

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSII)

SSM3K14T

DC-DC Converter

High Speed Switching Applications

Unit: mm

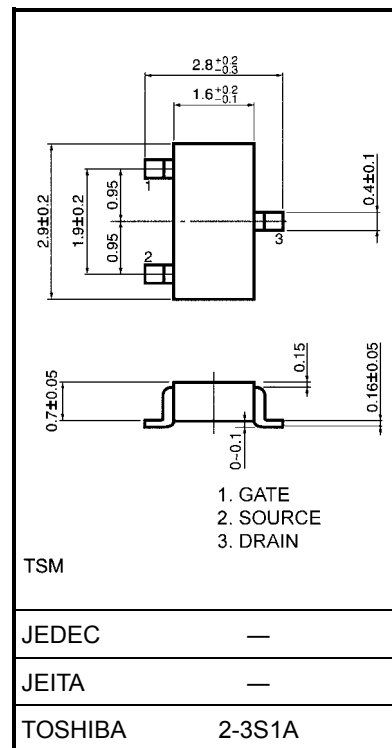
- Small Package
- Low ON-resistance: $R_{on} = 39 \text{ m}\Omega$ (max) (@ $V_{GS} = 10 \text{ V}$)
: $R_{on} = 57 \text{ m}\Omega$ (max) (@ $V_{GS} = 4.5 \text{ V}$)
- High speed: $t_{on} = 24 \text{ ns}$ (typ.)
: $t_{off} = 19 \text{ ns}$ (typ.)

Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristic		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	30	V
Gate-Source voltage		V_{GSS}	± 20	V
Drain current	DC	I_D	4.0	A
	Pulse	I_{DP} (Note 2)	8.0	
Drain power dissipation ($T_a = 25^\circ\text{C}$)		P_D (Note 1)	0.7	W
		$t = 10 \text{ s}$	1.25	
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	$-55 \sim 150$	$^\circ\text{C}$

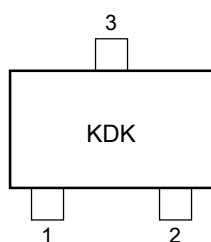
Note 1: Mounted on FR4 board
($25.4 \text{ mm} \times 25.4 \text{ mm} \times 1.6 \text{ t}$, Cu pad: 645 mm^2)

Note 2: The pulse width limited by max channel temperature.

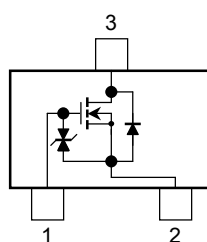


Weight: 10 mg (typ.)

Marking



Equivalent Circuit



Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

The Channel-to-Ambient thermal resistance $R_{th(ch-a)}$ and the drain power dissipation P_D vary according to the board material, board area, board thickness and pad area, and are also affected by the environment in which the product is used. When using this device, please take heat dissipation fully into account.

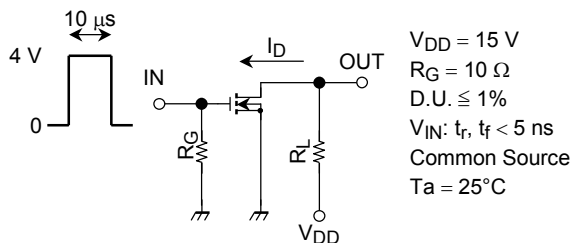
Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0$	—	—	± 1	μA
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = 1 \text{ mA}, V_{GS} = 0$	30	—	—	V
	$V_{(BR)DSX}$	$I_D = 1 \text{ mA}, V_{GS} = -20 \text{ V}$	15	—	—	
Drain Cut-off current	I_{DSS}	$V_{DS} = 30 \text{ V}, V_{GS} = 0$	—	—	1	μA
Gate threshold voltage	V_{th}	$V_{DS} = 5 \text{ V}, I_D = 0.1 \text{ mA}$	1.0	—	2.5	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 5 \text{ V}, I_D = 2 \text{ A}$ (Note 3)	3.2	6.4	—	S
Drain-Source ON resistance	$R_{DS(ON)}$	$I_D = 2 \text{ A}, V_{GS} = 10 \text{ V}$ (Note 3)	—	31	39	$\text{m}\Omega$
		$I_D = 2 \text{ A}, V_{GS} = 4.5 \text{ V}$ (Note 3)	—	45	57	
		$I_D = 2 \text{ A}, V_{GS} = 4.0 \text{ V}$ (Note 3)	—	50	67	
Total gate charge	Q_g	$V_{DD} \approx 24 \text{ V}, I_D = 4 \text{ A}, V_{GS} = 4 \text{ V}$	—	5.0	—	nC
Input capacitance	C_{iss}	$V_{DS} = 15 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	460	—	pF
Reverse transfer capacitance	C_{rss}	$V_{DS} = 15 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	62	—	pF
Output capacitance	C_{oss}	$V_{DS} = 15 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	106	—	pF
Switching time	Rise time	t_r	—	15	—	ns
	Turn-on time	t_{on}	—	24	—	
	Fall time	t_f	—	6	—	
	Turn-off time	t_{off}	—	19	—	

Note 3: Pulse test

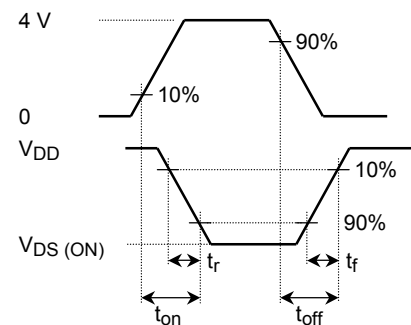
Switching Time Test Circuit

(a) Test circuit



(b) V_{IN}

(c) V_{OUT}



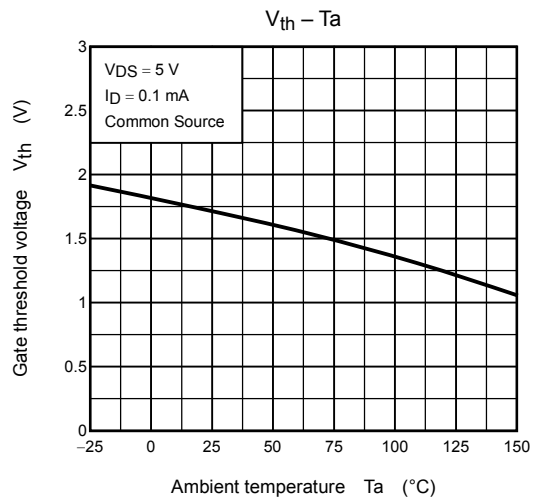
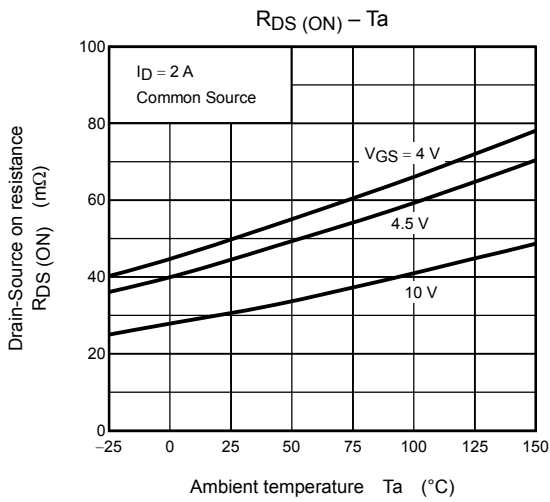
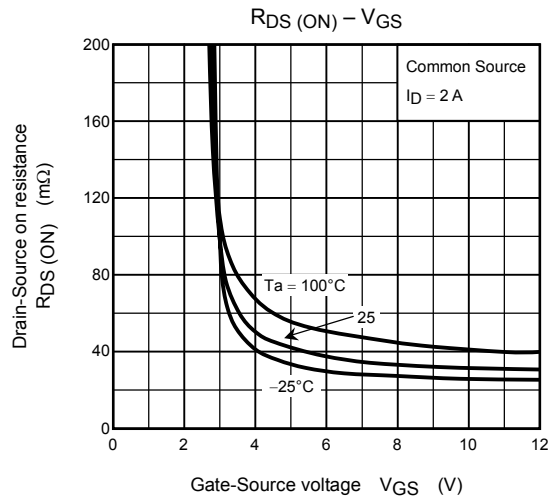
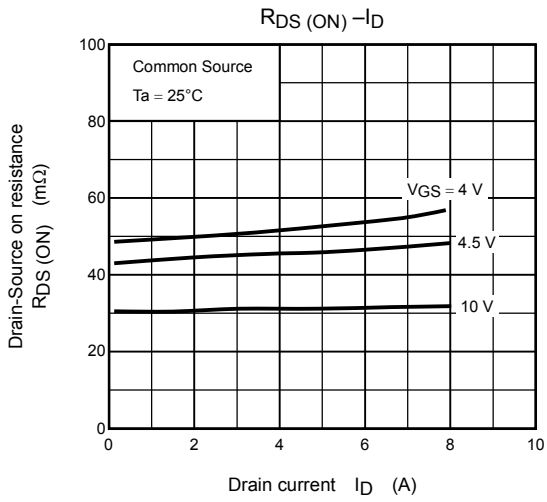
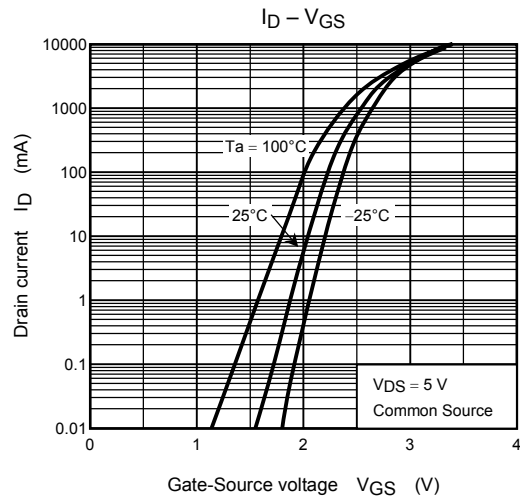
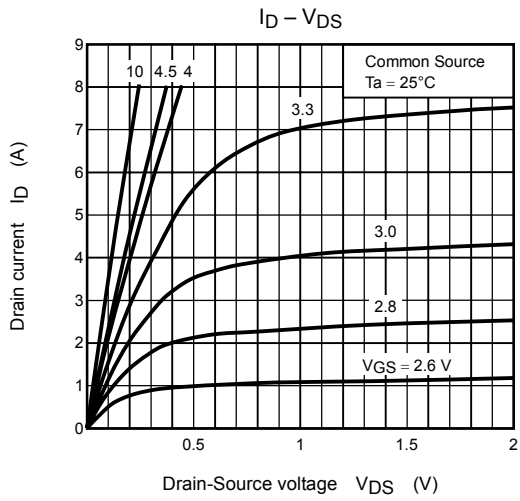
Precaution

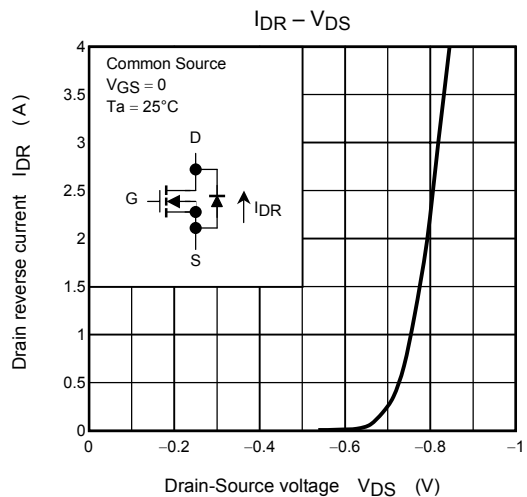
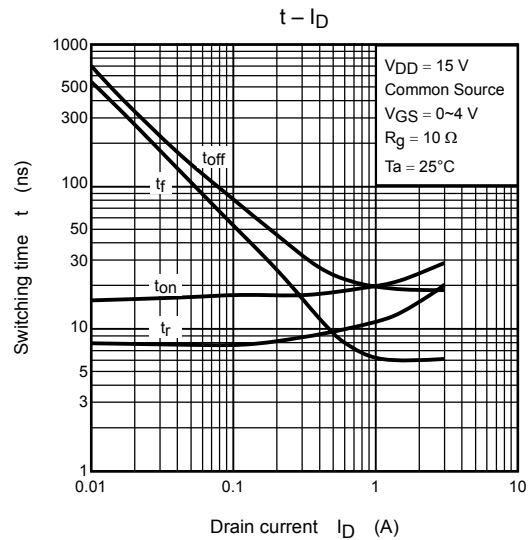
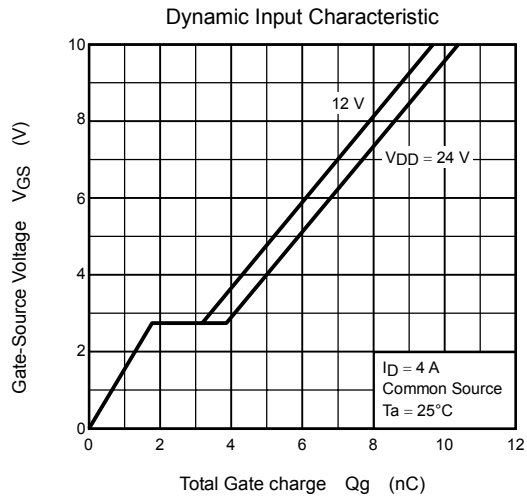
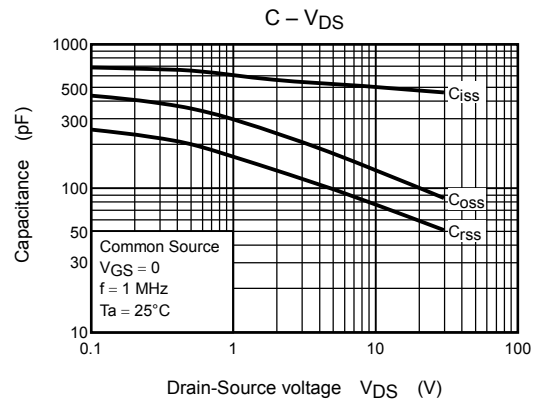
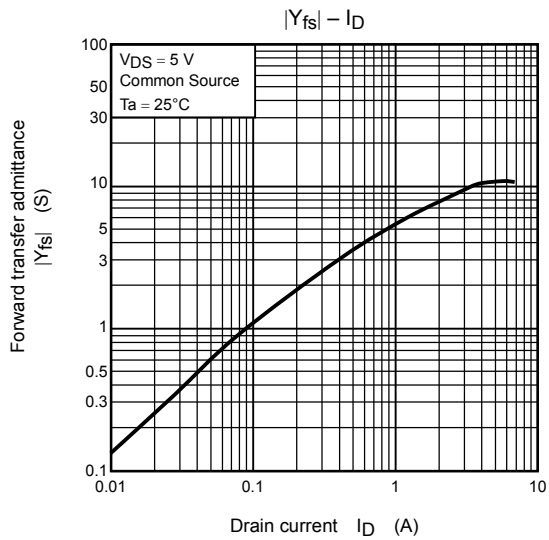
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = 100 \mu\text{A}$ for this product. For normal switching operation, $V_{GS(on)}$ requires higher voltage than V_{th} and $V_{GS(off)}$ requires lower voltage than V_{th} .

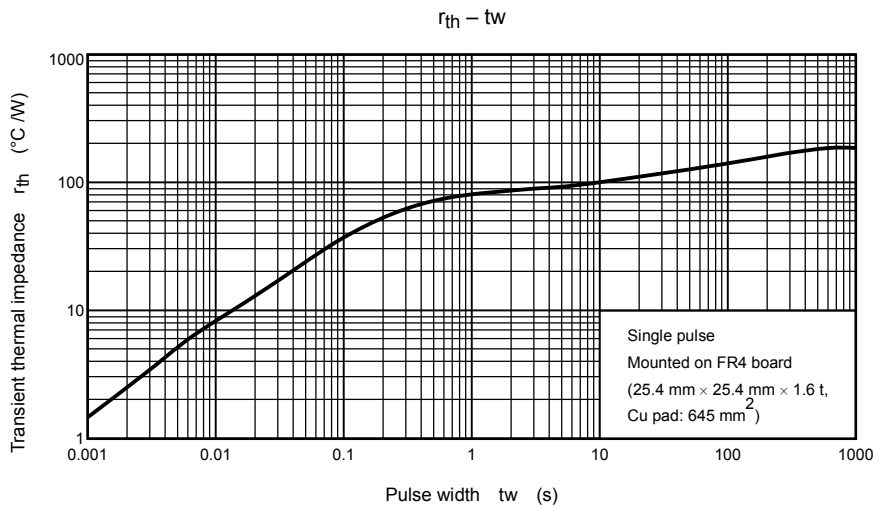
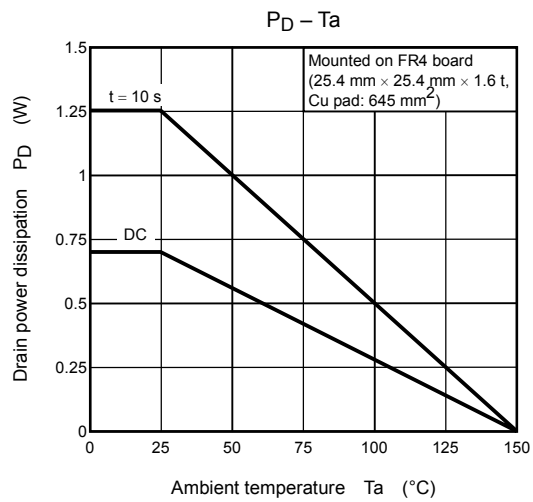
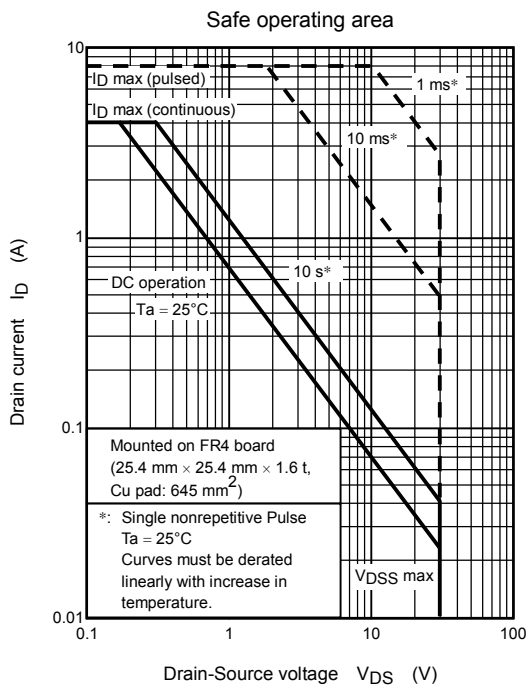
(relationship can be established as follows: $V_{GS(off)} < V_{th} < V_{GS(on)}$)

Please take this into consideration for using the device.

V_{GS} recommended voltage of 4 V or higher to turn on this product.







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