

Category TOSHIBA Field Effect Transistor Silicon N Channel MOS Type/Category

SSM3K12T

DC-DC Converter
High Speed Switching Applications

Unit: mm

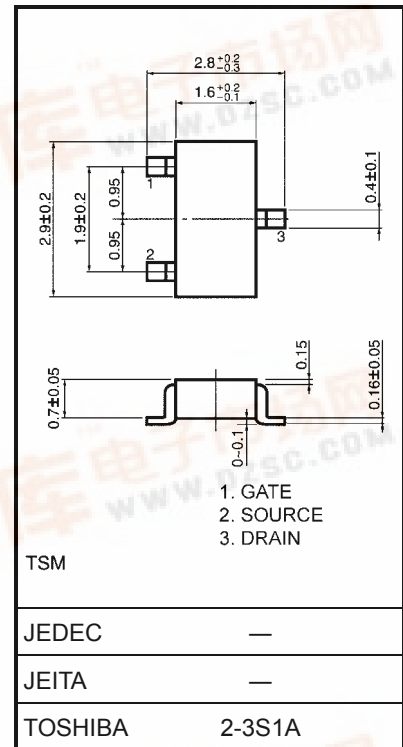
- Small Package
- Low ON-resistance : $R_{on} = 95 \text{ m}\Omega$ (max) (@ $V_{GS} = 10 \text{ V}$)
: $R_{on} = 145 \text{ m}\Omega$ (max) (@ $V_{GS} = 4.5 \text{ V}$)
- High speed : $t_{on} = 21 \text{ ns}$
: $t_{off} = 16 \text{ ns}$

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Drain-Source voltage	V_{DS}	30	V
Gate-Source voltage	V_{GS}	± 20	V
Drain current	DC	I_D	3.0
	Pulse	I_{DP} (Note 2)	6.0
Drain power dissipation (Ta = 25°C)	P_D (Note 1)	0.7	W
	$t = 10 \text{ s}$	1.25	
Channel temperature	T_{ch}	150	°C
Storage temperature range	T_{stg}	-55~150	°C

Note 1: Mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 t, Cu pad: 645 mm²)

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



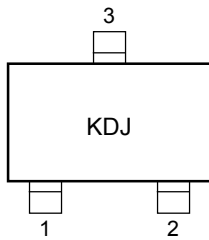
Weight: 10 mg (typ.)

Handling Precaution

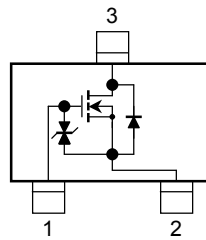
When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static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

Marking



Equivalent Circuit



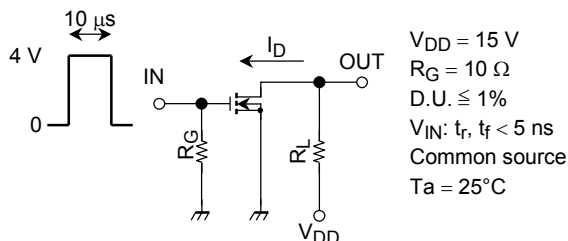
Electrical Characteristics (Ta = 25°C)

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
Drain Cut-off current	I_{DSS}	$V_{DS} = 30\text{ V}, V_{GS} = 0$	—	—	1	μA
Gate threshold voltage	V_{th}	$V_{DS} = 5\text{ V}, I_D = 0.1\text{ mA}$	1.1	—	1.8	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 5\text{ V}, I_D = 1.5\text{ A}$ (Note 3)	1.8	3.2	—	S
Drain-Source ON resistance	$R_{DS(ON)}$	$I_D = 1.5\text{ A}, V_{GS} = 10\text{ V}$ (Note 3)	—	78	95	m Ω
		$I_D = 1.5\text{ A}, V_{GS} = 4.5\text{ V}$ (Note 3)	—	117	145	
		$I_D = 1.5\text{ A}, V_{GS} = 4.0\text{ V}$ (Note 3)	—	135	175	
Total gate charge	Q_g	$V_{DD} = 24\text{ V}, I_D = 3\text{ A}, V_{GS} = 4\text{ V}$	—	2.6	—	nC
Input capacitance	C_{iss}	$V_{DS} = 15\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	120	—	pF
Reverse transfer capacitance	C_{rss}	$V_{DS} = 15\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	20	—	pF
Output capacitance	C_{oss}	$V_{DS} = 15\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	68	—	pF
Switching time	Rise time	t_r	—	13	—	ns
	Turn-on time	t_{on}	$V_{DD} = 15\text{ V}, I_D = 1.5\text{ A}$		—	
	Fall time	t_f	$V_{GS} = 0\text{--}4\text{ V}, R_G = 10\ \Omega$		—	
	Turn-off time	t_{off}	—	16	—	

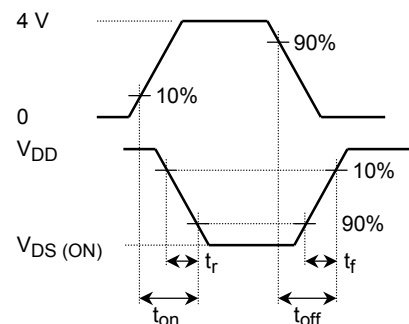
Note 3 : Pulse test

Switching Time Test Circuit

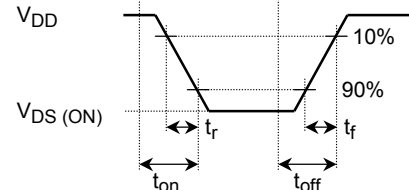
(a) Test circuit



(b) V_{IN}



(c) V_{OUT}



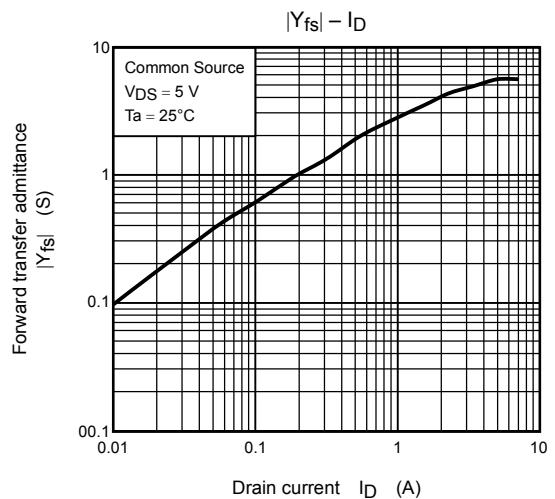
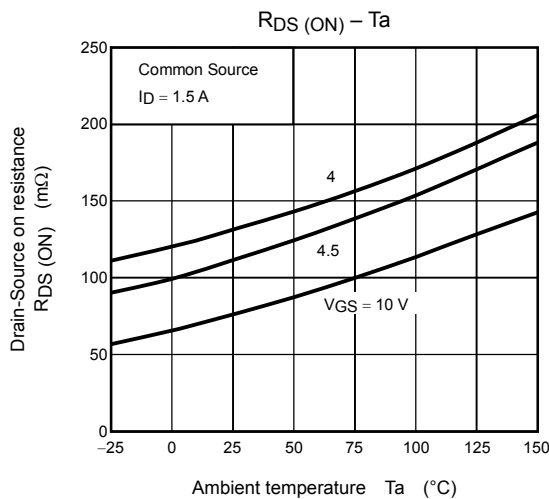
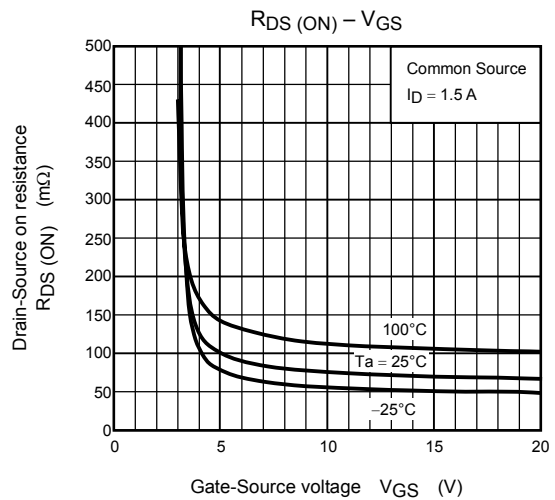
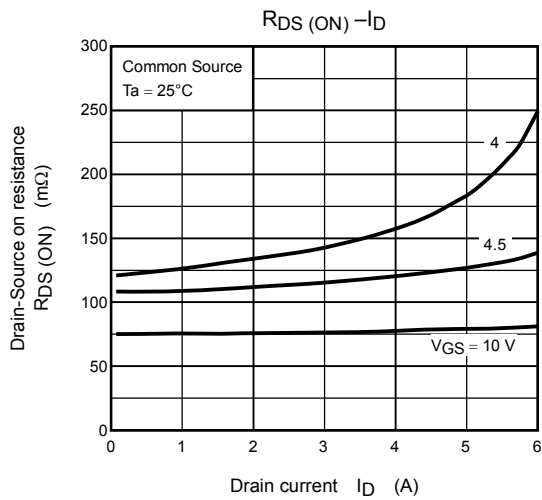
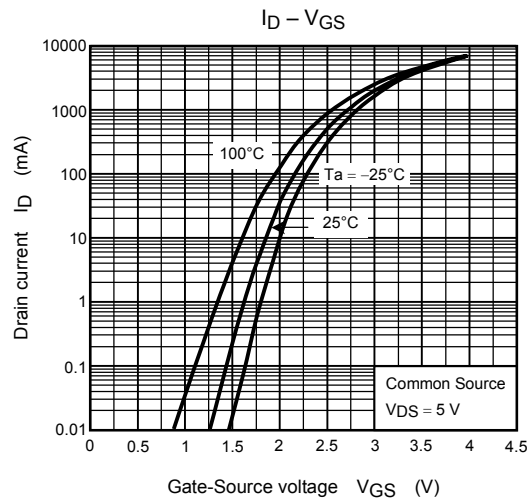
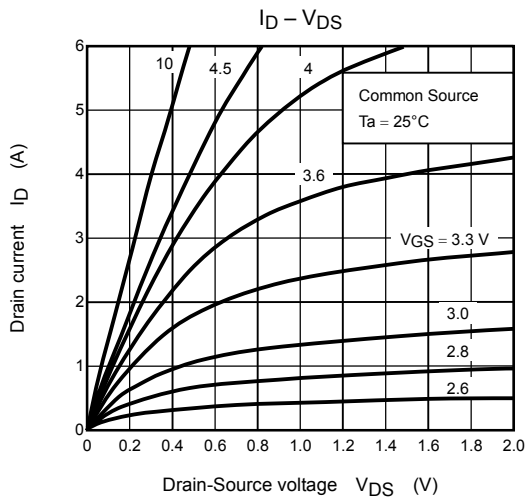
Precaution

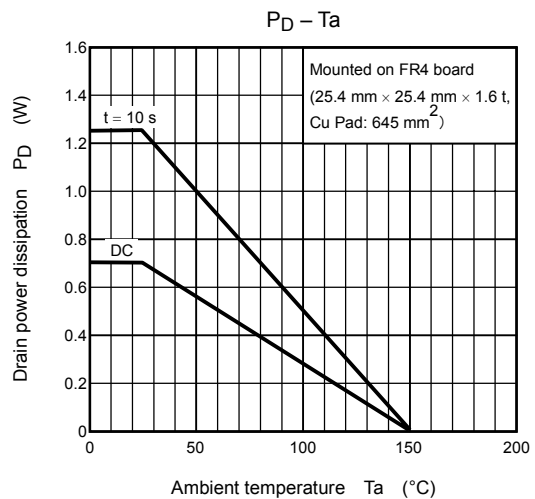
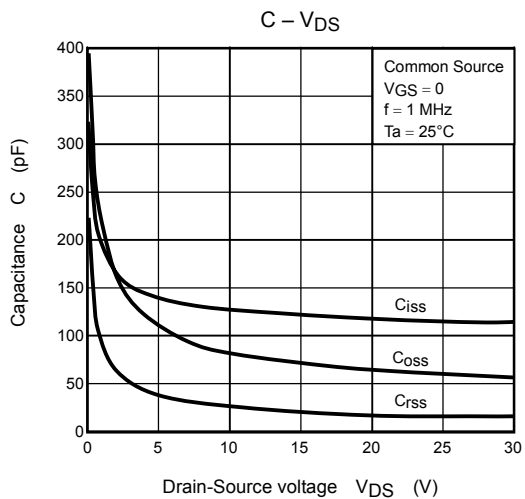
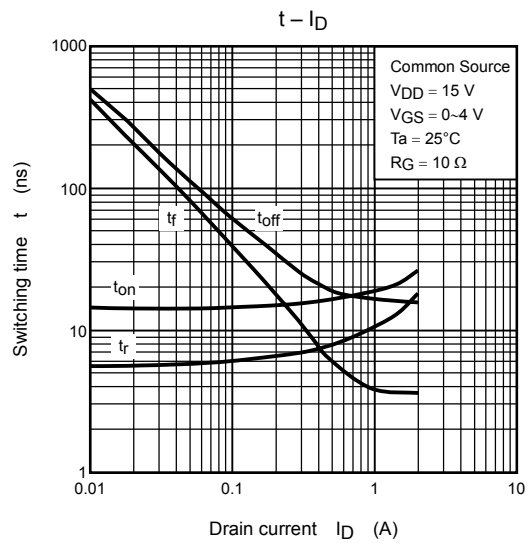
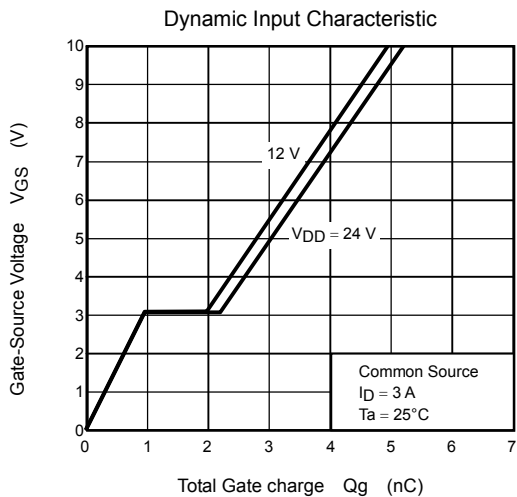
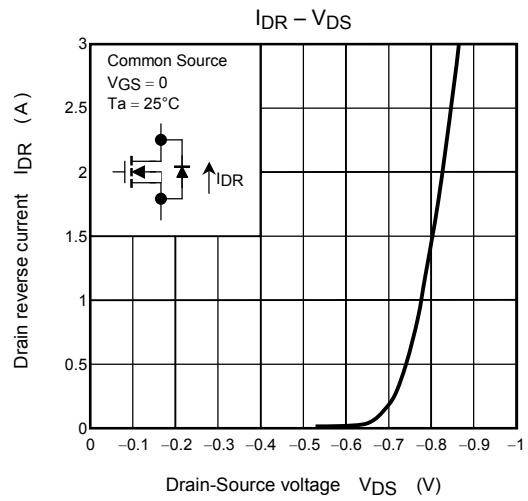
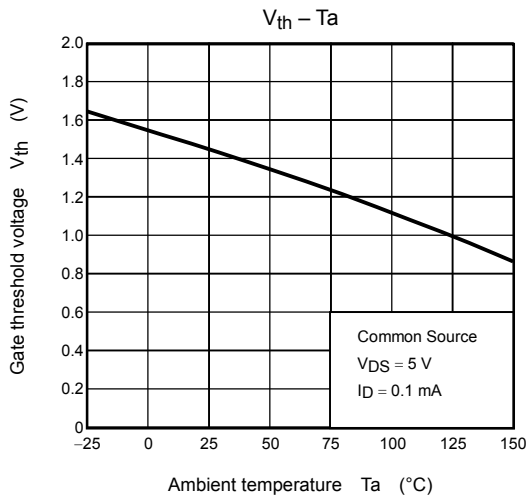
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = 100\ \mu\text{A}$ for this product. For normal switching operation, $V_{GS(ON)}$ requires higher voltage than V_{th} and $V_{GS(OFF)}$ requires lower voltage than V_{th} .

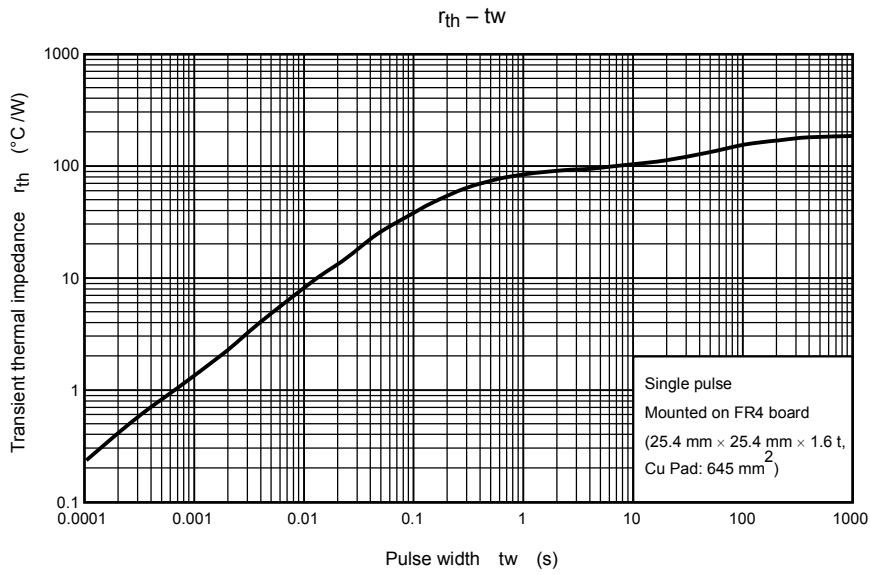
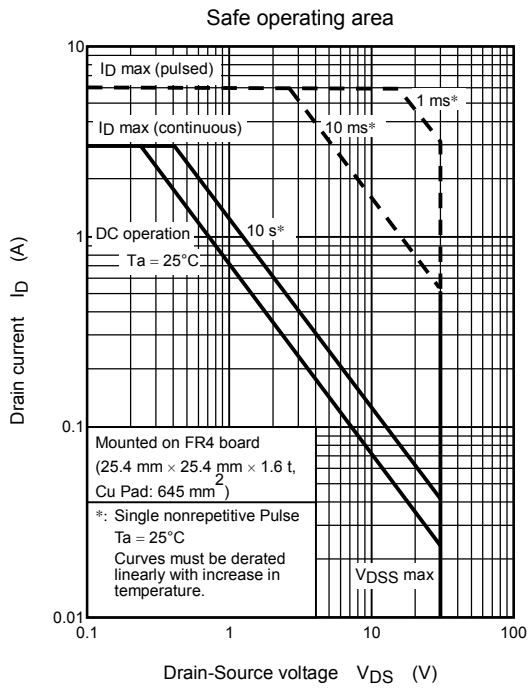
(relationship can be established as follows: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$)

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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