

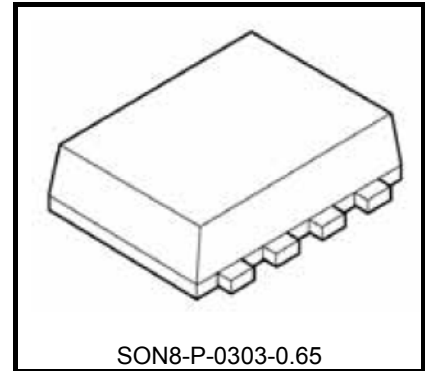
# TPD7211F

## Power MOSFET Gate Driver for half-bridge

TPD7211F is a Power MOSFET gate driver for half-bridge circuit. BiCD process is applied on this product.

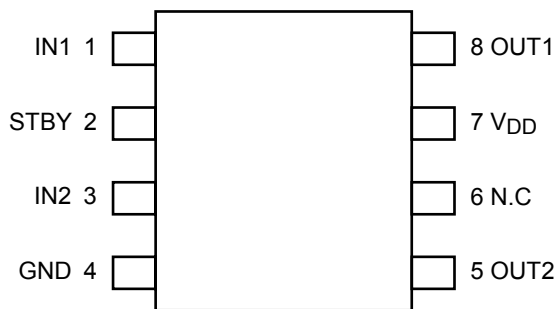
### Features

- Power MOSFET gate driver for half-bridge
- High-side can operate P channel MOSFET, Low-side can operate N channel MOSFET
- Housed in the PS-8 package and supplied in embossed carrier tape.



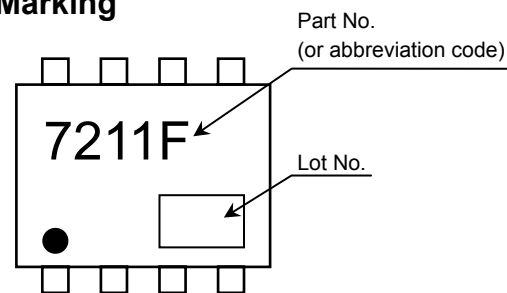
SON8-P-0303-0.65  
Weight: 0.017g (typ.)

### Pin Assignment (top view)



(TOP VIEW)

### Marking



● on the lower left of the marking indicates Pin 1

\*Weekly code: (Three digits)



Week of manufacture  
(01 for first week of year, continuing up to 52 or 53)  
Year of manufacture  
(The last digit of the calendar year)

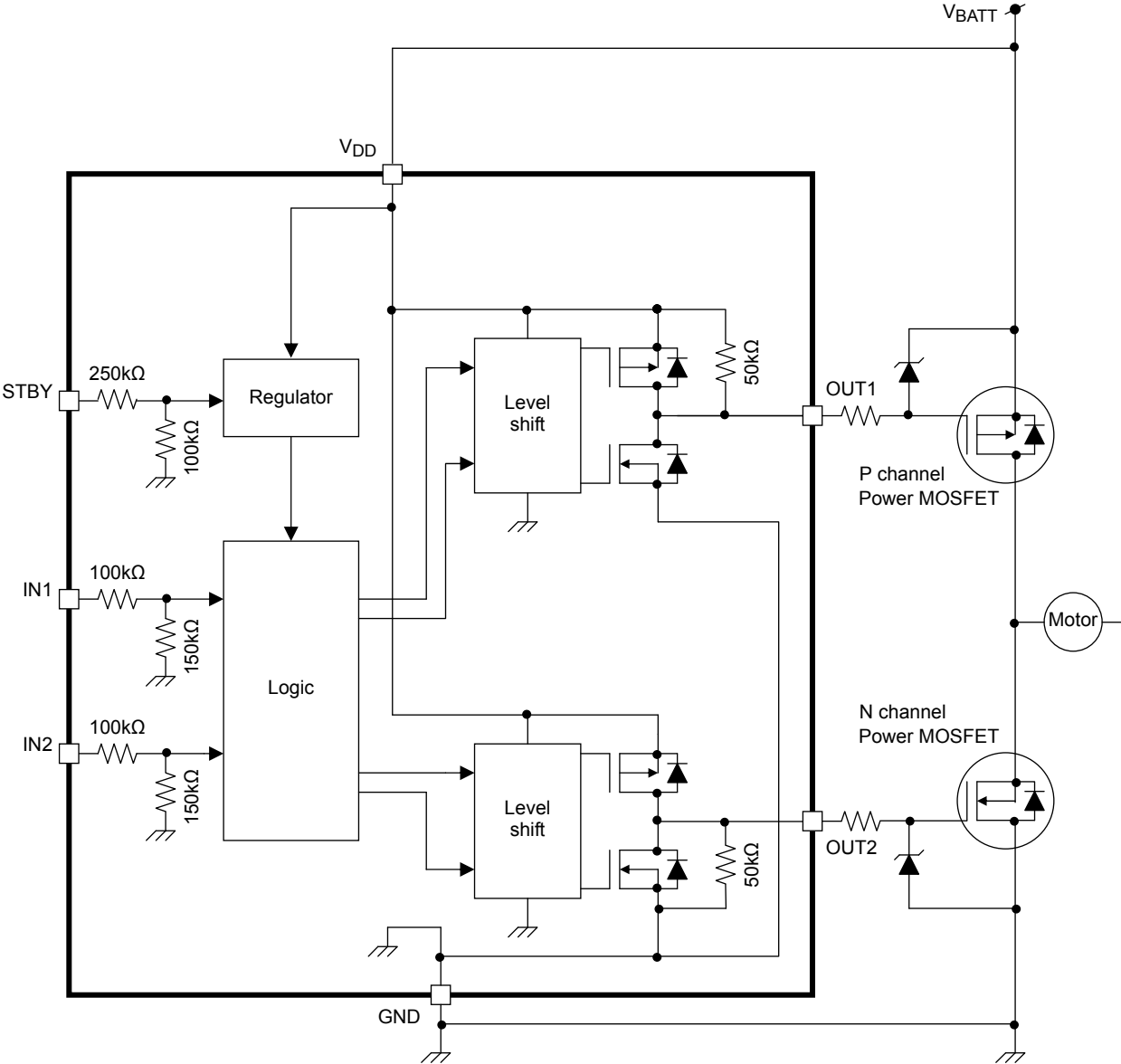
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product.

The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain

This product has a MOS structure and is sensitive electrostatic discharge.

Start of commercial production  
2011-04

Block Diagram / Application Circuit



## Pin Description

Pin No.	Symbol	Pin Description
1	IN1	Input pin for high-side output (OUT1) control. The IN1 pin has an internal pull-down resistor. Thus, even if the input is open-circuit, the OUT1 never turns on ("L") inadvertently.
2	STBY	Standby pin:By driving this pin "L", supply current is 10μA or less and all outputs can be turned off regardless of input signals. By driving this pin "H", all outputs are switching normally. The STBY pin has an internal pull-down resistor. When input is open circuit, this IC becomes the same operation as "L".
3	IN2	Input pin for low-side output (OUT2) control. The IN2 pin has an internal pull-down resistor. Thus, even if the input is open-circuit, the OUT2 never turns on ("H") inadvertently.
4	GND	Ground pin.
5	OUT2	Drives the low-side N channel power MOSFET.
6	N.C	No-Connect pin.
7	V <sub>DD</sub>	Power supply pin.
8	OUT1	Drives the high-side P channel power MOSFET.

## Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Pin	Rating	Unit	Remarks
Power supply voltage	V <sub>DD</sub>	V <sub>DD</sub>	-0.3 to 35	V	When V <sub>DD</sub> range is 30V or more, Pulse width ≤ 0.3s
Input voltage	V <sub>IN</sub>	IN1, IN2	-0.3 to 6	V	-
	V <sub>STBY</sub>	STBY	-0.3 to 35	V	When V <sub>DD</sub> range is 30V or more, Pulse width ≤ 0.3s
Output voltage	V <sub>OUT</sub>	OUT1, OUT2	-0.3 to V <sub>DD</sub> +0.3	V	Absolute Maximum Ratings is 35V or less. When V <sub>DD</sub> range is 30V or more, Pulse width ≤ 0.3s
Output current	I <sub>OUT</sub>	OUT1, OUT2	±500	mA	-
Power dissipation(Note 2)	P <sub>D(1)</sub>	-	0.7	W	Refer to Note 2a
	P <sub>D(2)</sub>	-	0.35	W	Refer to Note 2b
Operating temperature	T <sub>opr</sub>	-	-40 to 125	°C	-
Junction temperature	T <sub>j</sub>	-	150	°C	-
Storage temperature	T <sub>stg</sub>	-	-40 to 150	°C	-

Note1: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

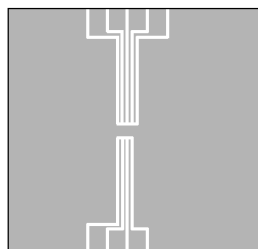
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

## Thermal Resistance

Characteristic	Symbol	Rating	Unit
Junction to ambient thermal resistance	R <sub>th(j-a)</sub>	178.6 (Note 2a)	°C / W
		357.2 (Note 2b)	

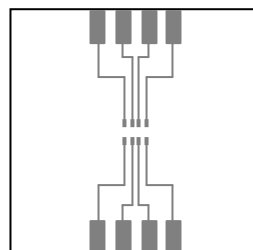
Note 2:

(a) Mounted on glass epoxy board



Glass epoxy board  
Material : FR-4  
25.4mm×25.4mm×0.8mm

(b) Mounted on glass epoxy board



Glass epoxy board  
Material : FR-4  
25.4mm×25.4mm×0.8mm

## Electrical Characteristics

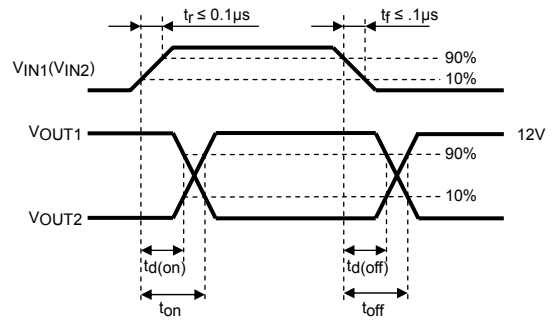
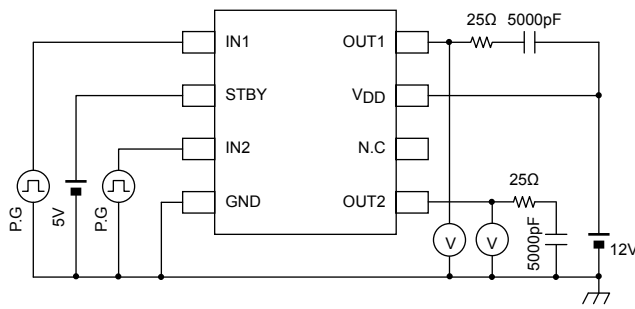
(Unless otherwise specified,  $T_j = -40$  to  $125$  °C,  $V_{DD} = 5$  to  $18$  V,  $V_{STBY} = 5$  V)

Characteristics	Symbol	Pin	Condition	Min	Typ.	Max	Unit
Operating supply voltage	$V_{DD(opr)}$	$V_{DD}$	-	5	12	18	V
Supply current	$I_{DD1}$	$V_{DD}$	$V_{STBY}=0V$ , $V_{DD}=12V$ , Output pin is open.	-	-	10	$\mu A$
	$I_{DD2}$	$V_{DD}$	$V_{STBY}=5V$ , $V_{DD}=12V$ , $V_{IN1,2}=0V$ , Output pin is open.	-	-	3	mA
High level input voltage	$V_{IH1}$	IN1,IN2	-	3.5	-	-	V
	$V_{IH2}$	STBY		3.5	-	-	V
Low level input voltage	$V_{IL1}$	IN1,IN2		-	-	1.5	V
	$V_{IL2}$	STBY		-	-	0.8	V
High level input current	$I_{IH1}$	IN1,IN2	$V_{IN1,2}=5V$ , per one input.	-	20	50	$\mu A$
	$I_{IH2}$	STBY	$V_{STBY}=5V$	-	15	50	$\mu A$
Low level input current	$I_{IL1}$	IN1,IN2	$V_{IN1,2}=0V$ , per one input.	-0.2	-	+0.2	$\mu A$
	$I_{IL2}$	STBY	$V_{STBY}=0V$	-0.2	-	+0.2	$\mu A$
High-side(OUT1) high-level output voltage	$V_{O1H}$	OUT1	$V_{IN1}=0V$ , $I_o=-10mA$	$V_{DD}$ -0.2	-	-	V
High-side(OUT1) low-level output voltage	$V_{O1L}$	OUT1	$V_{IN1}=5V$ , $I_o=+10mA$	-	-	0.2	V
Low-side(OUT2) high-level output voltage	$V_{O2H}$	OUT2	$V_{IN2}=5V$ , $I_o=-10mA$	$V_{DD}$ -0.2	-	-	V
Low-side(OUT2) low-level output voltage	$V_{O2L}$	OUT2	$V_{IN2}=0V$ , $I_o=+10mA$	-	-	0.2	V
Output ON Resistance	$R_{DS(ON)[SOURCE]}$	OUT1, OUT2	$T_j=25^\circ C$ , $I_o=-250mA$	-	4	8	$\Omega$
	$R_{DS(ON)[SINK]}$	OUT1, OUT2	$T_j=25^\circ C$ , $I_o=+250mA$	-	3	6	
Switching times	$t_{d(on)1}$	OUT1	$V_{DD}=12V$ , $R_o=25\Omega$ , $C_o=5000pF$	-	0.25	1	$\mu s$
	$t_{ON1}$			-	0.5	2	
	$t_{d(off)1}$			-	0.25	1	
	$t_{OFF1}$			-	0.5	2	
	$t_{d(on)2}$	OUT2		-	0.25	1	
	$t_{ON2}$			-	0.5	2	
	$t_{d(off)2}$			-	0.25	1	
	$t_{OFF2}$			-	0.5	2	
Dead times	$t_{dead1}$	OUT1, OUT2	$t_{d(off)1}-t_{d(on)2}$ , $t_{d(off)2}-t_{d(on)1}$	-	-	1	$\mu s$
	$t_{dead2}$	OUT1, OUT2	$t_{d(off)1}-t_{d(on)1}$ , $t_{d(off)2}-t_{d(on)2}$	-	-	1	

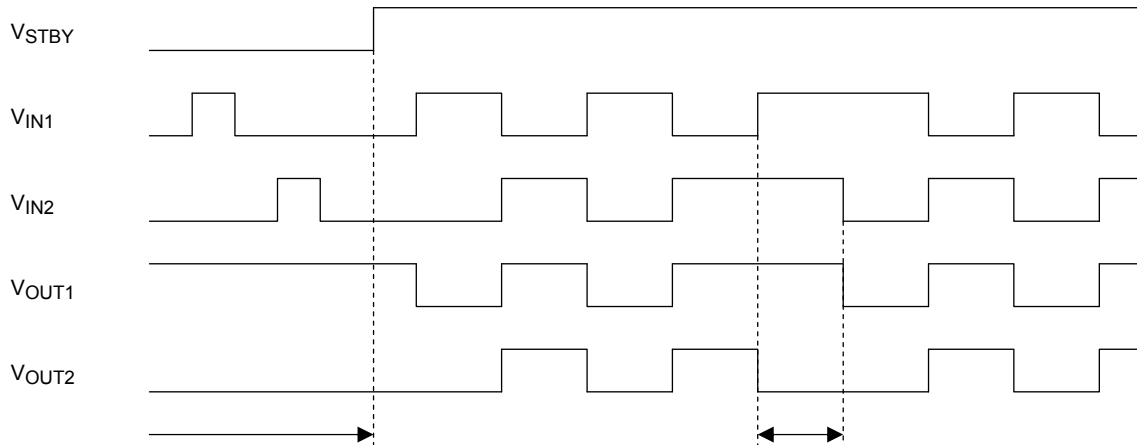
\*Please set the deadtime of the input signal after considering the switching time of external power MOSFET.

\*The condition of the typical value is  $T_j=25^\circ C$ ,  $V_{DD}=12V$ .

## Switching times test circuit



## Timing chart

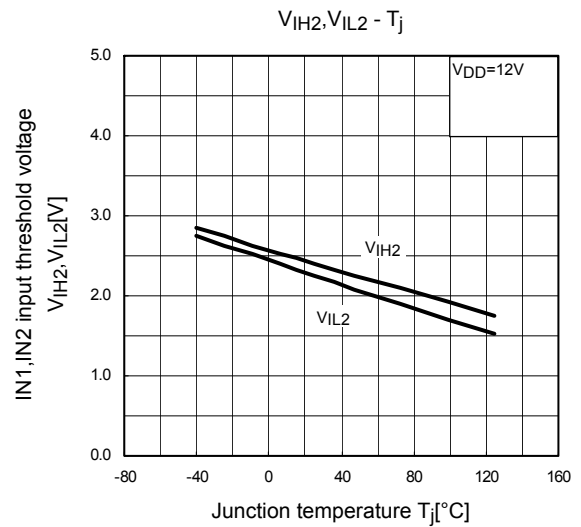
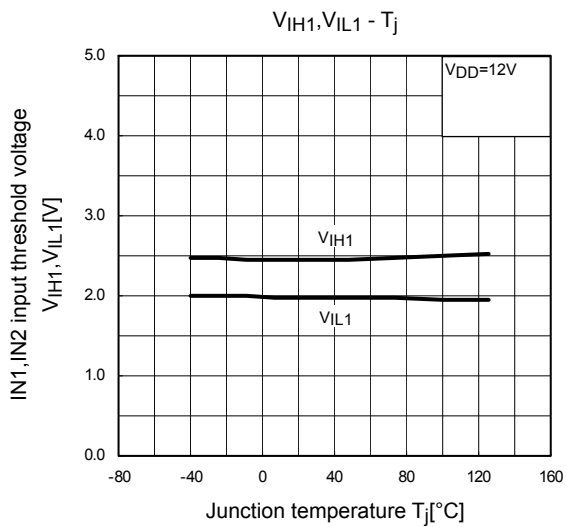
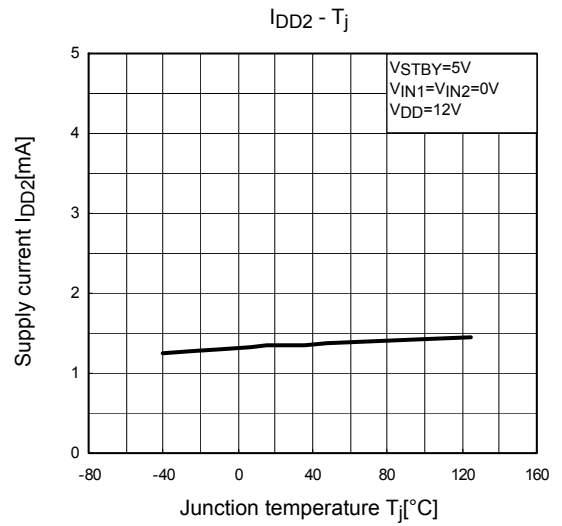
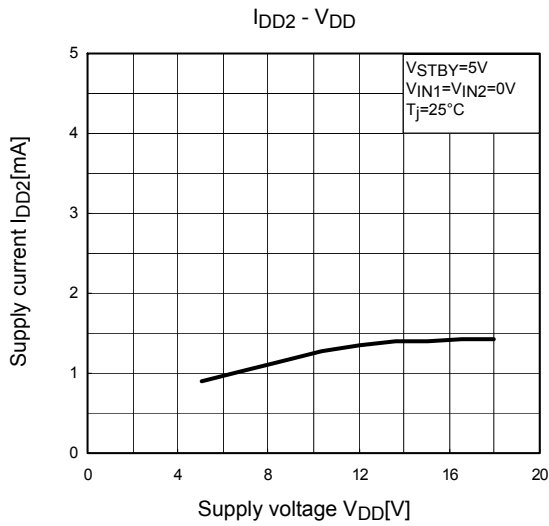
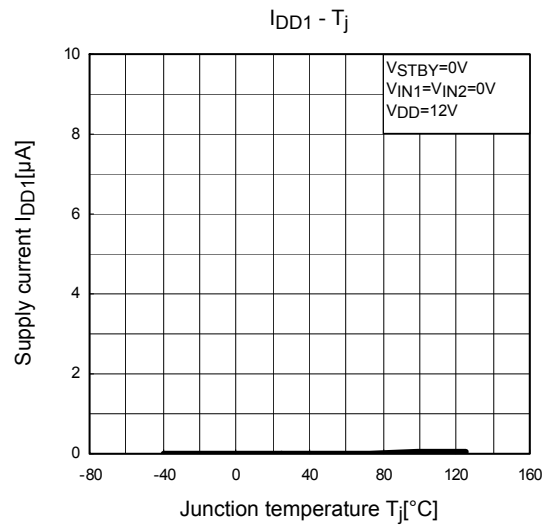
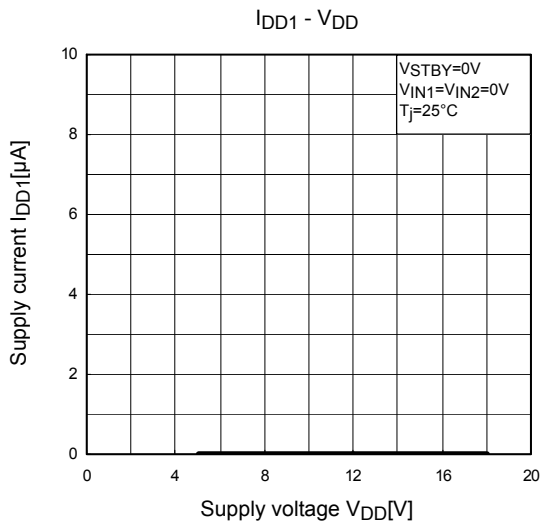


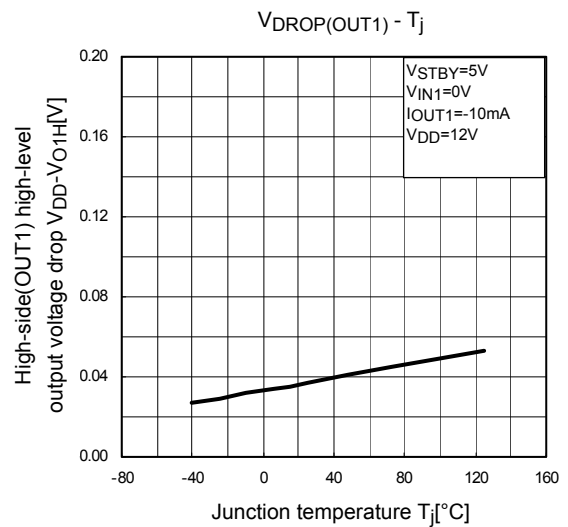
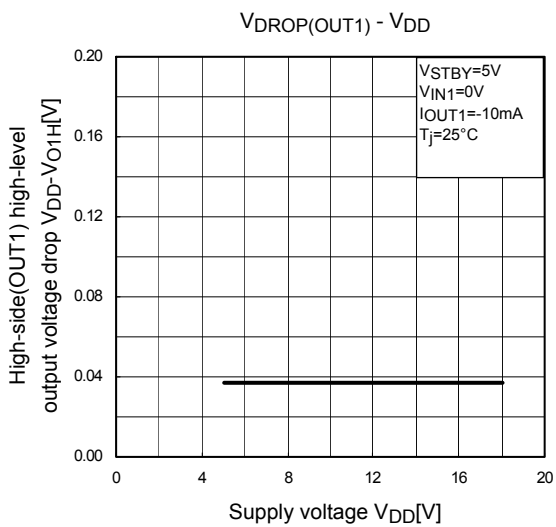
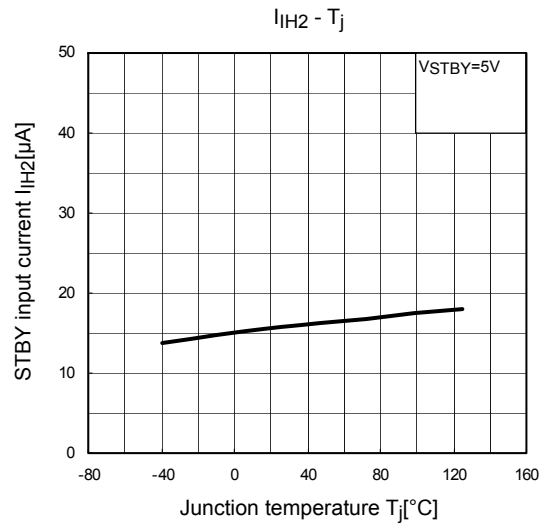
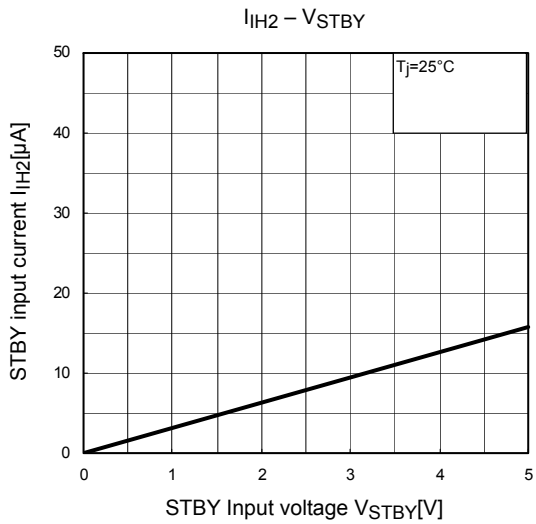
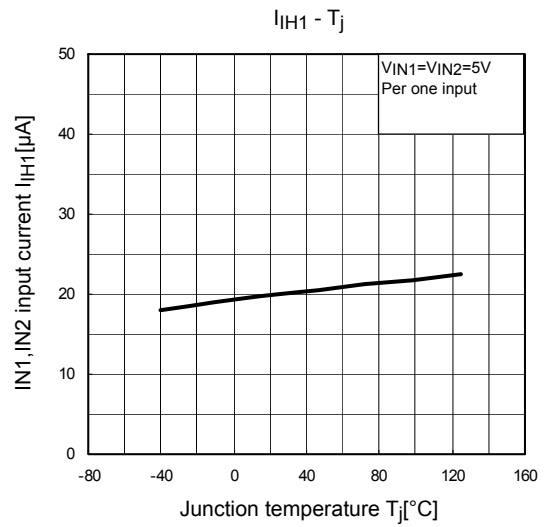
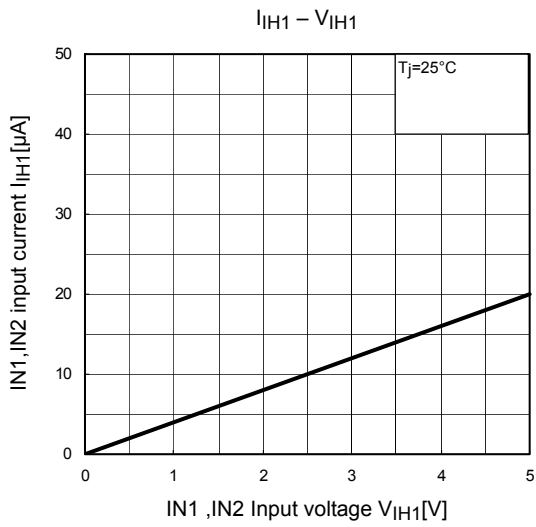
By driving STBY low, all output DMOS are turned off regardless of input signals.

Input that is High-side/Low-side arm shorting mode ( $V_{IN1}=V_{IN2}=H$ ) is a prohibition mode. When it is prohibition mode, it is  $V_{OUT1}=H$  and  $V_{OUT2}=L$ . (External MOSFETs are all off)

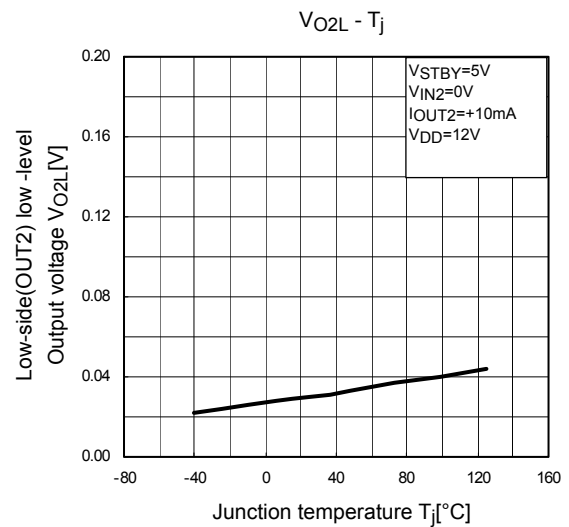
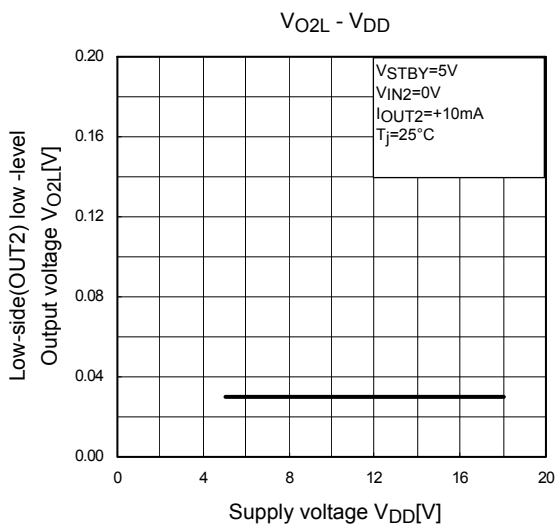
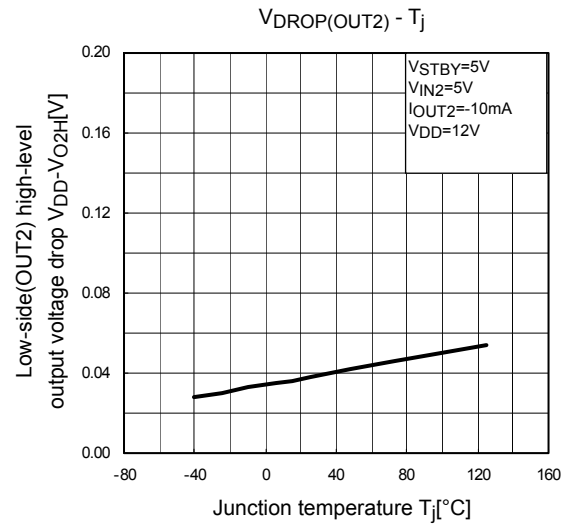
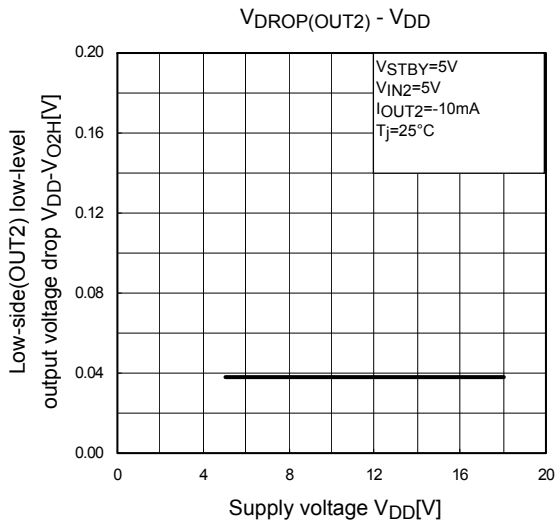
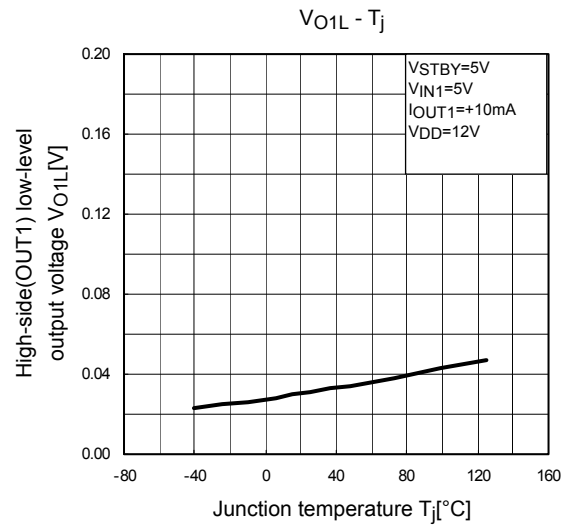
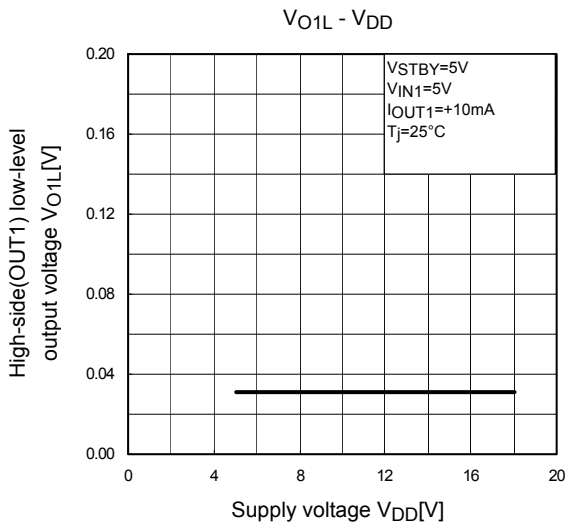
## Truth Table

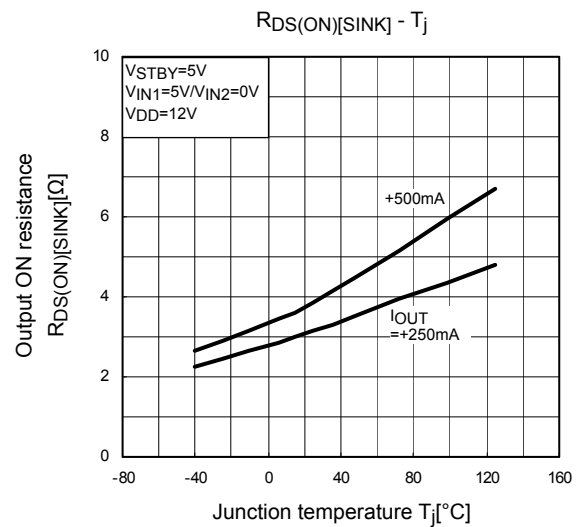
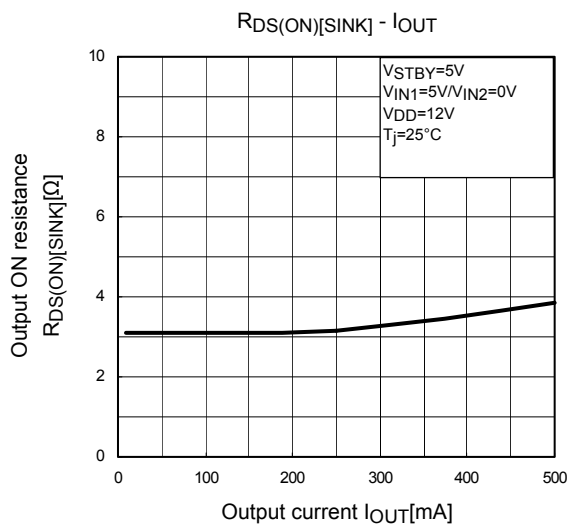
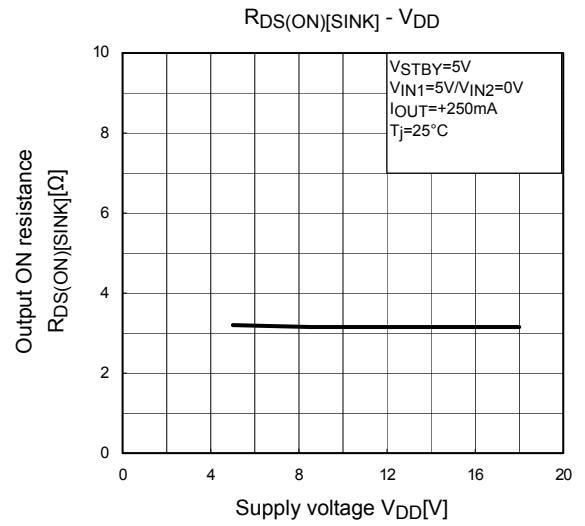
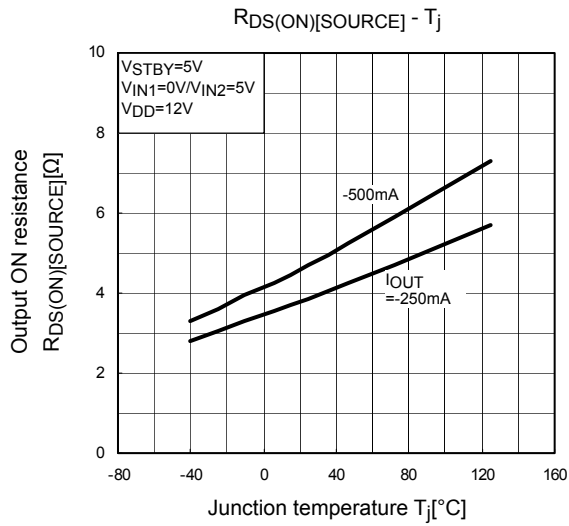
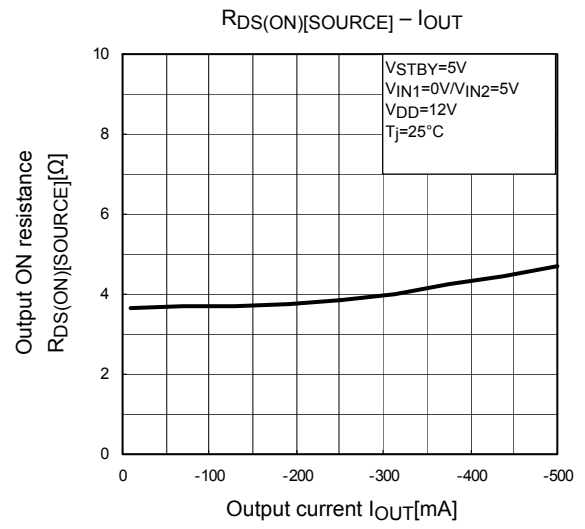
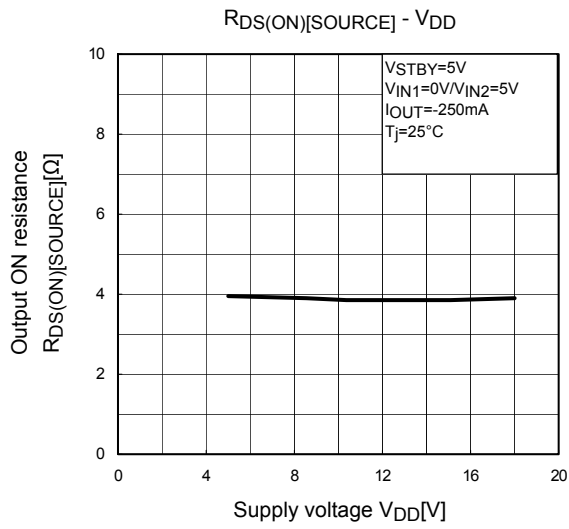
STBY signal	IN1 signal	IN2 signal	V <sub>OUT1</sub>	V <sub>OUT2</sub>	Remarks
L	L	L	H	L	Standby mode (Output is all off)
L	H	L	H	L	
L	L	H	H	L	
H	L	L	H	L	OUT1 and OUT2 are off mode. (External MOSFETs are all off mode)
H	H	L	L	L	OUT1 is on mode. (External high side MOSFET is on mode)
H	L	H	H	H	OUT2 is on mode. (External low side MOSFET is on mode)
H	H	H	H	L	High-side/Low-side arm shorting mode.

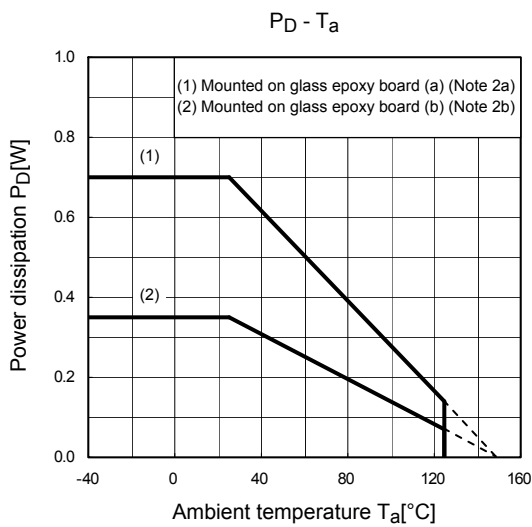
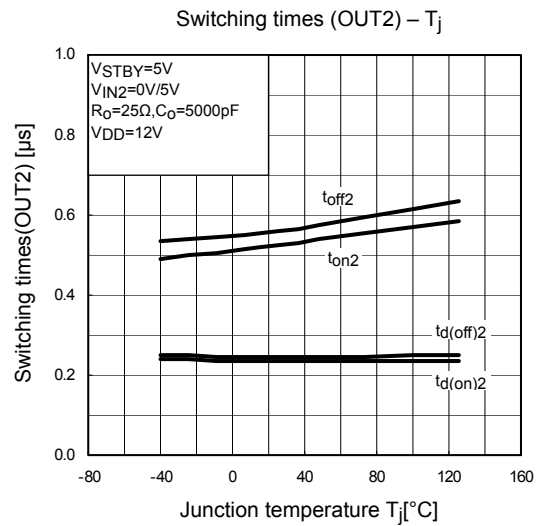
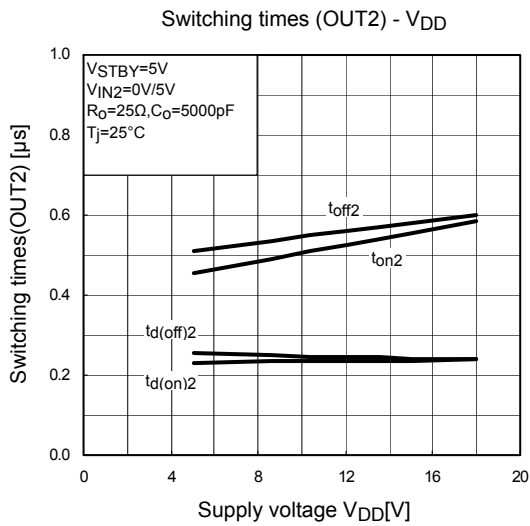
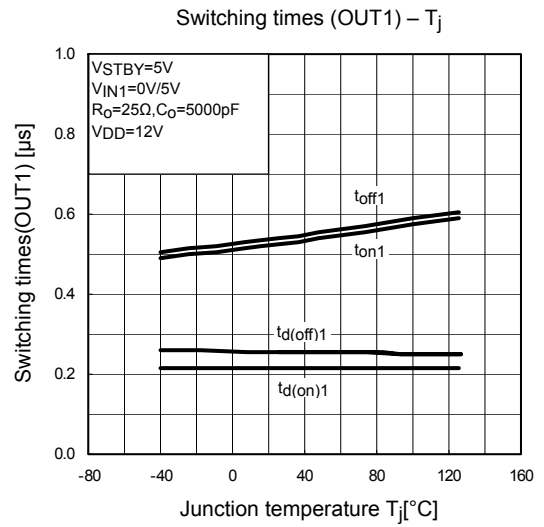
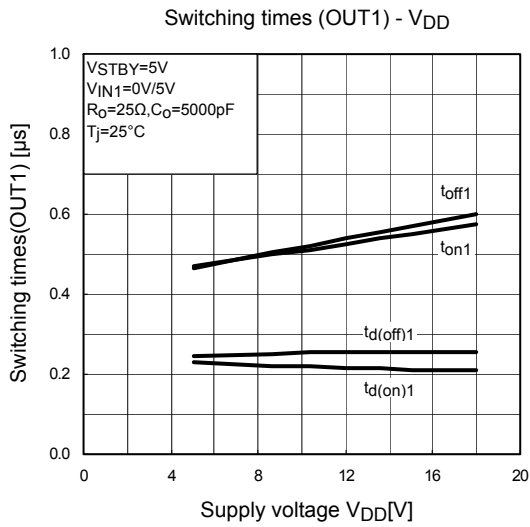








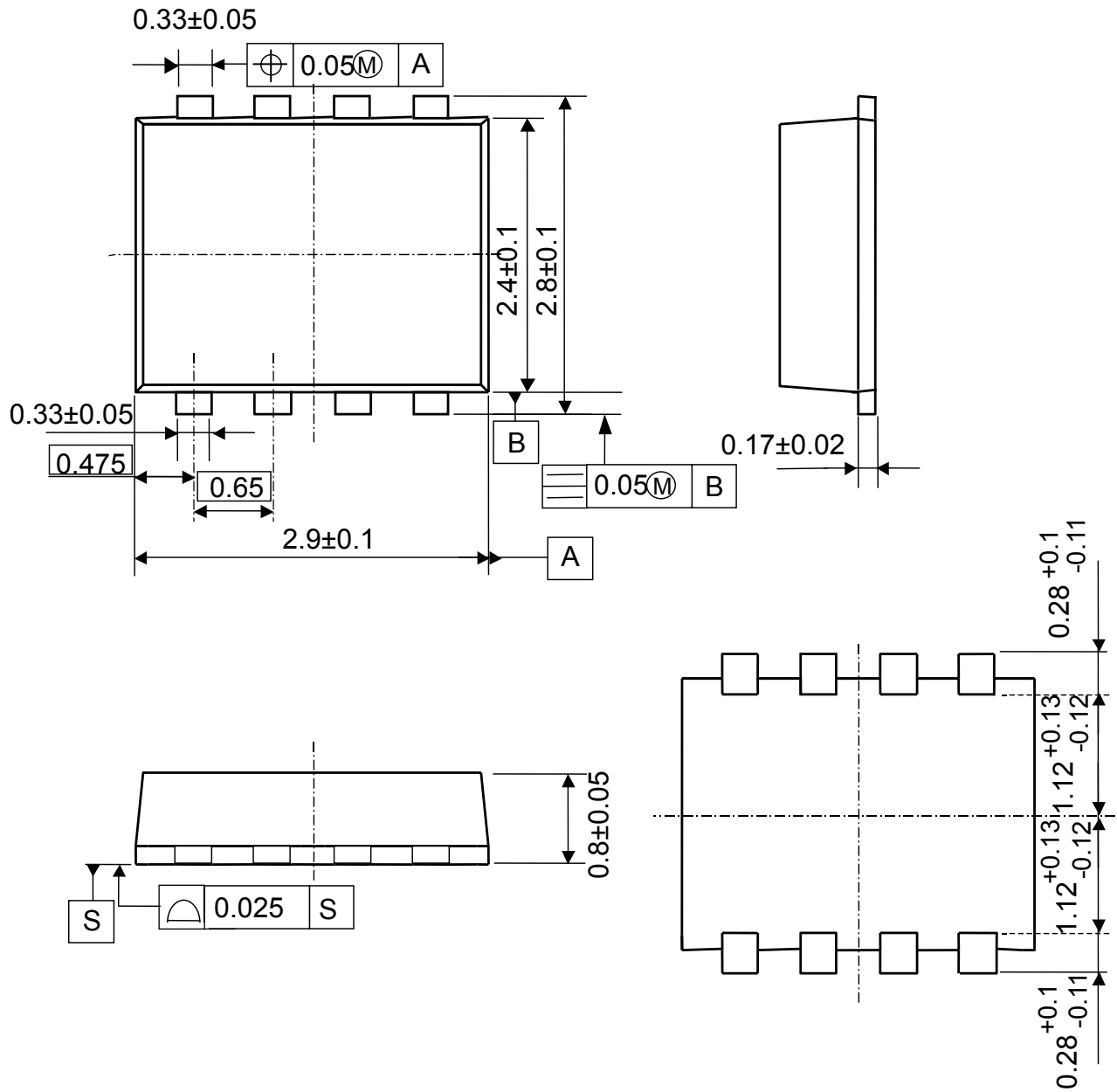




**Package Dimensions**

SON8-P-0303-0.65

Unit: mm



Weight: 0.017g(typ.)

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