TOSHIBA INTELLIGENT GTR MODULE SILICON N CHANNEL IGBT

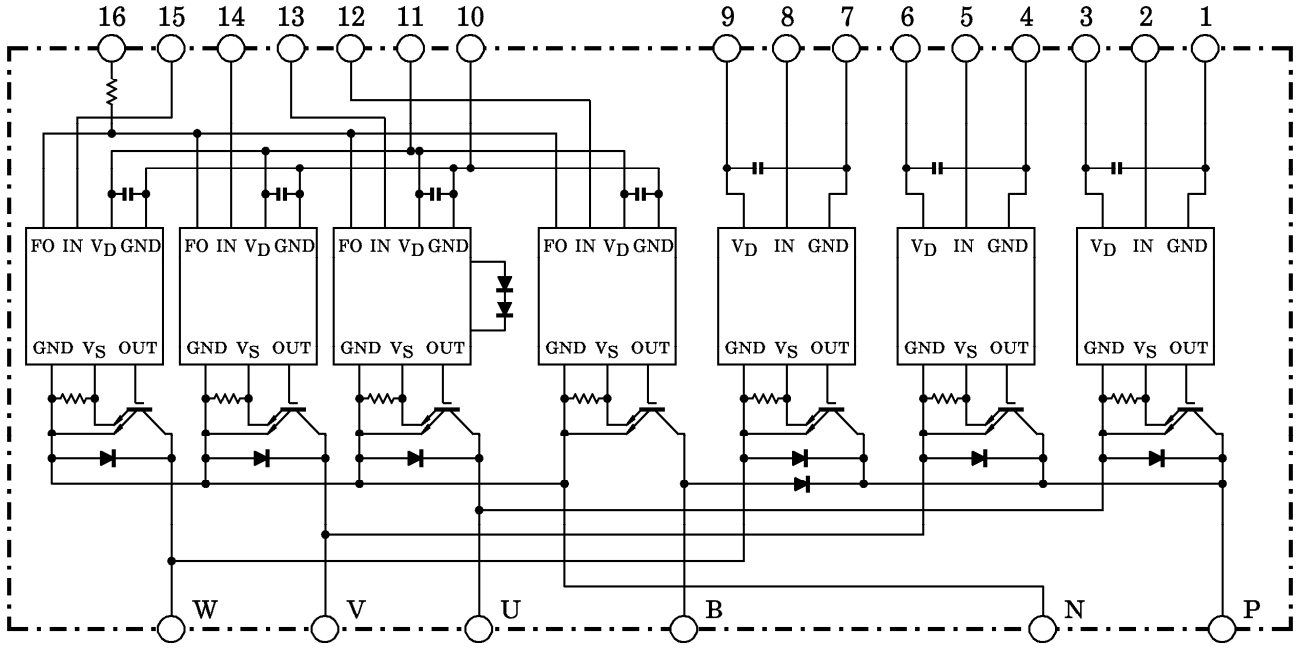
MIG100J201H

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}=3.0μs (Max.)
  t_{rr}=0.30μs (Max.)
- Outline : TOSHIBA 2-110A1A
- Weight : 520g

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		

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MAXIMUM RATINGS (T_j = 25°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	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	300	W
	Junction Temperature	—	T_j	150	°C
Brake	Supply Voltage	P-N power terminal	V_{CC}	450	V
	Collector-Emitter Voltage	—	V_{CES}	600	V
	Collector Current	Tc = 25°C, DC	I_C	30	A
	Reverse Voltage	—	V_R	600	V
	Forward Current	Tc = 25°C, DC	I_F	30	A
	Collector Power Dissipation	Tc = 25°C	P_C	80	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} = 600V	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} = 15V→0V	T_j = 25°C	—	2.0	2.5	V
			T_j = 125°C	—	2.0	—	
Forward Voltage	V_F	I_F = 100A		—	2.1	3.3	V
Switching Time	t_{on}	V_{CC} = 300V, I_C = 100A V_D = 15V, V_{IN} = 15V↔0V Inductive load (Note 1)		—	1.0	2.0	μs
	t_{off}			—	1.7	3.0	
	t_f			—	0.2	0.5	
	t_{rr}			—	0.1	0.3	

b. Brake stage

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Collector Cut-Off Current	I_{CEX}	V_{CEX} = 600V	T_j = 25°C	—	—	1	mA
			T_j = 125°C	—	—	20	
Collector-Emitter Saturation Voltage	$V_{CE\ (sat)}$	V_D = 15V, I_C = 30A V_{IN} = 15V→0V	T_j = 25°C	—	1.7	2.7	V
			T_j = 125°C	—	1.6	—	
Reverse Current	I_R	V_R = 600V	T_j = 25°C	—	—	1	mA
			T_j = 125°C	—	—	20	
Forward Voltage	V_F	I_F = 30A		—	2.0	2.5	V
Switching Time	t_{on}	V_{CC} = 300V, I_C = 30A V_D = 15V, V_{IN} = 15V↔0V Inductive load (Note 1)		—	0.9	2.0	μs
	t_{off}			—	1.7	3.0	
	t_f			—	0.25	0.5	
	t_{rr}			—	0.15	0.3	

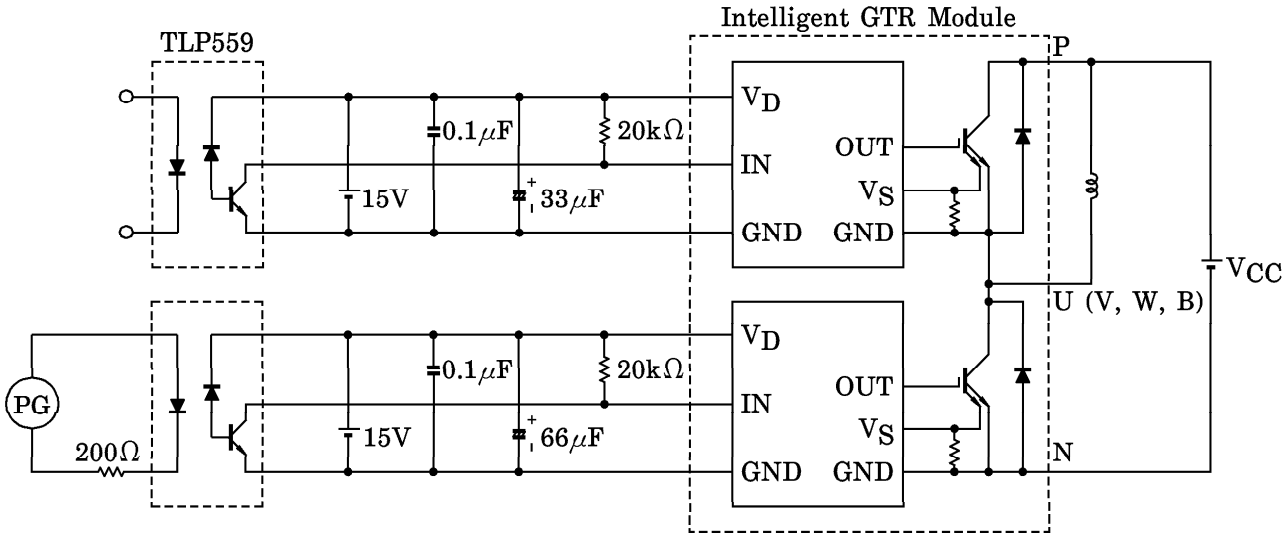
c. Control stage (T_j = 25°C)

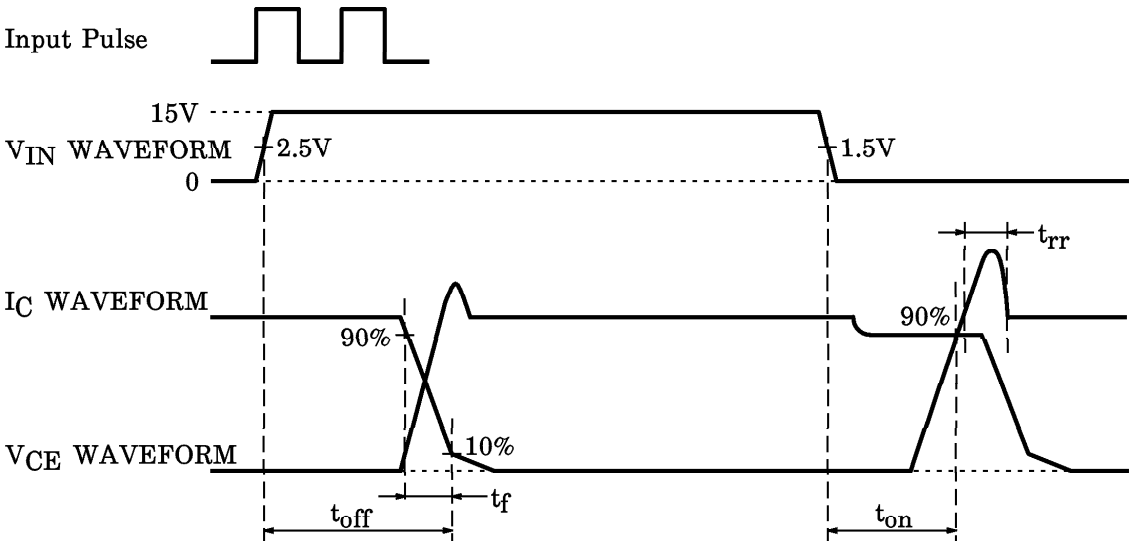
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current	High Side	$I_{D\ (H)}$	V_D = 15V	—	8	—	mA
	Low Side	$I_{D\ (L)}$		—	32	—	
Input-On Signal Voltage		$V_{IN\ (on)}$	V_D = 15V, I_C = 100mA	1.3	1.5	1.7	V
Input-Off Signal Voltage		$V_{IN\ (off)}$	V_D = 15V, I_C = 100mA	2.2	2.5	2.8	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			40	—	—	
Short Circuit Protection Trip Level	Trip Level	SC	V_D = 15V, T_j = 125°C	240	300	—	A
	Reset Level			60	—	—	
Over Current Cut-Off Time		t_{off} (OC)	V_D = 15V	—	5	—	μs
Over Temperature Protection	Trip Level	OT	Case temperature	110	118	125	°C
	Reset Level	OTr		—	98	—	
Control Supply Under Voltage Protection	Trip Level	UV	—	11.0	12.0	12.5	V
	Reset Level	UVr		—	12.5	—	
Fault Output Pulse Width		t_{FO}	V_D = 15V	1	2	3	ms

d. Thermal resistance (T_j = 25°C)

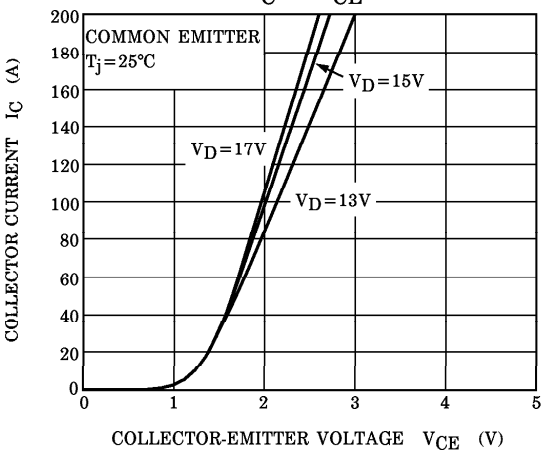
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th\ (j\text{-}c)}$	Inverter IGBT stage	—	—	0.418	°C / W
		Inverter FRD stage	—	—	1.000	
		Brake IGBT stage	—	—	1.562	
		Brake FRD stage	—	—	2.000	
Case to Fin Thermal Resistance	$R_{th\ (c\text{-}f)}$	Compound is applied	—	0.05	—	°C / W

Note 1 : Switching time test circuit & timing chart

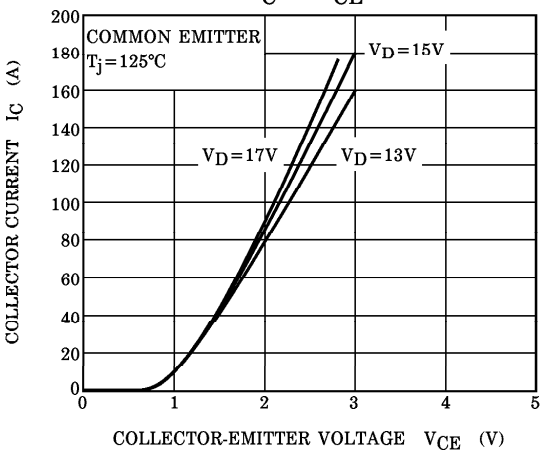




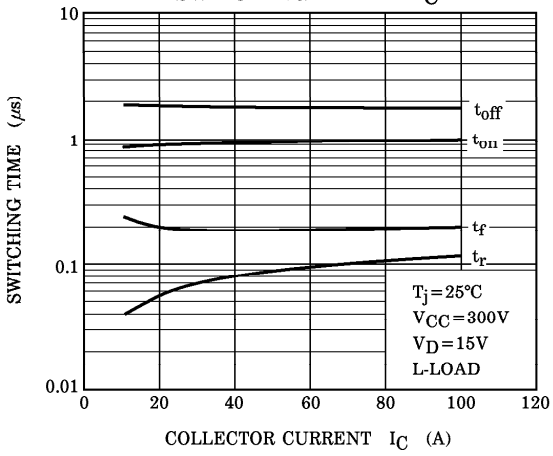
I_C – V_{CE}



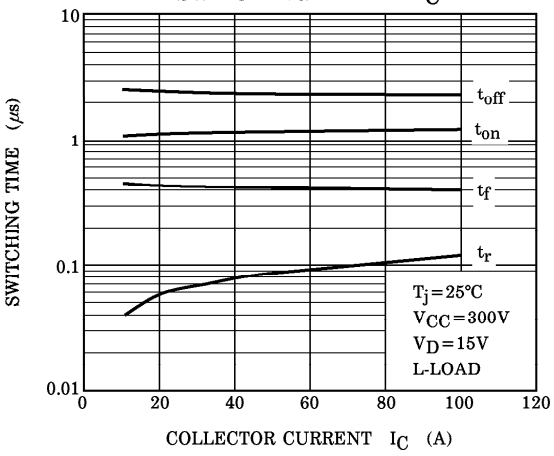
I_C – V_{CE}



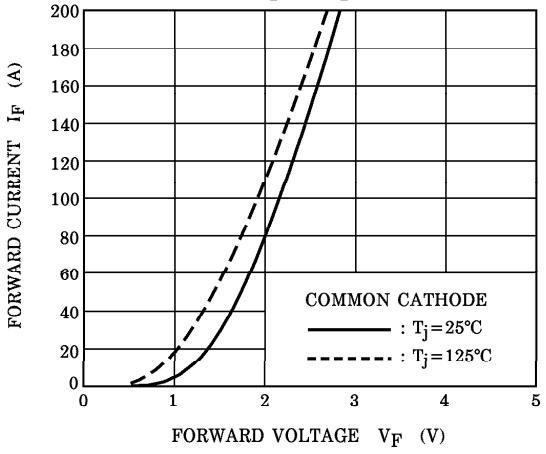
SWITCHING TIME – I_C



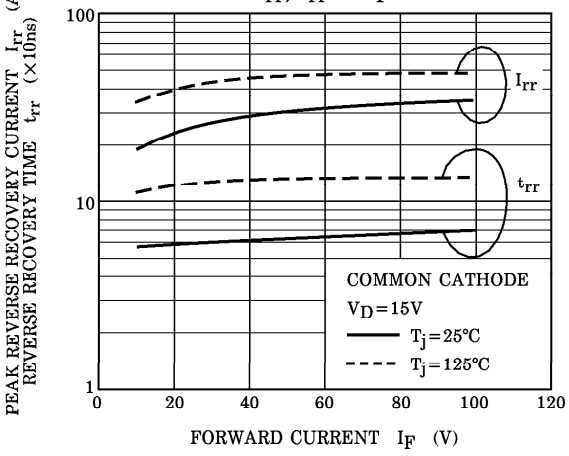
SWITCHING TIME – I_C



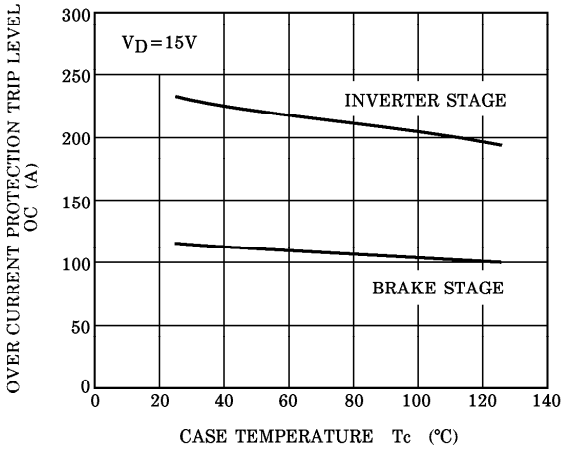
I_F – V_F



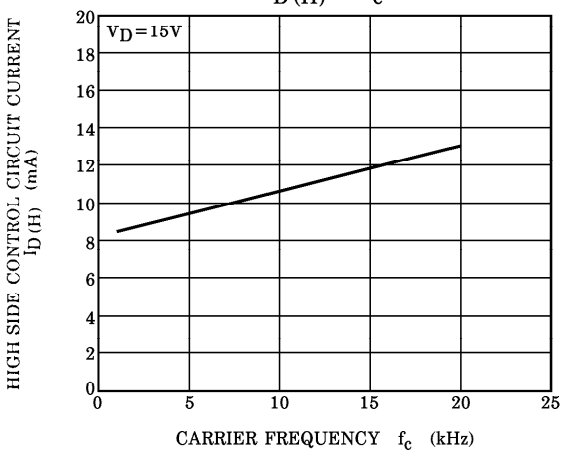
t_{rr}, I_{rr} – I_F



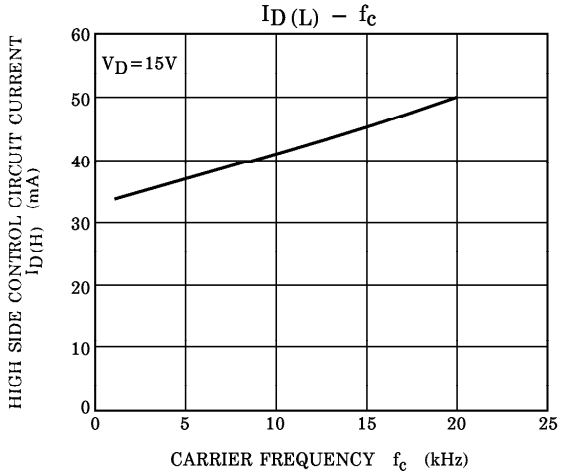
OC – Tc



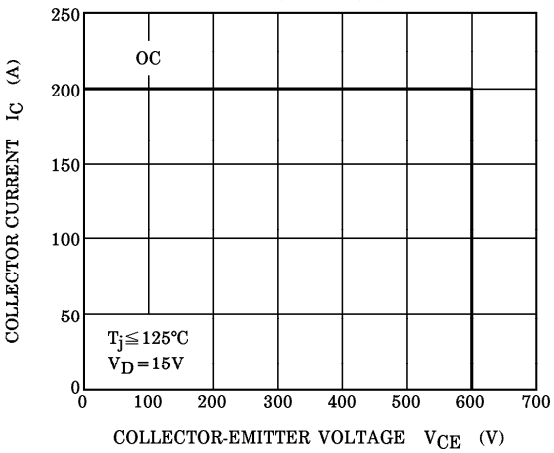
$I_{D(H)}$ – f_c



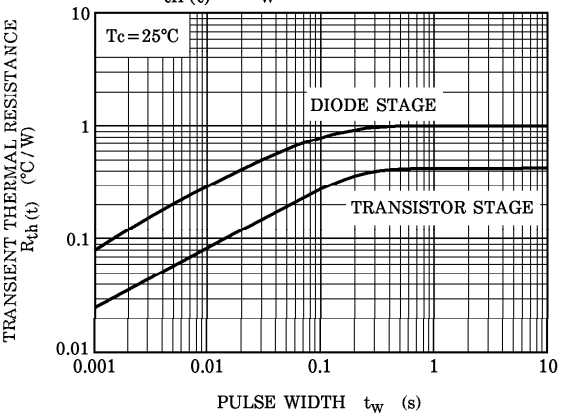
$I_{D(L)}$ – f_c



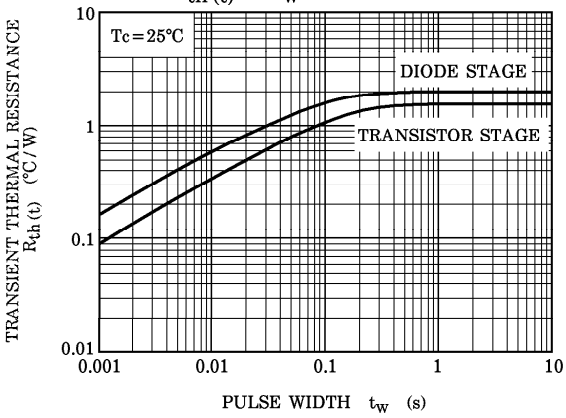
REVERSE BIAS SOA



$R_{th(t)}$ – t_w INVERTER STAGE

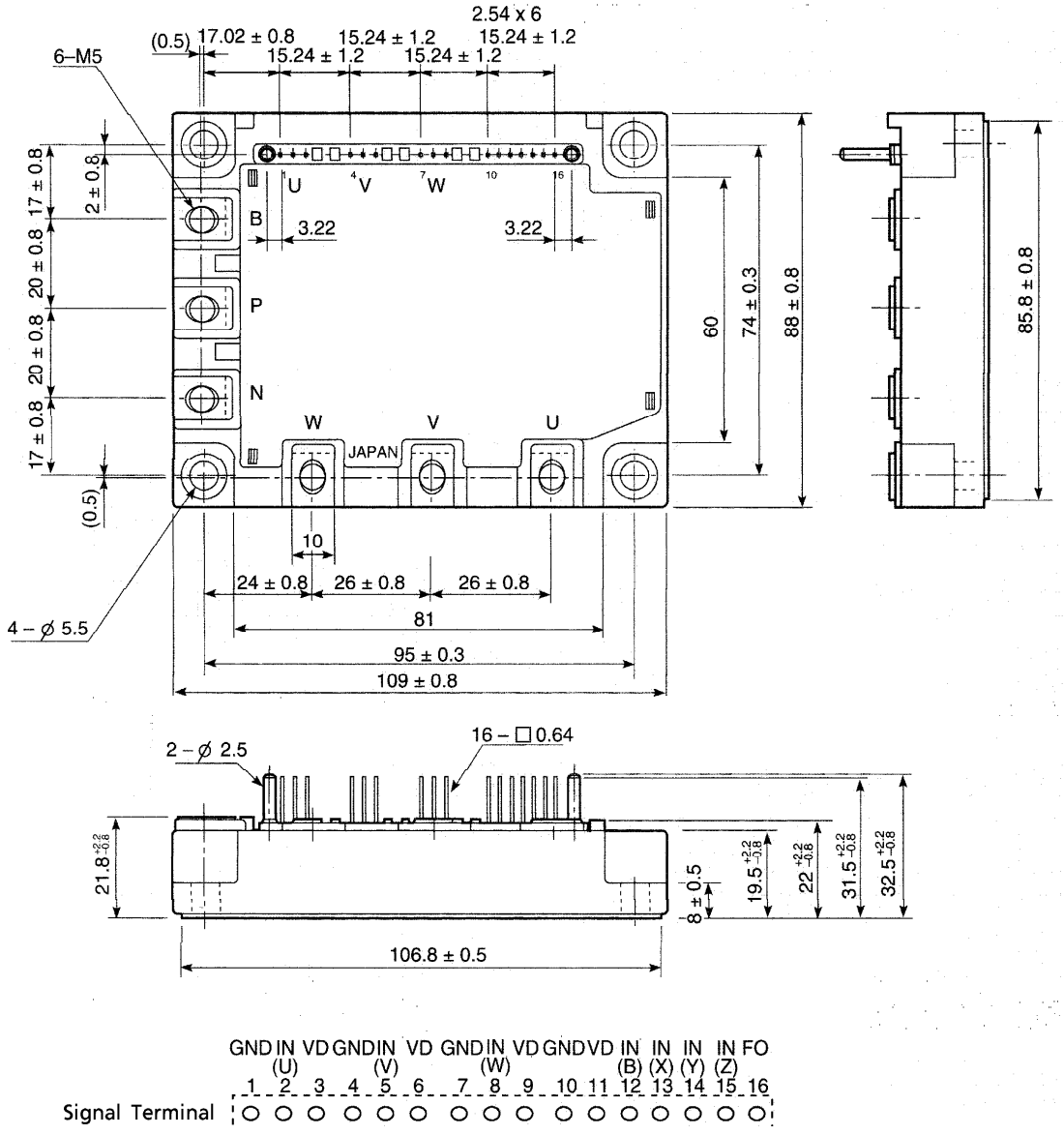


$R_{th(t)}$ – t_w BRAKE STAGE



OUTLINE

Unit : mm



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