TOSHIBA INTELLIGENT GTR MODULE SILICON N CHANNEL IGBT

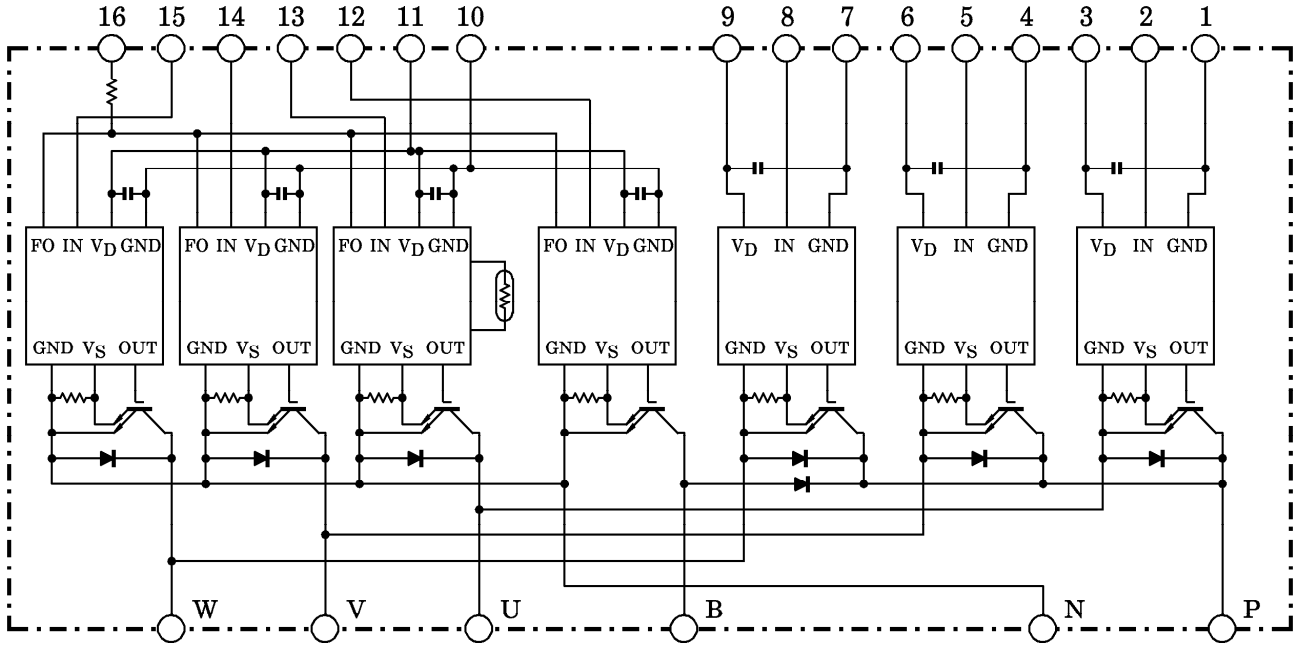
MIG100Q201H

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 : $V_{CE\,(sat)}$=3.5V (Max.)
  t_{off}=2.5μs (Max.)
  t_{rr}=0.21μs (Max.)
- Outline : 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

961001EAA1

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	100	A
	Forward Current	Tc = 25°C, DC	I_F	100	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	400	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}	14	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	Nm

ELECTRICAL CHARACTERISTICS (T_j = 25°C)

a. Inverter stage

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Collector Cut-Off Current	I_{CEX}	V_{CEX} = 1200V	T_j = 25°C	—	—	1	mA
			T_j = 125°C	—	—	20	
Collector-Emitter Saturation Voltage	$V_{CE\ (sat)}$	V_D = 15V, I_C = 100A V_{IN} = 3V→0V	T_j = 25°C	—	2.7	3.5	V
			T_j = 125°C	—	2.6	—	
Forward Voltage	V_F	I_F = 100A		—	2.0	2.7	V
Switching Time	t_{on}	V_{CC} = 600V, I_C = 100A V_D = 15V, V_{IN} = 3V↔0V Inductive load (Note 1)		0.8	1.5	2.2	μs
	$t_{c\ (on)}$			—	0.5	1.0	
	t_{rr}			—	0.14	0.21	
	t_{off}			—	1.5	2.5	
	$t_{c\ (off)}$			—	0.3	0.6	

b. Brake stage

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Collector Cut-Off Current	I_{CEX}	V_{CEX} = 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	—	2.6	—	
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		—	2.0	2.7	V
Switching Time	t_{on}	V_{CC} = 600V, I_C = 50A V_D = 15V, V_{IN} = 3V↔0V 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	

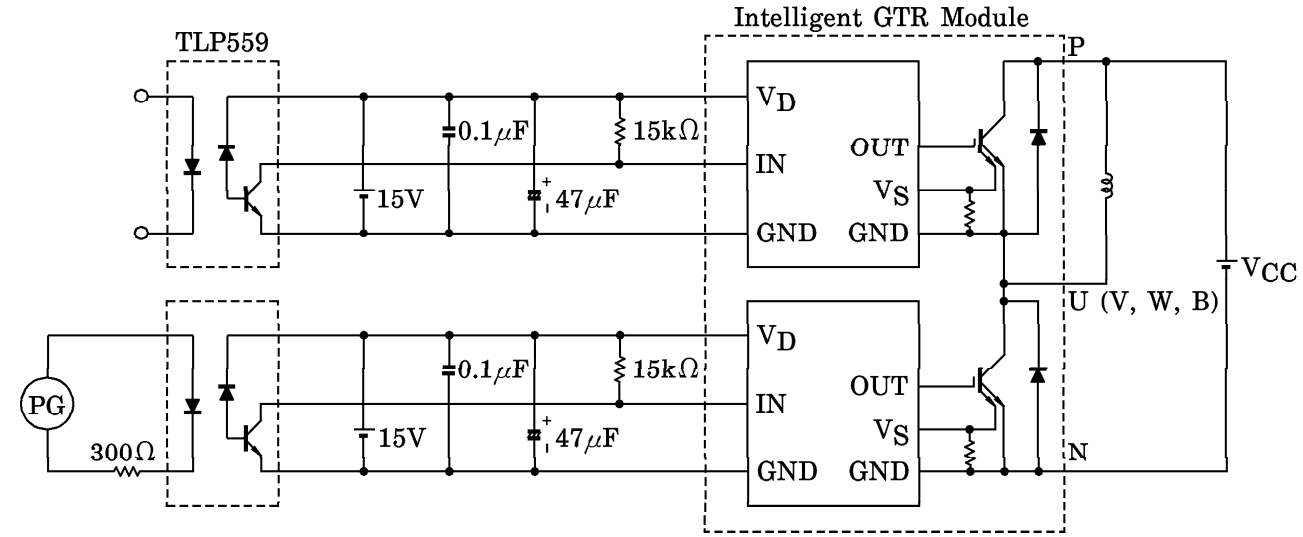
c. Control stage (T_j = 25°C)

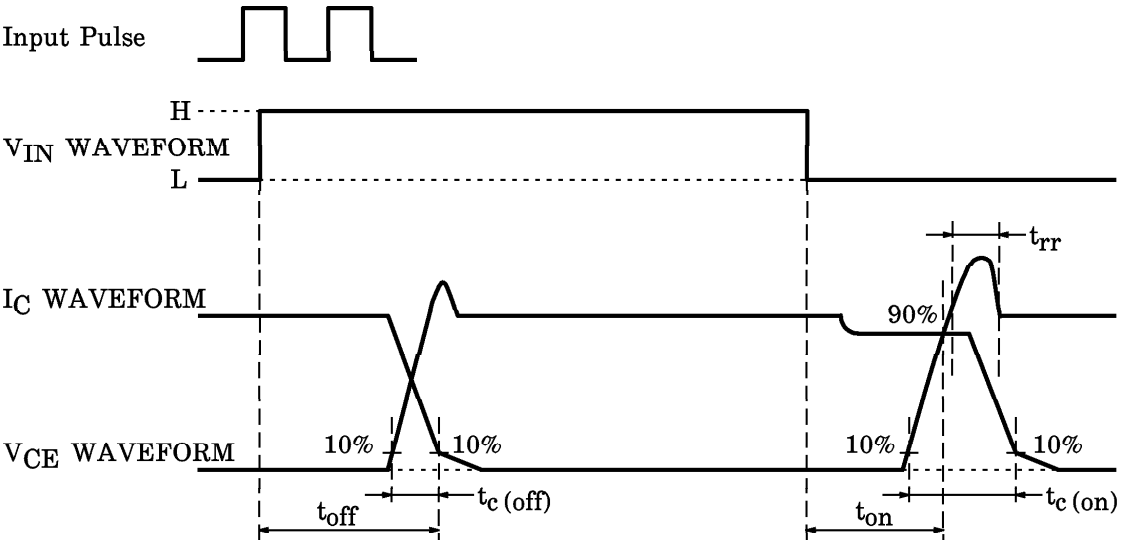
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current	High Side	$I_{D\ (H)}$	V_D = 15V	—	20	30	mA
	Low Side	$I_{D\ (L)}$		—	80	120	
Input On Signal Voltage		$V_{IN\ (on)}$	V_D = 15V, I_C = 100mA	0.9	1.1	1.3	V
Fault Output Current	Protection	$I_{FO\ (on)}$	V_D = 15V	8	10	12	mA
	Normal	$I_{FO\ (off)}$		—	—	1	
Over Current Protection Trip Level	Inverter	OC	V_D = 15V, T_j = 125°C	160	200	—	A
	Brake			70	100	—	
Short Circuit Protection Trip Level	Inverter	SC	V_D = 15V, T_j = 125°C	240	300	—	A
	Brake			105	150	—	
Over Current Cut-Off Time		t_{off} (OC)	V_D = 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_{FO}	V_D = 15V	1	2	3	ms

d. Thermal resistance (T_j = 25°C)

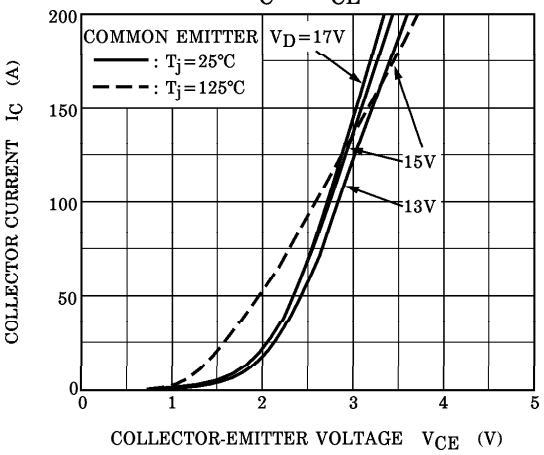
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th\ (j\text{-}c)}$	Inverter IGBT	—	—	0.156	°C / W
		Inverter FRD	—	—	0.50	
		Brake IGBT	—	—	0.312	
		Brake FRD	—	—	1.00	
Case to Fin Thermal Resistance	$R_{th\ (c\text{-}f)}$	Compound is applied	—	0.04	—	°C / W

Attached 1 : Switching time test circuit & timing chart

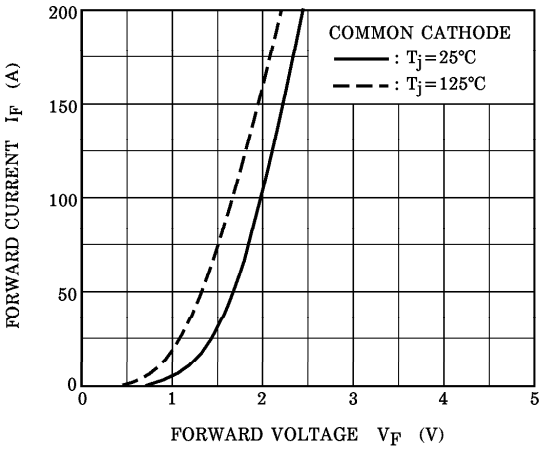




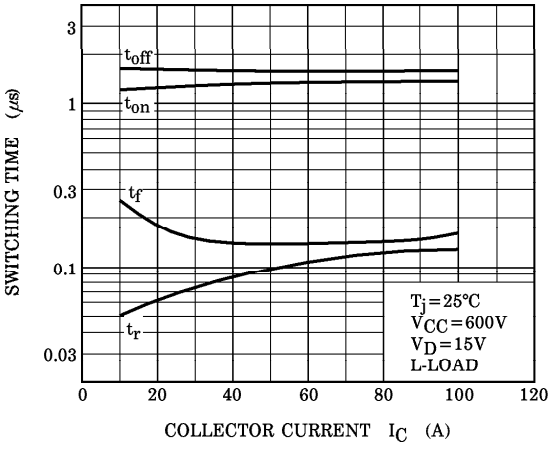
I_C – V_{CE}



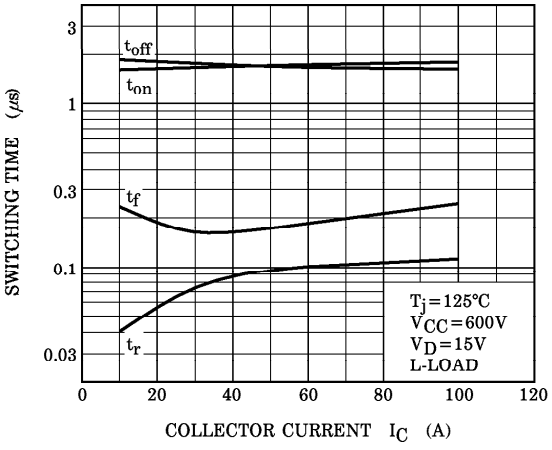
I_F – V_F



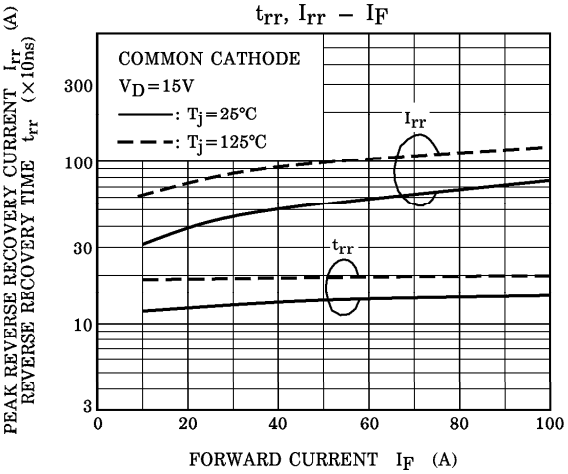
SWITCHING TIME – I_C



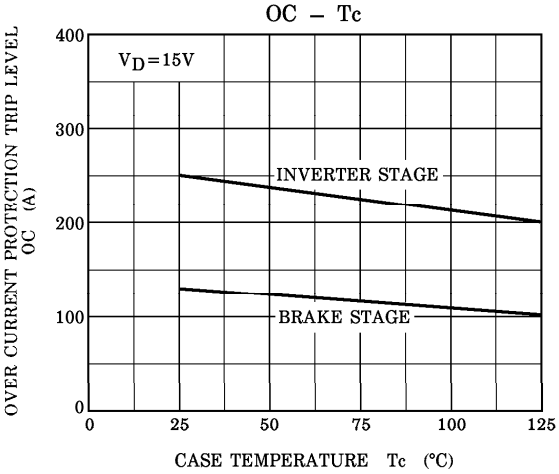
SWITCHING TIME – I_C



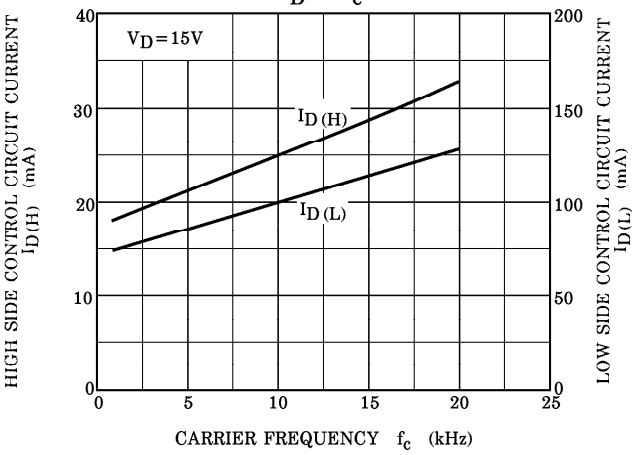
t_{rr}, I_{rr} – I_F



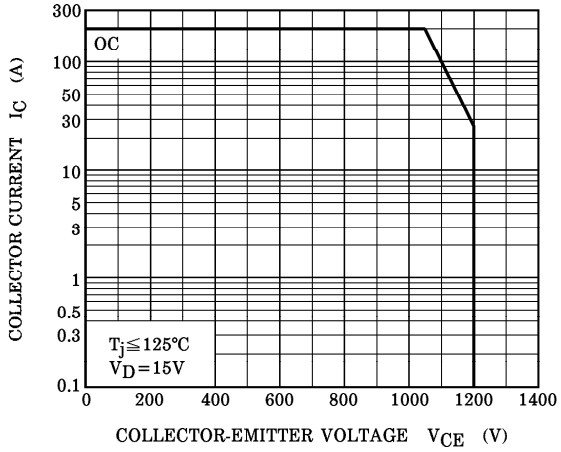
OC – Tc



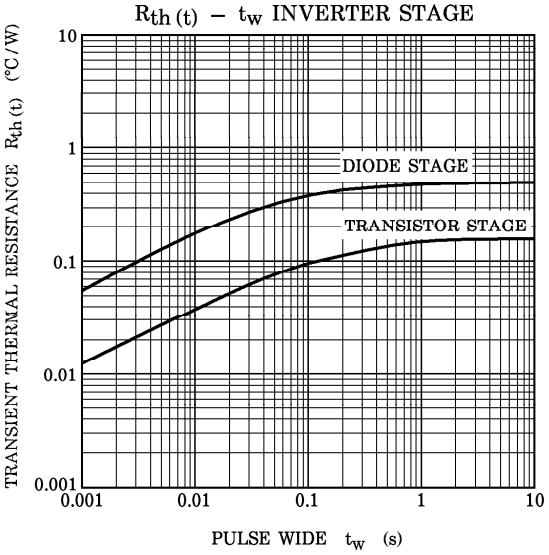
$I_D - f_c$



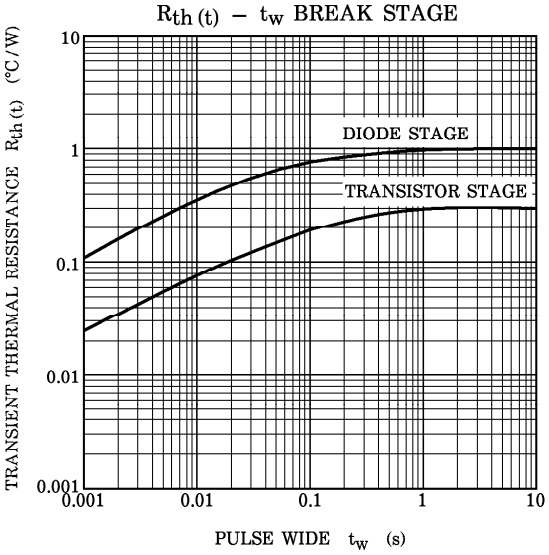
REVERSE BIAS SOA



$R_{th}(t) - t_w$ INVERTER STAGE

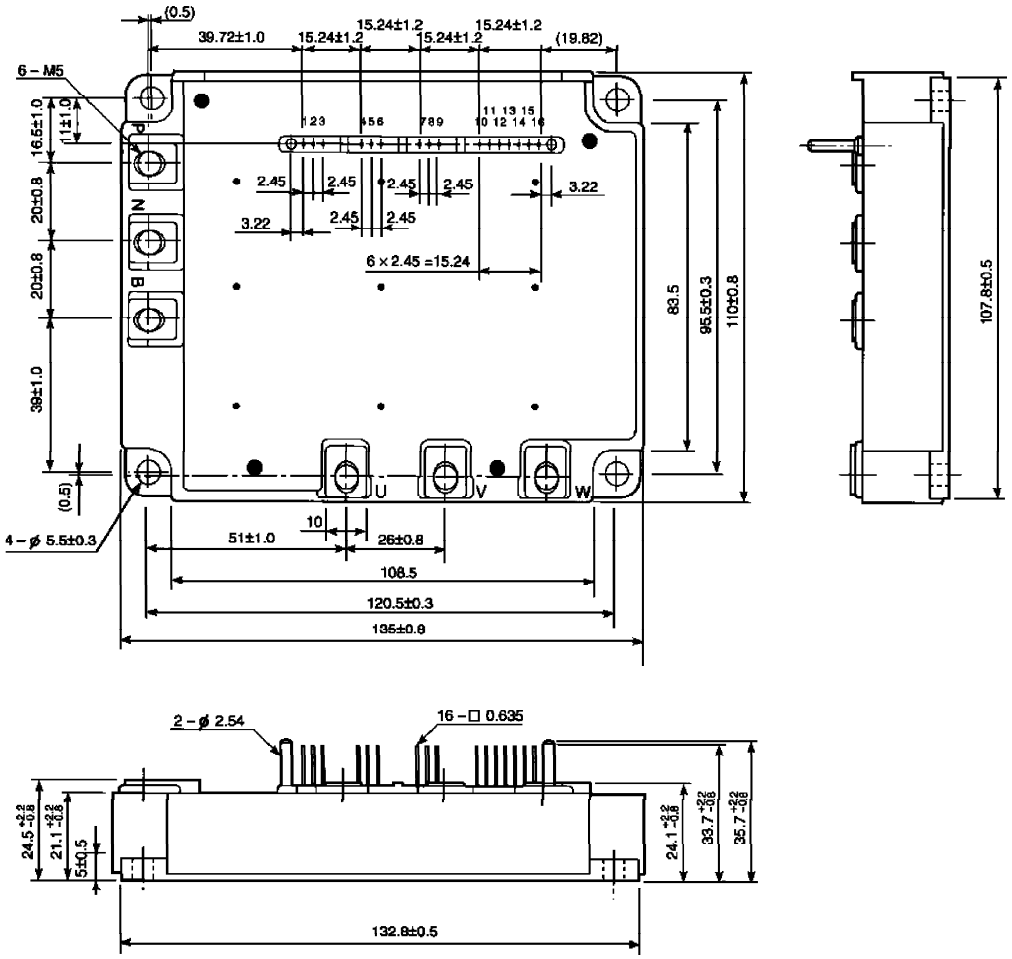


$R_{th}(t) - t_w$ BREAK STAGE



OUTLINE : TOSHIBA

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		