

TOSHIBA INTELLIGENT POWER MODULE SILICON N CHANNEL IGBT

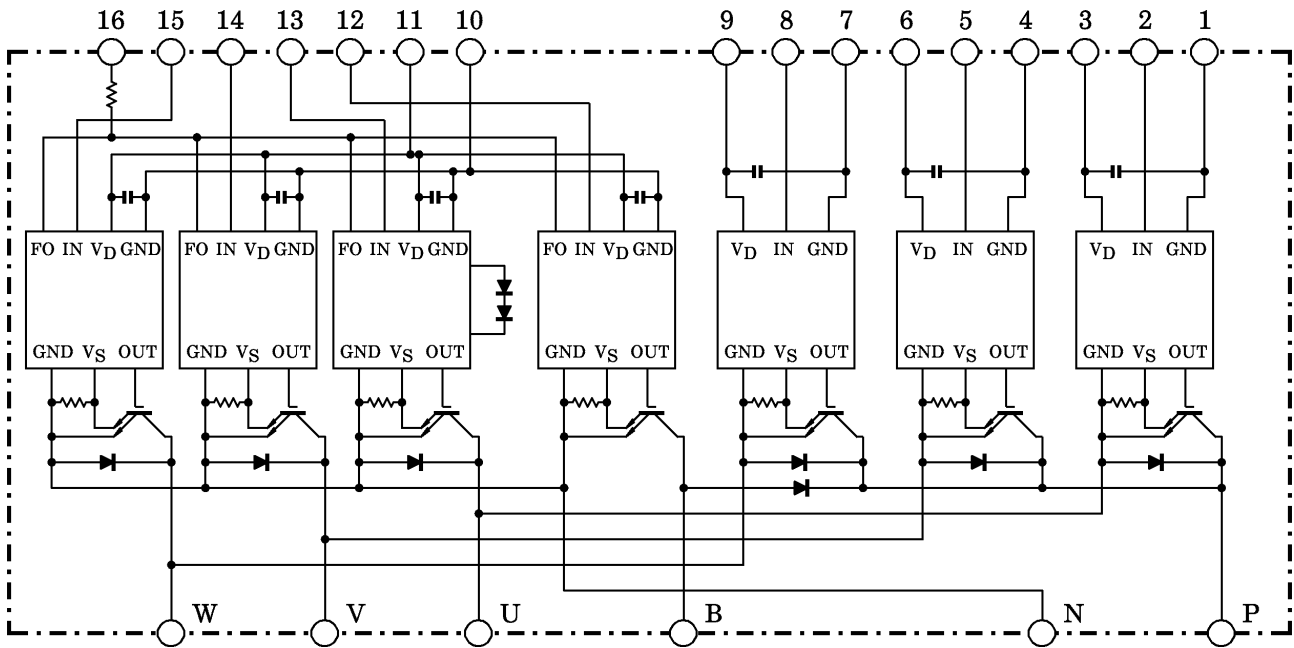
MIG50J201H

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.)
 $t_{off}=3.0\mu s$ (Max.)
 $t_{rr}=0.30\mu s$ (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 ($T_j = 25^\circ\text{C}$)

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	50	A
	Forward Current	$T_c = 25^\circ\text{C}$, DC	I_F	50	A
	Collector Power Dissipation	$T_c = 25^\circ\text{C}$	P_C	150	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	30	A
	Reverse Voltage	—	V_R	600	V
	Forward Current	$T_c = 25^\circ\text{C}$, DC	I_F	30	A
	Collector Power Dissipation	$T_c = 25^\circ\text{C}$	P_C	80	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}	$V_{CEX} = 600\text{V}$	$T_j = 25^\circ\text{C}$	—	—	1	mA
			$T_j = 125^\circ\text{C}$	—	—	20	
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{V}$, $I_C = 50\text{A}$ $V_{IN} = 15\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.0	2.5	V
			$T_j = 125^\circ\text{C}$	—	2.0	—	
Forward Voltage	V_F	$I_F = 50\text{A}$	—	2.1	3.0	V	
Switching Time	t_{on}	$V_{CC} = 300\text{V}$, $I_C = 50\text{A}$	—	0.8	2.0	μs	
	t_{off}	$V_D = 15\text{V}$, $V_{IN} = 15\text{V} \leftrightarrow 0\text{V}$	—	1.2	3.0		
	t_f	Inductive load	—	0.25	0.5		
	t_{rr}	(Note 1)	—	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	—	0.9	2.0	μs	
	t _{off}		V _D = 15V, V _{IN} = 15V ↔ 0V	—	1.7	1.0		
	t _f		Inductive load	—	0.25	0.5		
	t _{rr}		(Note 1)	—	0.15	0.3		

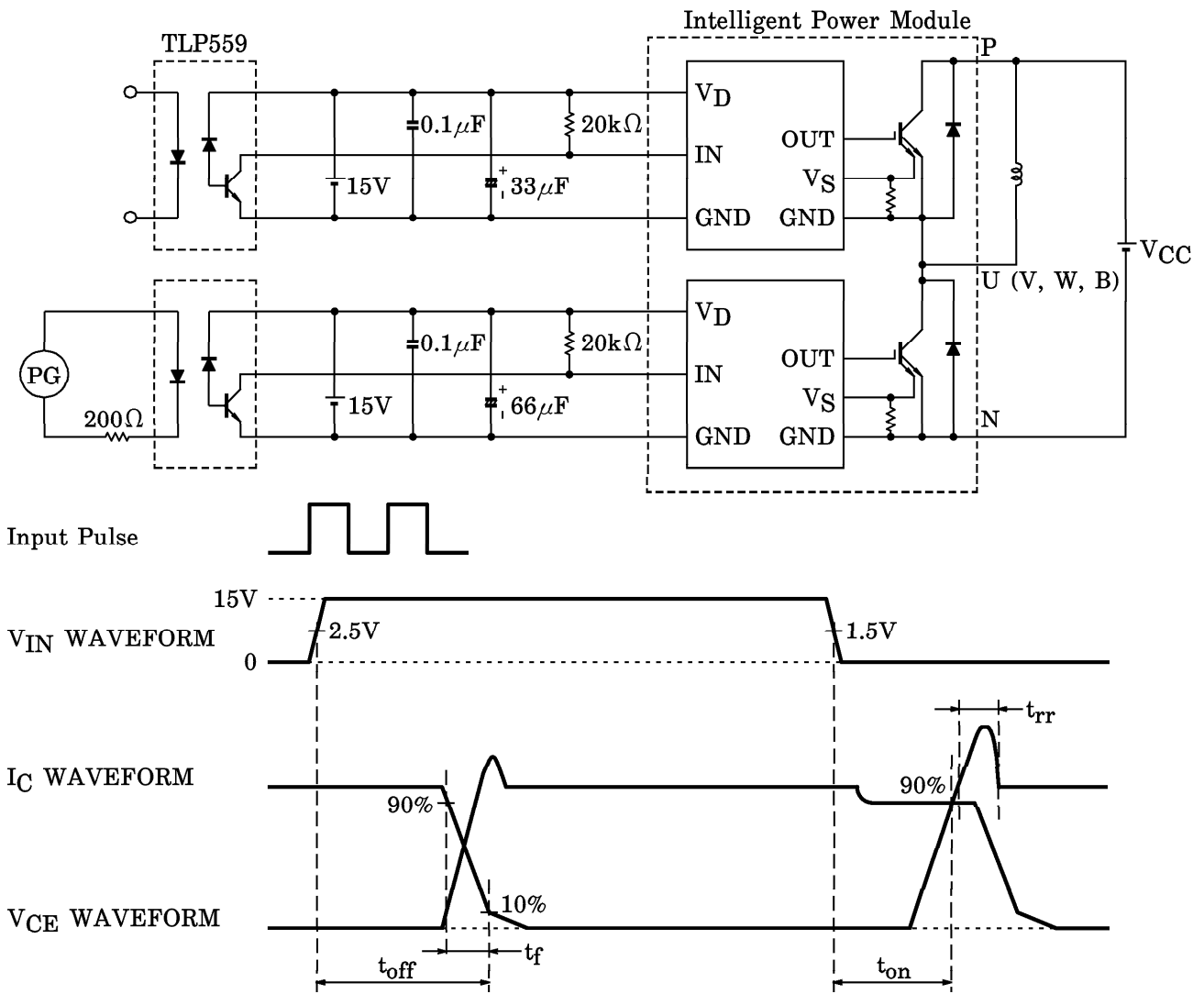
c. Control stage (T_j = 25°C)

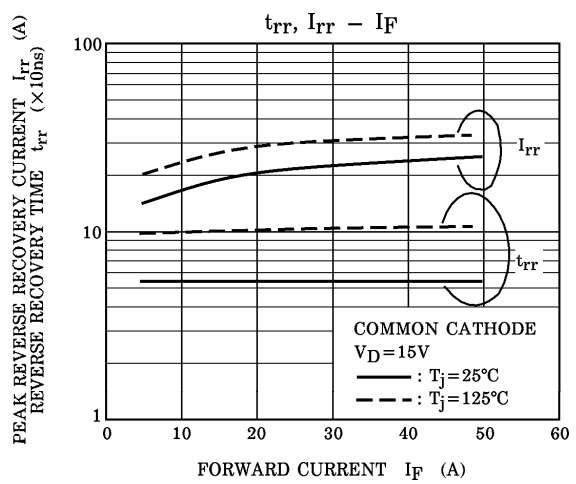
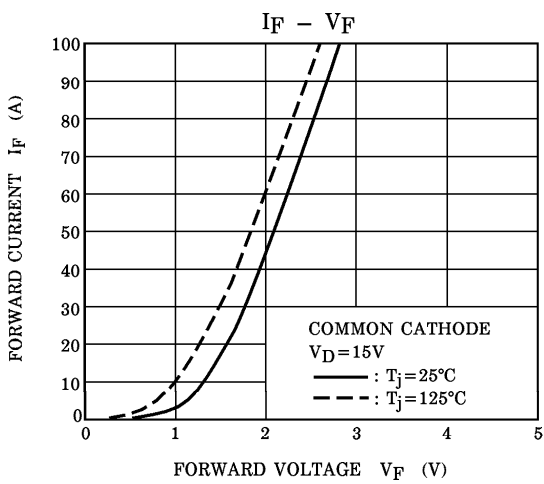
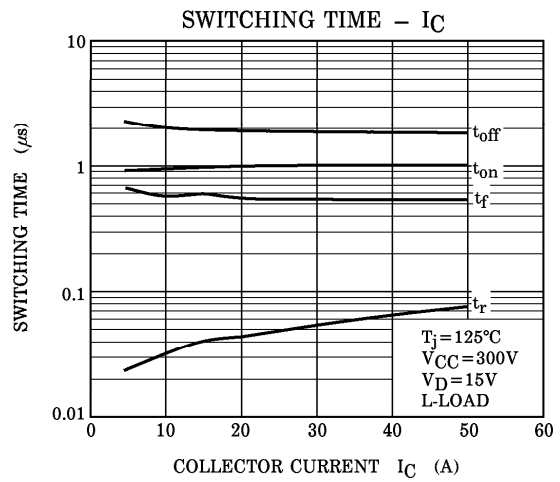
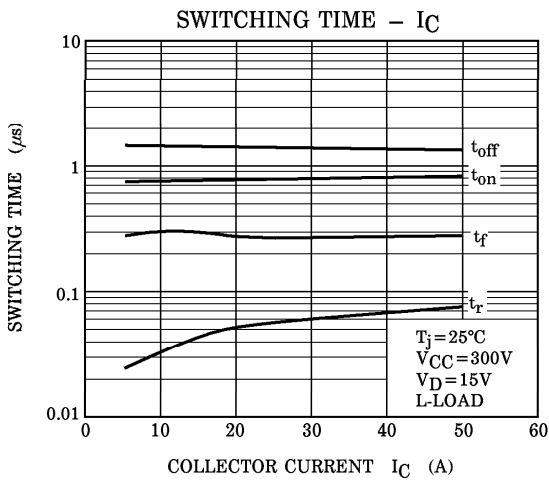
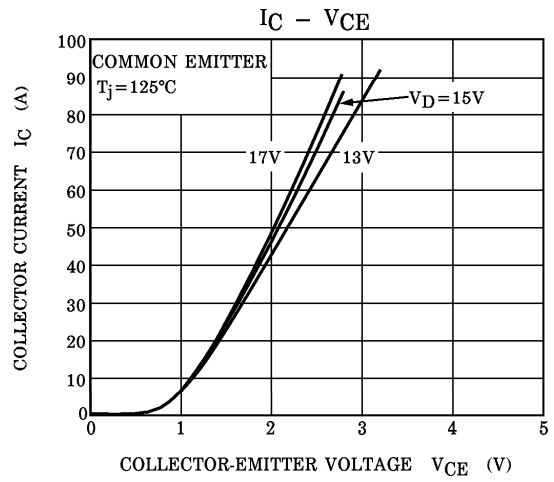
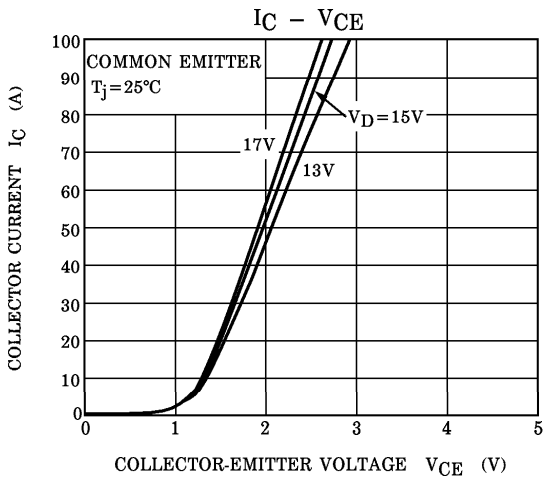
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current	High Side	I _{D (H)}	V _D = 15V	—	8	—	mA
	Low Side	I _{D (L)}		—	32	—	
Input-On Signal Voltage		V _{IN (on)}	V _D = 15V, I _C = 50mA	1.3	1.5	1.7	V
Input-Off Signal Voltage		V _{IN (off)}	V _D = 15V, I _C = 50mA	2.2	2.5	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	75	100	—	A
	Brake			40	—	—	
Short Circuit Protection Trip Level	Inverter	SC	V _D = 15V, T _j = 125°C	110	150	—	A
	Brake			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

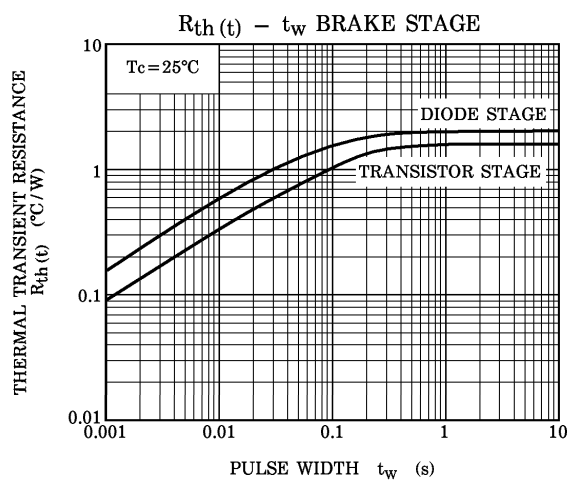
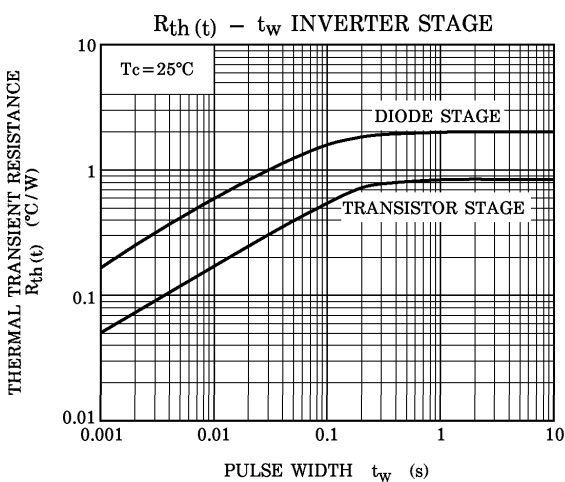
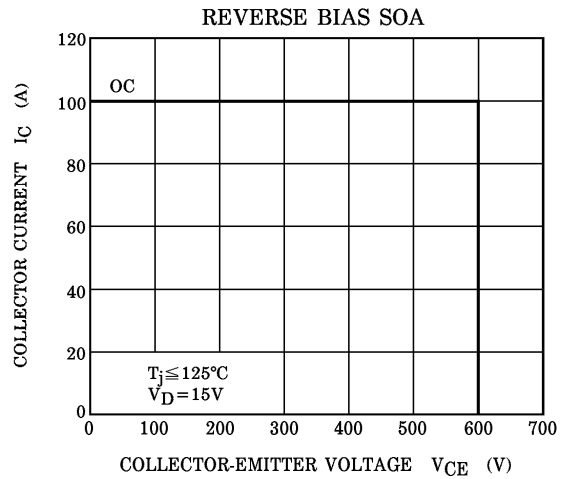
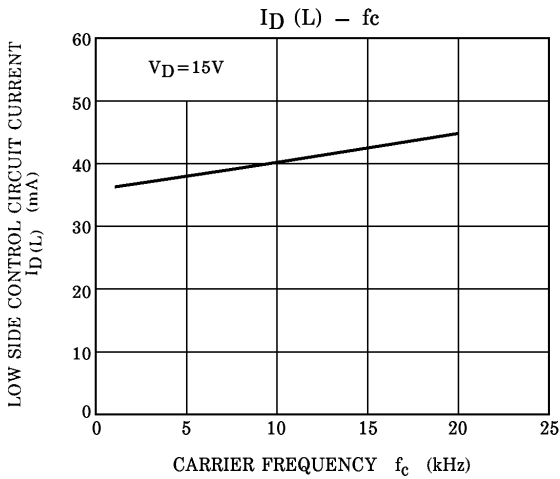
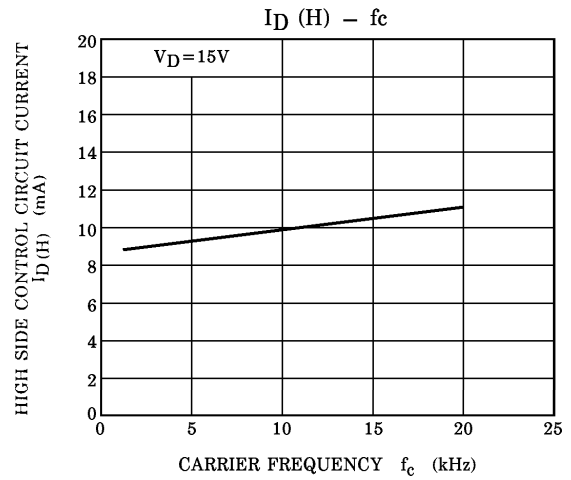
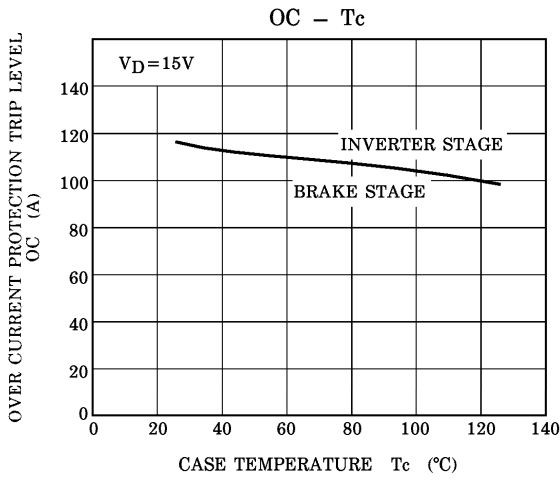
d. Thermal resistance ($T_j = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th(j-c)}$	Inverter IGBT stage	—	—	0.833	$^\circ\text{C/W}$
		Inverter FRD stage	—	—	2.000	
		Brake IGBT stage	—	—	1.562	
		Brake FRD stage	—	—	2.000	
Case to Fin Thermal Resistance	$R_{th(c-f)}$	Compound is applied	—	0.05	—	$^\circ\text{C/W}$

Note 1 : Switching time test circuit & timing chart

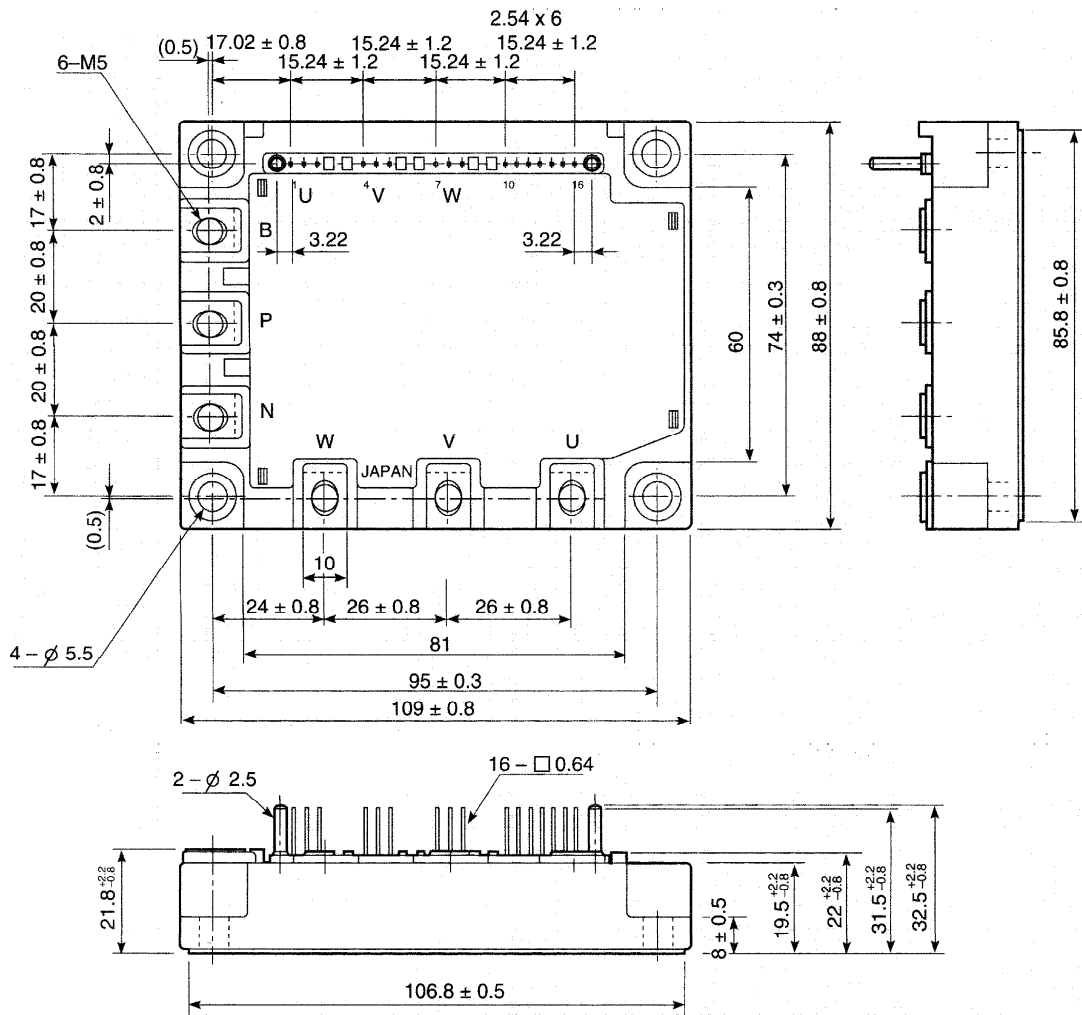






OUTLINE

Unit : mm



	GND	IN	VD	GND	IN	VD	GND	VD	IN	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