

**TOSHIBA**

**MIG30J103H**

TOSHIBA INTELLIGENT POWER MODULE SILICON N CHANNEL IGBT

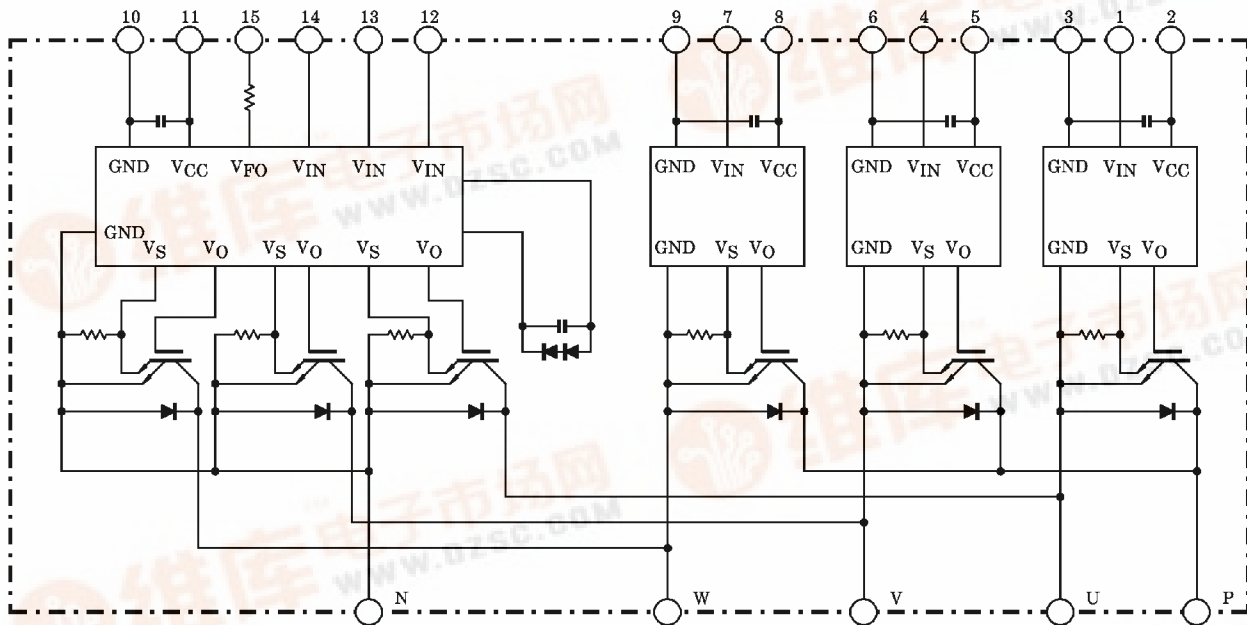
# MIG30J103H

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Intelligent Power Module that include IGBT drive circuits, overcurrent, undervoltage lockout, and overtemperature protection.
- The Electrodes are Isolated from Case.
- High speed type IGBT :  $V_{CE(sat)}=2.7V$  (MAX.)  
 $t_{off}=2.0\mu s$  (MAX.)  
 $t_{rr}=0.25\mu s$  (MAX.)
- Outline : TOSHIBA 2-99E1A (See page 5 for the device outline)
- Weight : 80g

EQUIVALENT CIRCUIT



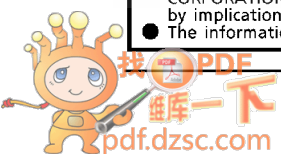
- |          |          |          |
|----------|----------|----------|
| 1. VINU  | 2. VDU   | 3. GNDU  |
| 4. VINV  | 5. VDV   | 6. GNDV  |
| 7. VINW  | 8. VDW   | 9. GNDW  |
| 10. GNDL | 11. VDL  | 12. VINX |
| 13. VINY | 14. VINZ | 15. VFO  |

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MAXIMUM RATINGS ( $T_j = 25^\circ\text{C}$ )

	SYMBOL	ITEM	CONDITION	RATING	UNIT
Inverter Part	V <sub>CC</sub>	Supply Voltage	P-N	400	V
	V <sub>CES</sub>	Collector-Emitter Voltage	—	600	V
	±I <sub>C</sub>	Collector Current (DC)	T <sub>c</sub> = 25°C	30	A
	P <sub>C</sub>	Collector Power Dissipation	T <sub>c</sub> = 25°C	83	W
	T <sub>j</sub>	Junction Temperature	—	150	°C
Control Part	V <sub>D</sub>	Supply Voltage	—	20	V
	V <sub>IN</sub>	Input Voltage	V <sub>IN</sub> = V <sub>D</sub>	20	V
	V <sub>FO</sub>	Fowl Output Voltage	V <sub>FO</sub> = V <sub>D</sub>	20	V
	I <sub>FO</sub>	Fowl Output Current	—	7	mA
All System	T <sub>c</sub>	Operating Temperature	—	-20 ~ +100	°C
	T <sub>stg</sub>	Storage Temperature Range	—	-40 ~ +125	°C
	V <sub>ISO</sub>	Isolation Voltage	AC, 1 min	2500	V <sub>rms</sub>
	—	Screw Torque	M5	2	N·m

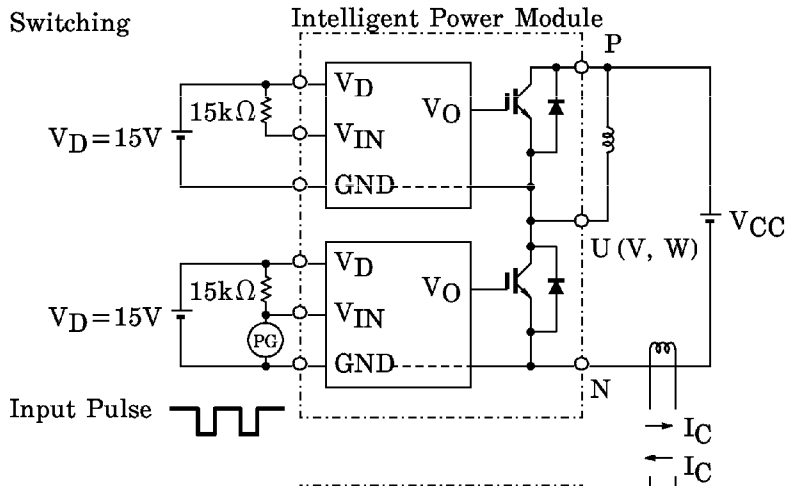
ELECTRICAL CHARACTERISTICS ( $T_j = 25^\circ\text{C}$ )

Inverter Part

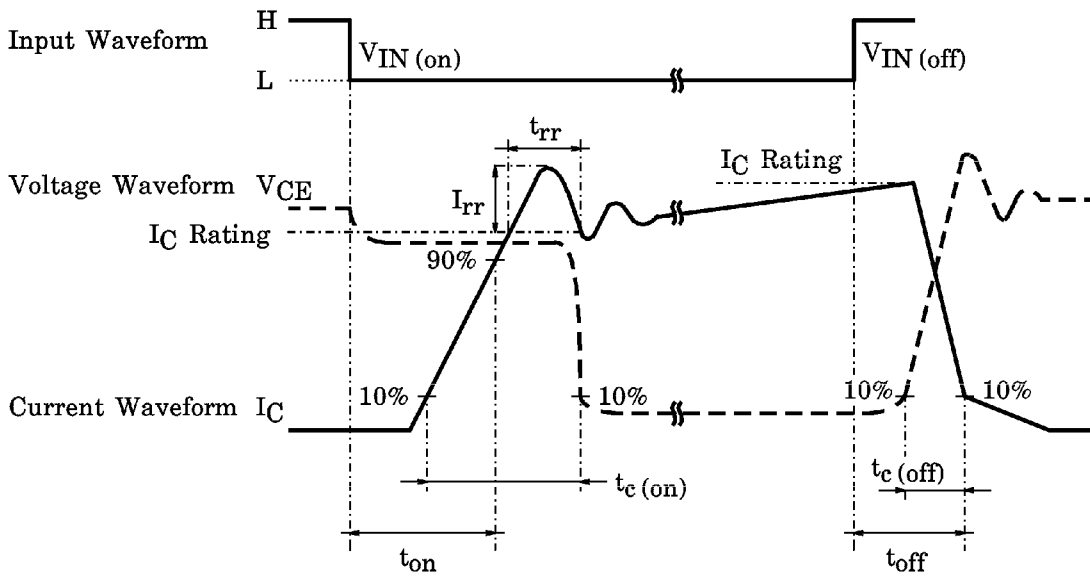
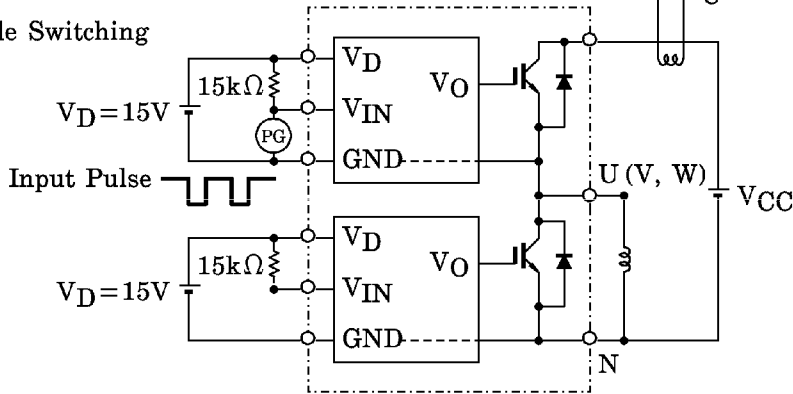
SYMBOL	ITEM	TEST CONDITION	SPEC			UNIT	
			MIN.	TYP.	MAX.		
V <sub>CE (sat)</sub>	Collector-Emitter Saturation Voltage	V <sub>D</sub> = 15V I <sub>IN</sub> = 0mA	I <sub>C</sub> = 30A	—	2.1	2.7	V
			I <sub>C</sub> = 30A, T <sub>j</sub> = 125°C	—	—	3.0	
V <sub>F</sub>	Forward Voltage	I <sub>F</sub> = 30A	—	2.0	2.7	V	
t <sub>on</sub>	Switching Time	V <sub>CC</sub> = 300V I <sub>C</sub> = 30A V <sub>D</sub> = 15V I <sub>IN</sub> = 1mA ↔ 0mA Inductive Load	—	0.5	1.3	2.0	μs
t <sub>c (on)</sub>			—	—	0.3	1.0	
t <sub>off</sub>			—	0.5	1.0	2.0	
t <sub>c (off)</sub>			—	—	0.5	1.5	
t <sub>rr</sub>			—	0.15	0.25		
I <sub>CES</sub>	Collector Cut-off Current	V <sub>CE</sub> = 600V	T <sub>j</sub> = 25°C	—	—	1	mA
			T <sub>j</sub> = 125°C	—	—	20	

Note 1 : Switching Time Test Circuit & Timing Chart

a) Low Side Switching



b) High Side Switching



Control Part ( $T_j = 25^\circ\text{C}$ )

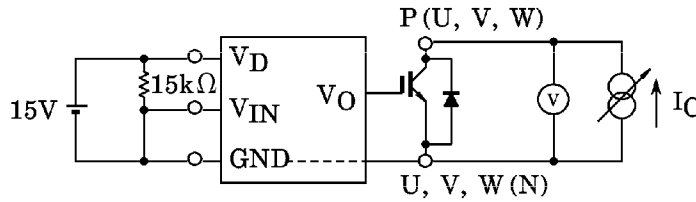
SYMBOL	ITEM	TEST CONDITION	SPEC			UNIT	
			MIN.	TYP.	MAX.		
$I_D$	Circuit Current	$V_D = 15\text{V}$	High Side	6	12	18	mA
			Low Side	11	23	35	
$V_{IN(\text{on})}$	Input On Signal Voltage	—	1.0	1.3	1.6	V	
$V_{IN(\text{off})}$	Input Off Signal Voltage		1.5	1.8	2.1		
$I_{FO}$	Foul Output Current (Protection)	$V_D = 15\text{V}, V_{FO} = 15\text{V}$	3	5	7	mA	
	Foul Output Current (Normal)		—	—	1		
OC	Over Current Protection Trip Level	$V_D = 15\text{V}$	46	55	—	A	
		$V_D = 15\text{V}, T_j \leq 125^\circ\text{C}$	39	—	—		
$t_{\text{off(OC)}}$	Over Current Cut Off Time	$V_D = 15\text{V}$	5	10	18	$\mu\text{s}$	
OT	Over Temperature Protection	Case Temperature	Trip Level	100	110	120	$^\circ\text{C}$
			Reset Level	80	90	100	
UV	Control Supply Under-Voltage Protection	—	Trip Level	11.3	12.0	12.7	V
			Reset Level	11.8	12.5	13.2	
$t_{FO}$	Foul Output Pulse Width	$V_D = 15\text{V}$	5	10	15	ms	

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

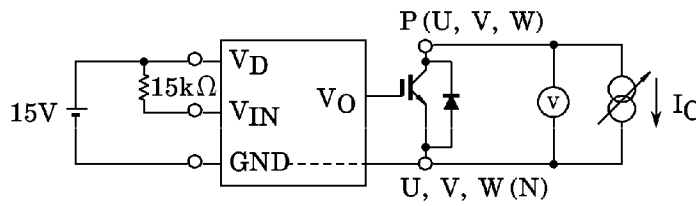
SYMBOL	ITEM	TEST CONDITION	SPEC			UNIT
			MIN.	TYP.	MAX.	
$R_{th(j-c)}$	Junction to Case Thermal Resistance	INV. IGBT	—	—	1.5	$^\circ\text{C}/\text{W}$
$R_{th(j-e)}$		INV. FWD	—	—	4.5	
$R_{th(c-f)}$	Case to Fin Thermal Resistance with compound	—	—	0.2	—	

**ELECTRICAL CHARACTERISTICS TEST CIRCUIT** ( $V_{CE(sat)}$ ,  $V_F$ ,  $I_{CES}$ ,  $I_D$ ,  $V_{IN}$ ,  $I_{FO}$ ,  $t_{FO}$ )

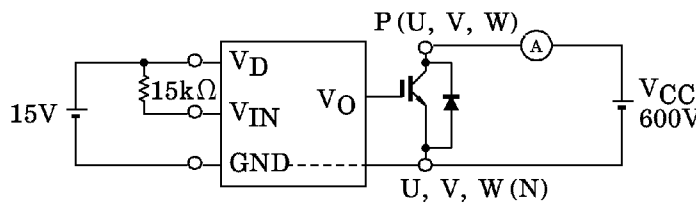
a)  $V_{CE(sat)}$



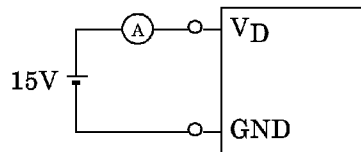
b)  $V_F$



c)  $I_{CES}$

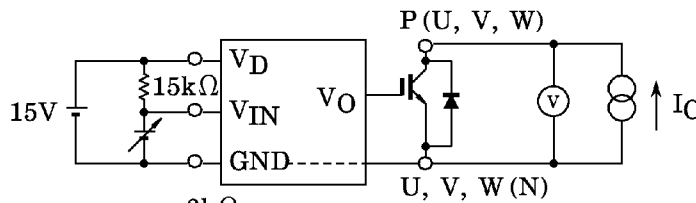


d)  $I_D$

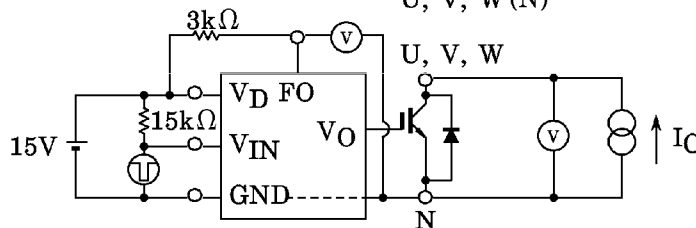


e)  $V_{IN(OFF)}$

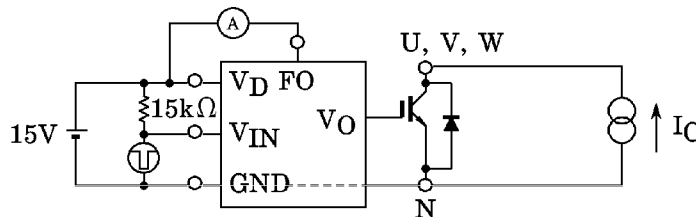
$V_{IN(ON)}$



f)  $t_{FO}$

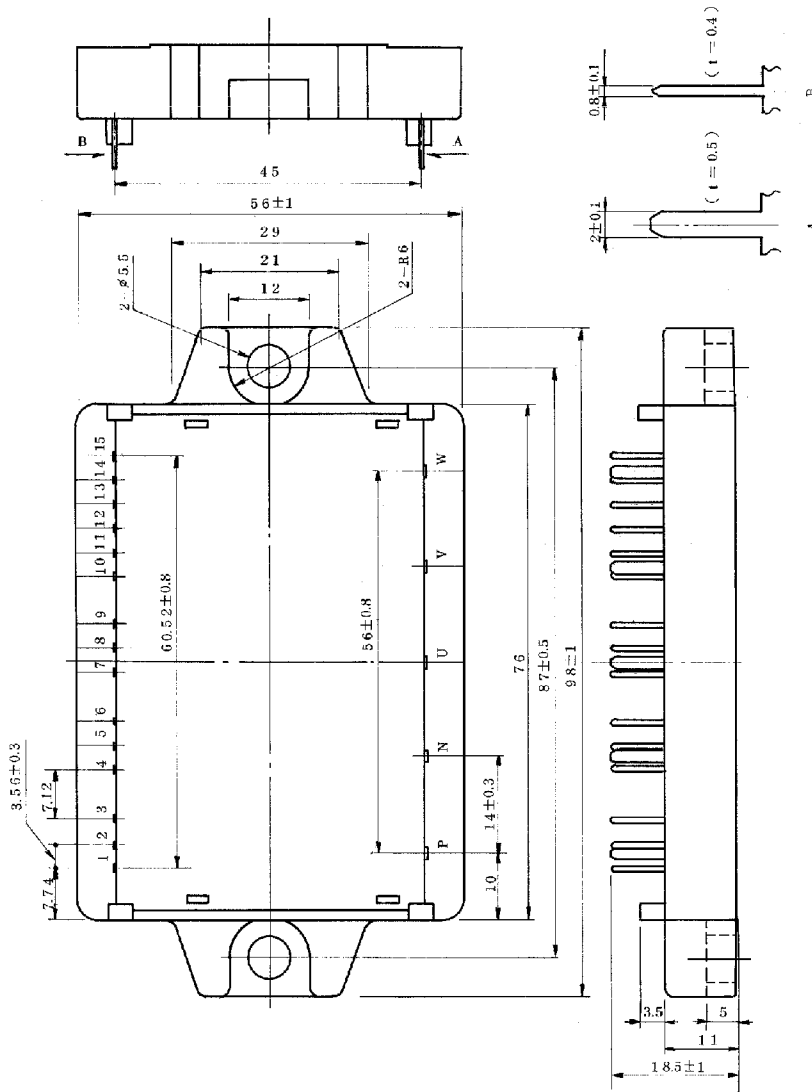


g)  $I_{FO}$



OUTLINE : TOSHIBA 2-99E1A

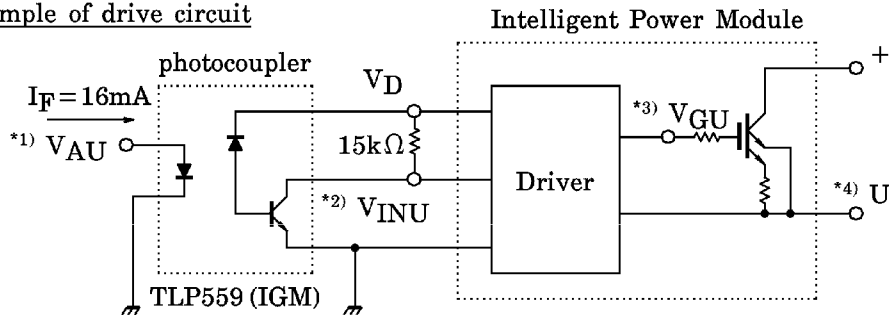
Unit in mm



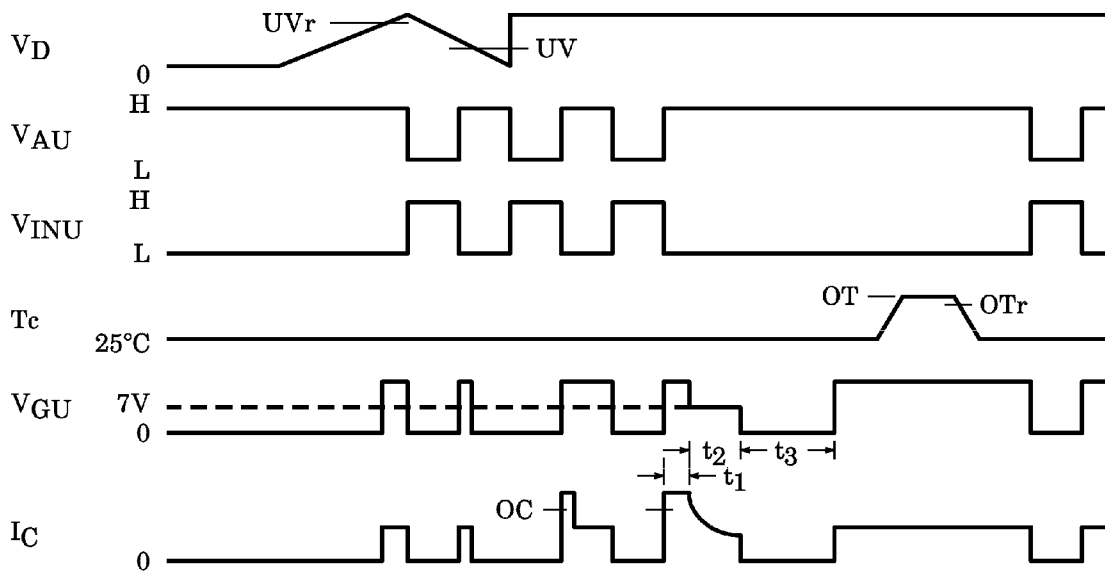
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TIMING CHART (High side)

Typical example of drive circuit



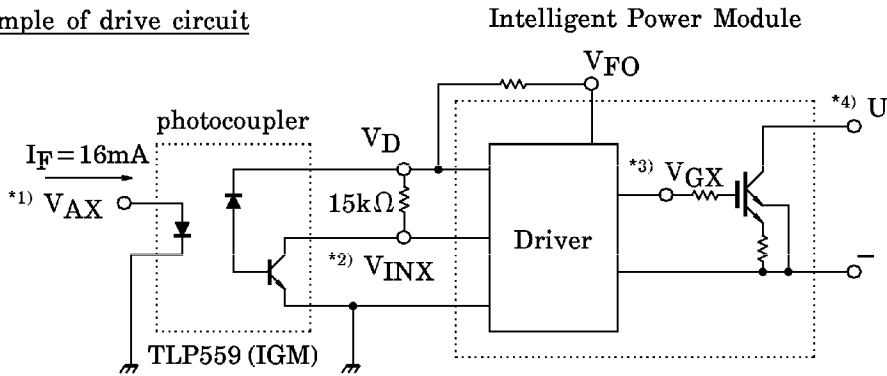
- \*1) or  $V_{AV}$ ,  $V_{AW}$
- \*2) or  $V_{INV}$ ,  $V_{INW}$
- \*3) or  $V_{GV}$ ,  $V_{GW}$
- \*4) or  $V$ ,  $W$



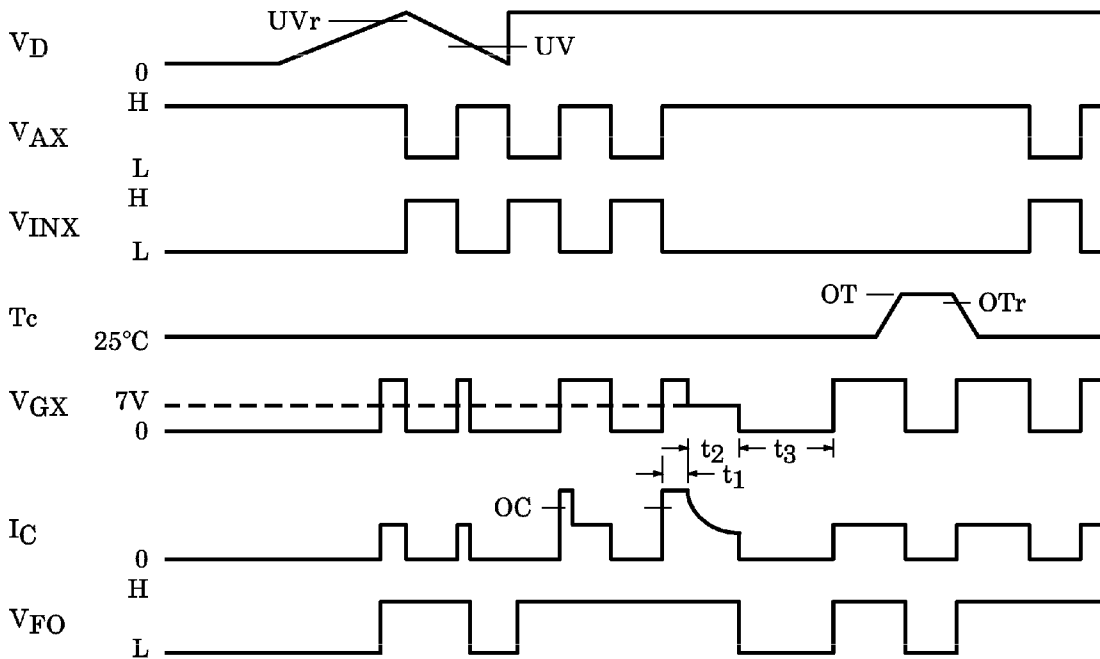
- UV : Under-Voltage Trip Level
- UVr : Under-Voltage Reset Level
- OT : Over Temperature Trip Level
- OTr : Over Temperature Reset Level
- OC : Over Current
- $t_1$  :  $2.5\mu\text{s}$  (Typ.)
- $t_2$  :  $10\mu\text{s}$  (Typ.)
- $t_3$  :  $10\text{ms}$  (Typ.)

TIMING CHART (Low side)

Typical example of drive circuit



- \*1) or V<sub>AY</sub>, V<sub>AZ</sub>
- \*2) or V<sub>INY</sub>, V<sub>INZ</sub>
- \*3) or V<sub>GY</sub>, V<sub>GZ</sub>
- \*4) or V, W



- UV : Under-Voltage Trip Level
- UVr : Under-Voltage Reset Level
- OT : Over Temperature Trip Level
- OTr : Over Temperature Reset Level
- OC : Over Current
- t<sub>1</sub> : 2.5μs (Typ.)
- t<sub>2</sub> : 10μs (Typ.)
- t<sub>3</sub> : 10ms (Typ.)



