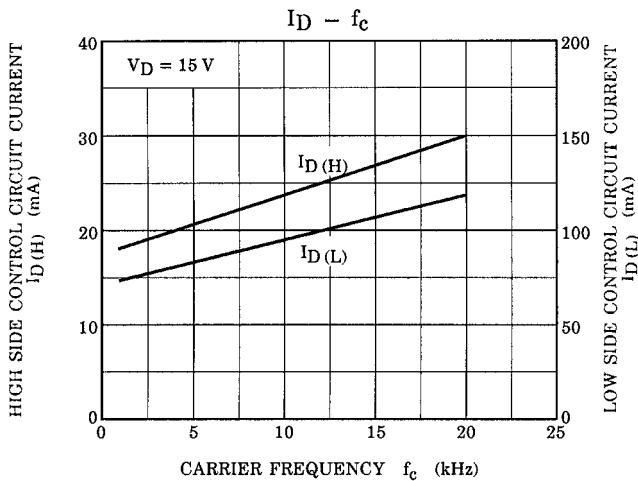
d. Thermal Resistance ($T_j = 25^\circ\text{C}$)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Junction to case thermal resistance	$R_{th(j-c)}$	Inverter IGBT	—	—	0.208	$^\circ\text{C} / \text{W}$
		Inverter FRD	—	—	0.50	
		Brake IGBT	—	—	0.312	
		Brake FRD	—	—	1.00	
Case to fin thermal resistance	$R_{th(c-f)}$	Compound is applied	—	0.04	—	$^\circ\text{C} / \text{W}$

Note 1: Switching time test circuit & timing chart

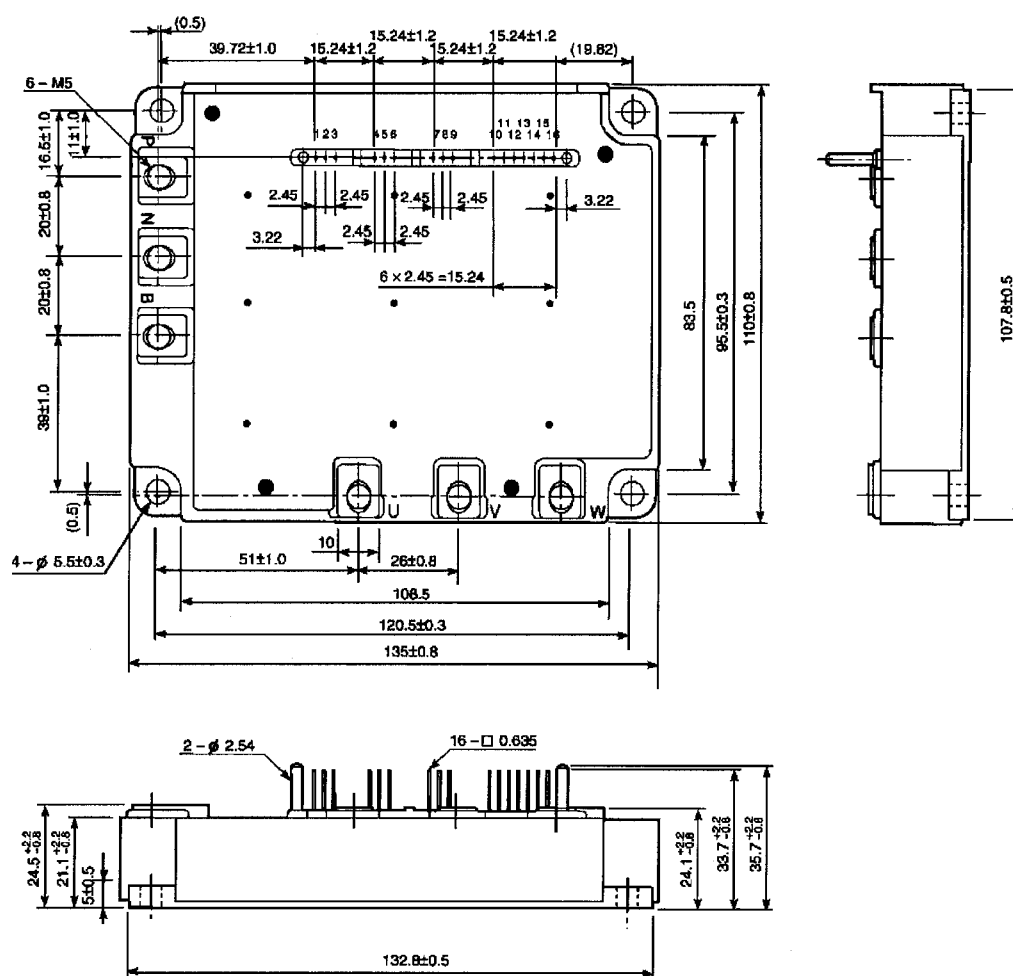






Package Dimensions: TOSHIBA 2-136A1A

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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