

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

SSM6N48FU

Load Switching Applications

- 2.5-V drive
- N-ch 2-in-1
- Low ON-resistance: $R_{DS(ON)} = 3.2 \Omega$ (max) (@ $V_{GS} = 4.0$ V)
 $R_{DS(ON)} = 5.4 \Omega$ (max) (@ $V_{GS} = 2.5$ V)

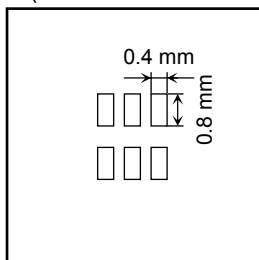
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$) (Q1, Q2 Common)

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DSS}	30	V
Gate-Source voltage		V_{GSS}	± 20	V
Drain current	DC	I_D	100	mA
	Pulse	I_{DP}	400	
Power dissipation		P_D (Note 1)	300	mW
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 150	$^\circ\text{C}$

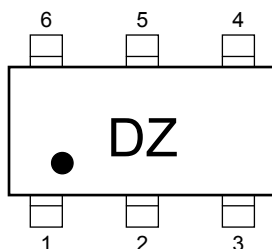
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

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.).

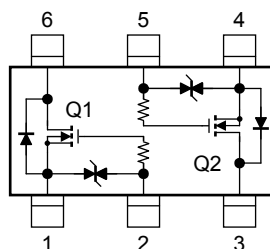
Note 1: Total rating
 Mounted on an FR4 board
 (25.4 mm $\times$ 25.4 mm $\times$ 1.6 mm, Cu Pad: 0.32mm² $\times$ 6)



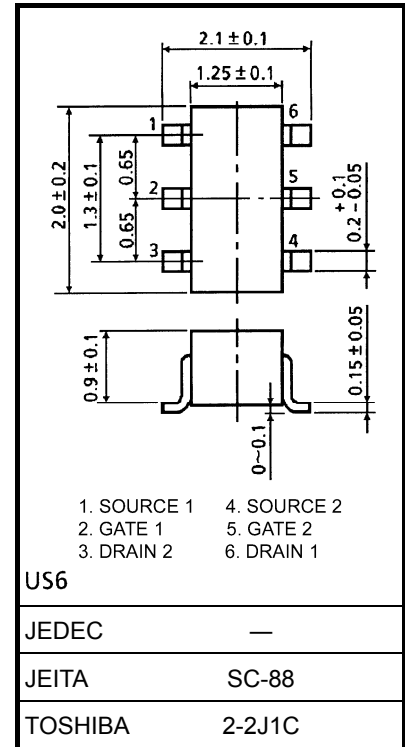
Marking



Equivalent Circuit (top view)



Unit: mm



Weight: 6.8 mg (typ.)

Electrical Characteristics (Ta = 25°C) (Q1, Q2 Common)

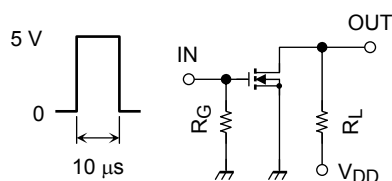
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = 0.1 \text{ mA}$, $V_{GS} = 0 \text{ V}$	30	—	—	V
	$V_{(BR)DSX}$	$I_D = 0.1 \text{ mA}$, $V_{GS} = -10 \text{ V}$ (Note 3)	16	—	—	
Drain cut-off current	I_{DSS}	$V_{DS} = 30 \text{ V}$, $V_{GS} = 0 \text{ V}$	—	—	1	μA
Gate leakage current	I_{GSS}	$V_{GS} = \pm 12 \text{ V}$, $V_{DS} = 0 \text{ V}$	—	—	± 1	μA
Gate threshold voltage	V_{th}	$V_{DS} = 3 \text{ V}$, $I_D = 0.1 \text{ mA}$	0.8	—	1.5	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 3 \text{ V}$, $I_D = 10 \text{ mA}$ (Note 2)	33	—	—	mS
Drain-Source ON resistance	$R_{DS(ON)}$	$I_D = 10 \text{ mA}$, $V_{GS} = 4 \text{ V}$ (Note 2)	—	2.0	3.2	Ω
		$I_D = 10 \text{ mA}$, $V_{GS} = 2.5 \text{ V}$ (Note 2)	—	3.0	5.4	
Input capacitance	C_{iss}	$V_{DS} = 3 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	—	15.1	—	pF
Reverse transfer capacitance	C_{rss}		—	7.8	—	
Output capacitance	C_{oss}		—	12.4	—	
Switching time	Turn-on time	$V_{DD} = 5 \text{ V}$, $I_D = 10 \text{ mA}$, $V_{GS} = 0 \text{ to } 5 \text{ V}$, $R_G = 50 \Omega$	—	35	—	ns
	Turn-off time		—	180	—	
Drain-source forward voltage	V_{DSF}	$I_D = -100 \text{ mA}$, $V_{GS} = 0 \text{ V}$ (Note 2)	—	-0.83	-1.2	V

Note 2: Pulse test

Note 3: If a reverse bias is applied between gate and source, this device enters $V_{(BR)DSX}$ mode. Note that the drain-source breakdown voltage is lowered in this mode.

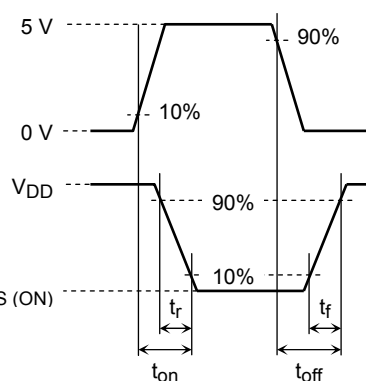
Switching Time Test Circuit

(a) Test circuit

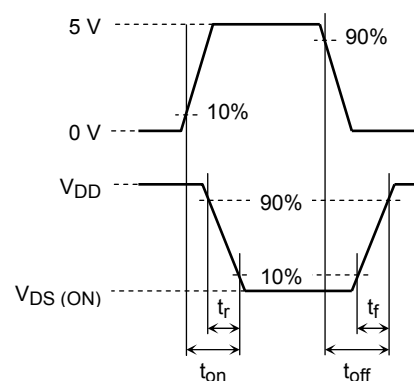


$V_{DD} = 5 \text{ V}$
 $R_G = 50 \Omega$
Duty $\leq 1\%$
 V_{IN} : t_r , $t_f < 5 \text{ ns}$
Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN}



(c) V_{OUT}



Precaution

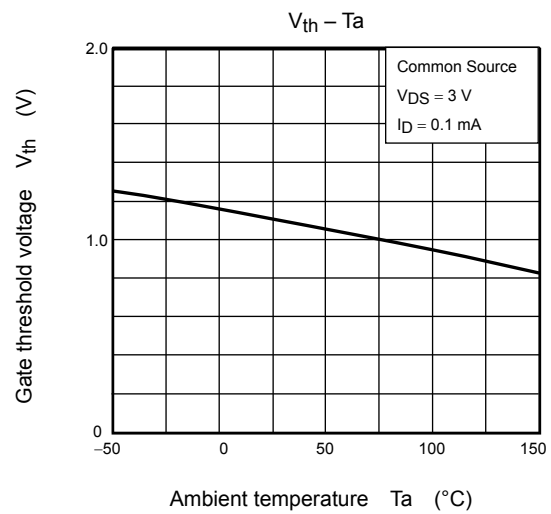
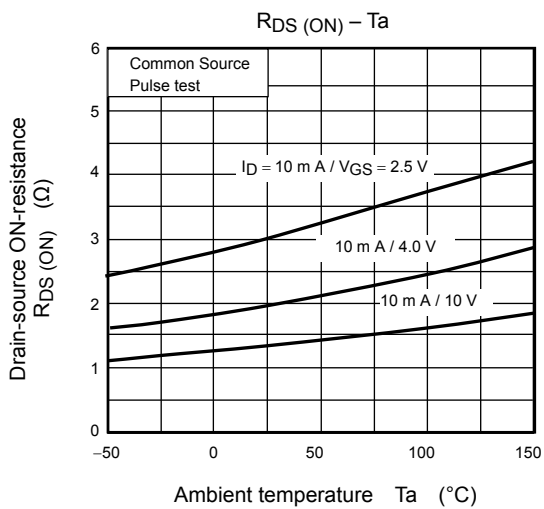
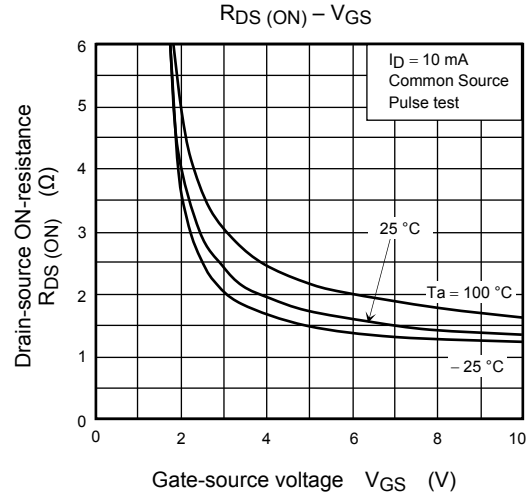
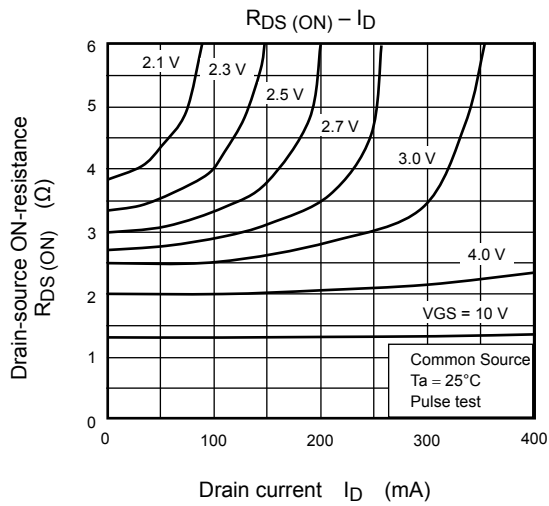
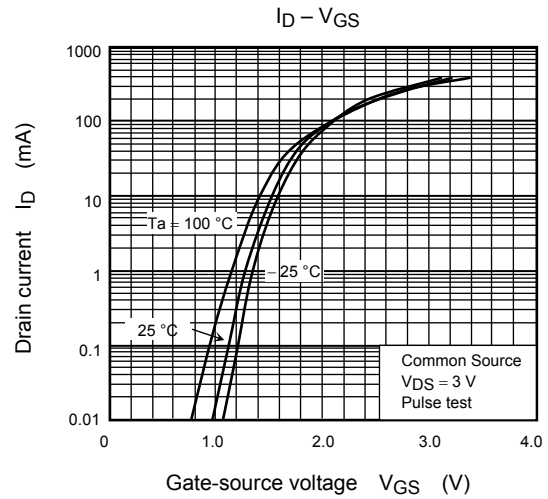
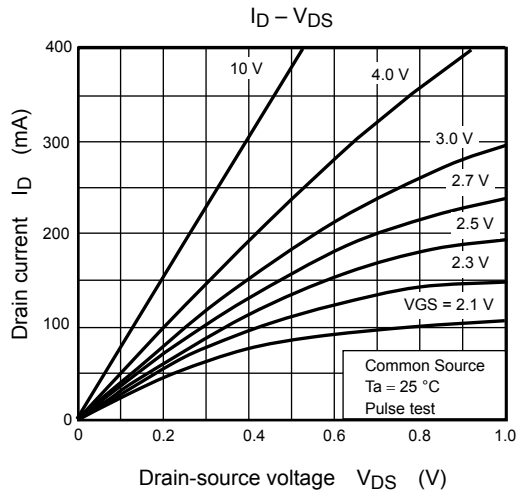
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = 0.1 \text{ mA}$ for this product. For normal switching operation, $V_{GS(ON)}$ requires higher voltage than V_{th} and $V_{GS(OFF)}$ requires lower voltage than V_{th} . (Relationship can be established as follows: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$)

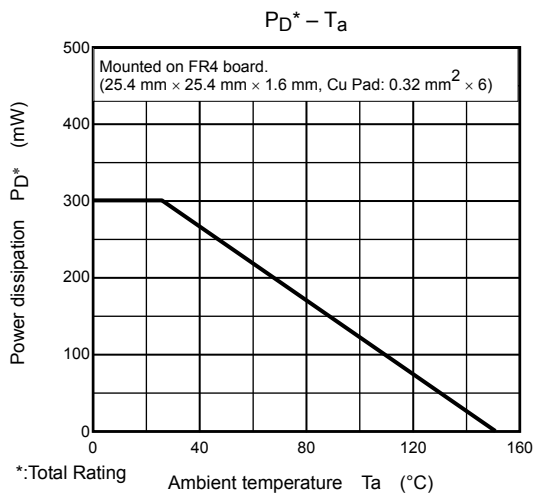
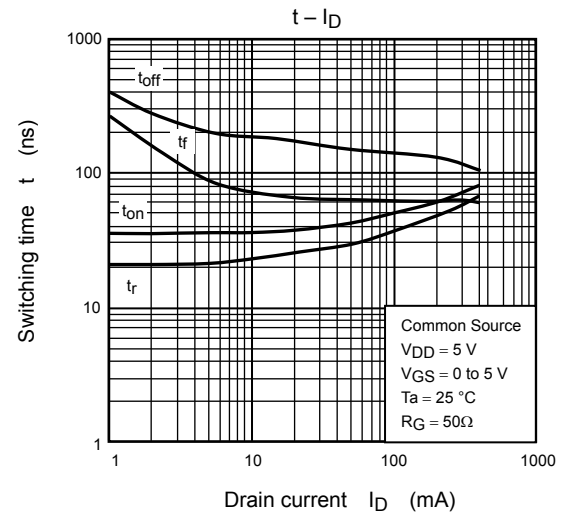
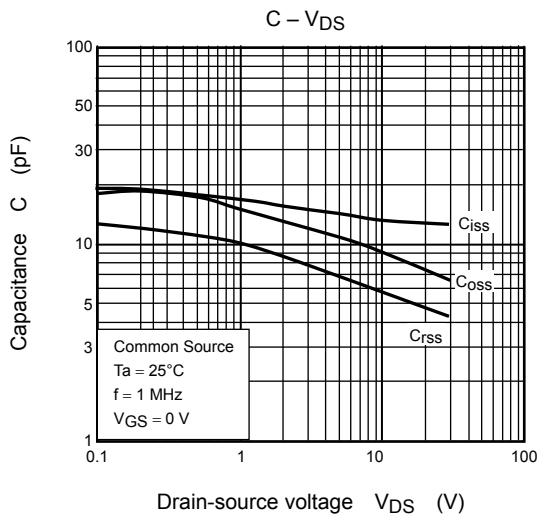
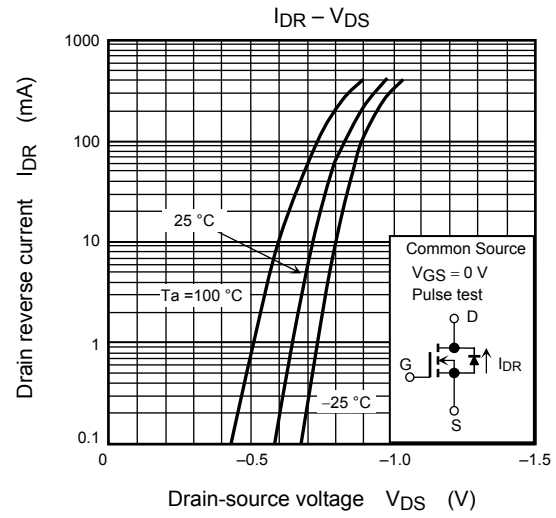
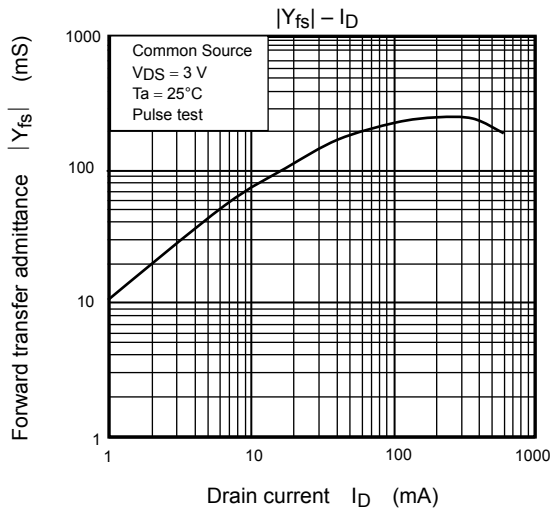
Please take this into consideration for using the device.

Do not use this device under avalanche mode. It may cause the device to break down.

Handling Precaution

When handling individual devices (which are not yet mounting 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.





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