

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

SSM4K27CT

○ Switching Applications

- Small package
- Low on-resistance: $R_{DS(ON)} = 205 \text{ m}\Omega$ (max) (@ $V_{GS} = 4.0 \text{ V}$)
 $R_{DS(ON)} = 260 \text{ m}\Omega$ (max) (@ $V_{GS} = 2.5 \text{ V}$)
 $R_{DS(ON)} = 390 \text{ m}\Omega$ (max) (@ $V_{GS} = 1.8 \text{ V}$)

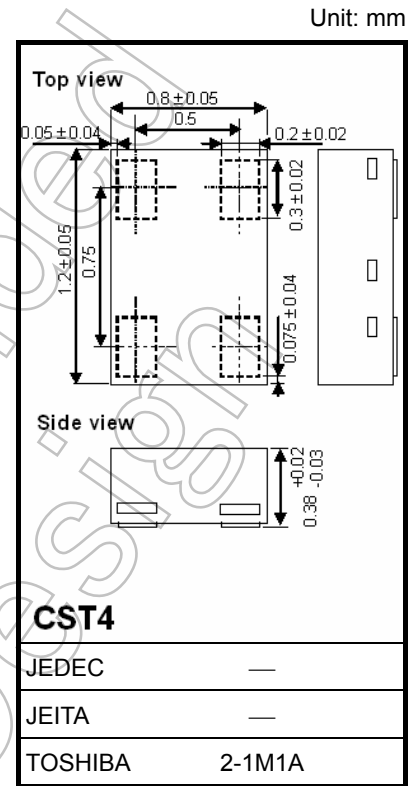
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Drain-Source voltage	V_{DSS}	20	V
Gate-Source voltage	V_{GSS}	± 12	V
Drain current	DC	I_D	0.5
	Pulse	I_{DP}	1.0
Power dissipation	P_D (Note 1)	400	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.

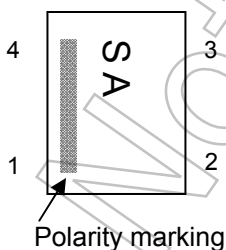
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

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

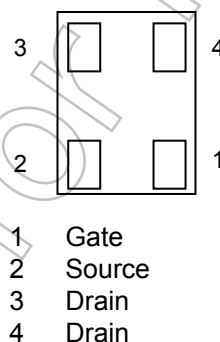


Weight: 1.1 mg (typ.)

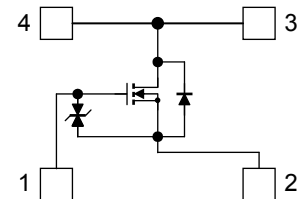
Marking (top view)



Electrode Layout (bottom view)



Equivalent Circuit (top view)



Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), ensure that the environment is protected against static 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.

Start of commercial production
2005-02

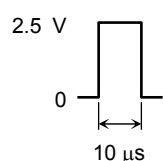
Electrical Characteristics (Ta=25°C)

Characteristics	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 12\text{ V}$, $V_{DS} = 0$	—	—	± 1	μA
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = 1\text{ mA}$, $V_{GS} = 0$	20	—	—	V
	$V_{(BR)DSX}$	$I_D = 1\text{ mA}$, $V_{GS} = -12\text{ V}$	10	—	—	
Drain cut-off current	I_{DSS}	$V_{DS} = 20\text{ V}$, $V_{GS} = 0$	—	—	10	μA
Gate threshold voltage	V_{th}	$V_{DS} = 3\text{ V}$, $I_D = 1\text{ mA}$	0.5	—	1.1	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 3\text{ V}$, $I_D = 0.25\text{ A}$ (Note2)	0.8	1.6	—	S
Drain-Source on-resistance	$R_{DS(ON)}$	$I_D = 0.25\text{ A}$, $V_{GS} = 4\text{ V}$ (Note2)	—	175	205	$\text{m}\Omega$
		$I_D = 0.25\text{ A}$, $V_{GS} = 2.5\text{ V}$ (Note2)	—	200	260	
		$I_D = 0.10\text{ A}$, $V_{GS} = 1.8\text{ V}$ (Note2)	—	250	390	
Input capacitance	C_{iss}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0$, $f = 1\text{ MHz}$	—	174	—	pF
Reverse transfer capacitance	C_{rss}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0$, $f = 1\text{ MHz}$	—	25	—	pF
Output capacitance	C_{oss}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0$, $f = 1\text{ MHz}$	—	31	—	pF
Switching time	Turn-on time	t_{on}	—	10	—	ns
	Turn-off time	t_{off}	—	12	—	

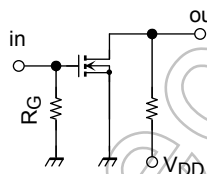
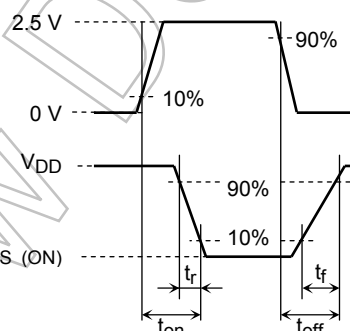
Note2: Pulse test

Switching Time Test Circuit

(a) Test Circuit



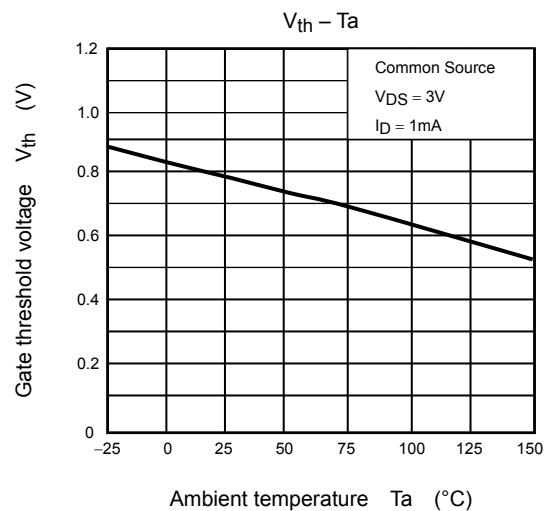
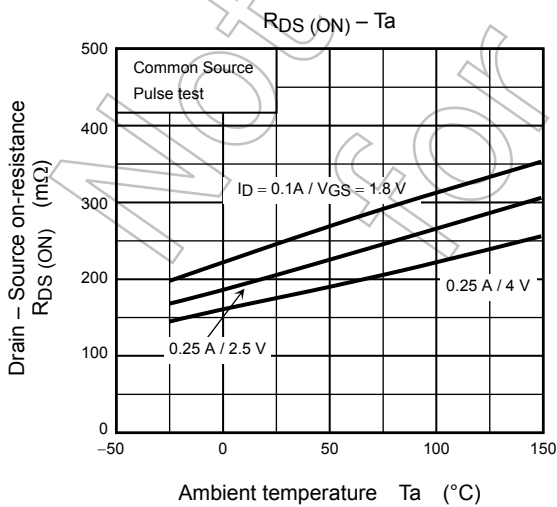
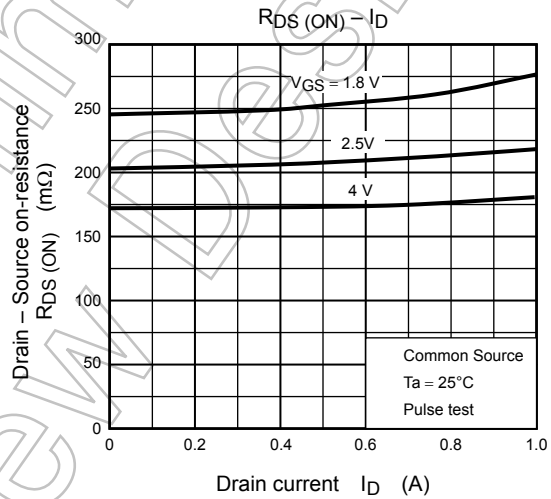
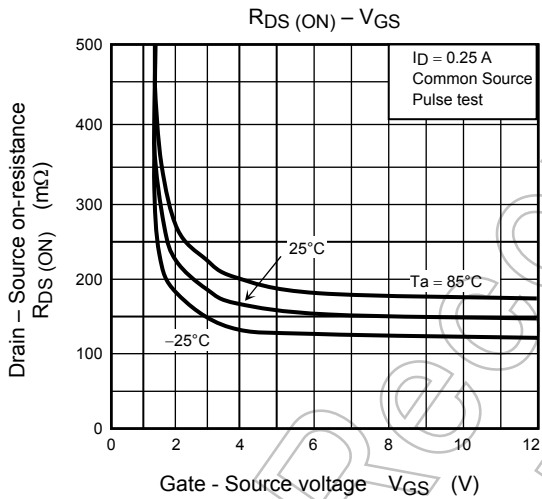
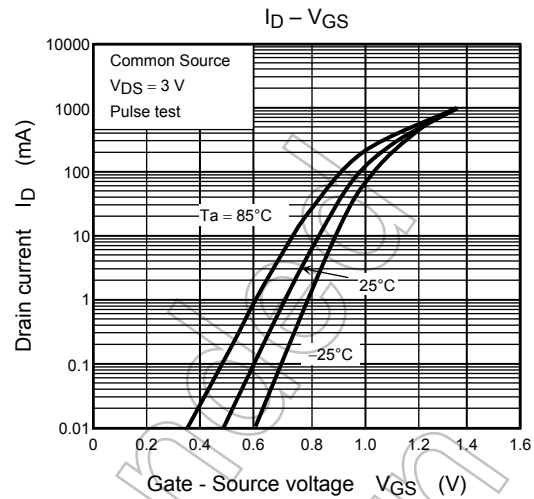
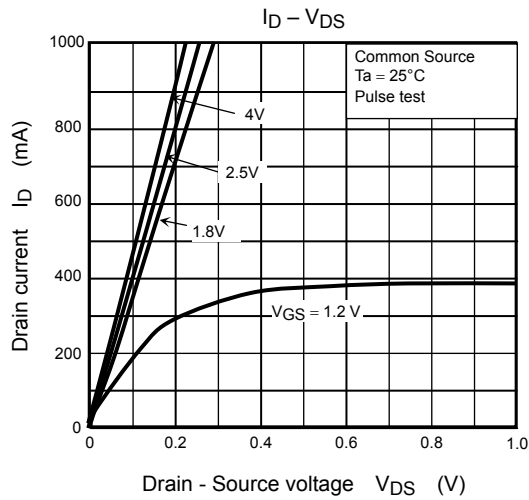
$V_{DD} = 10\text{ V}$
 $R_G = 4.7\ \Omega$
Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5\text{ ns}$
Common Source
 $T_a = 25^\circ\text{C}$

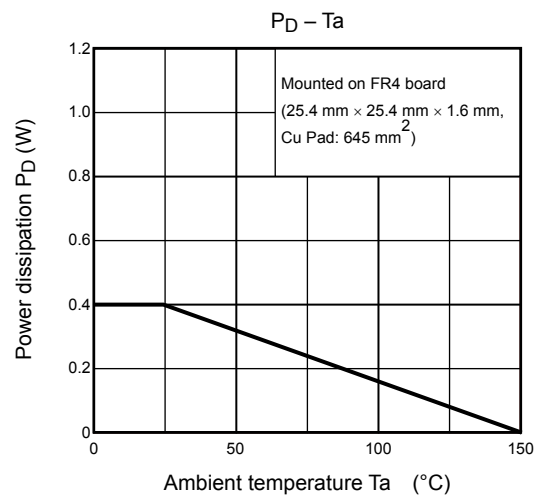
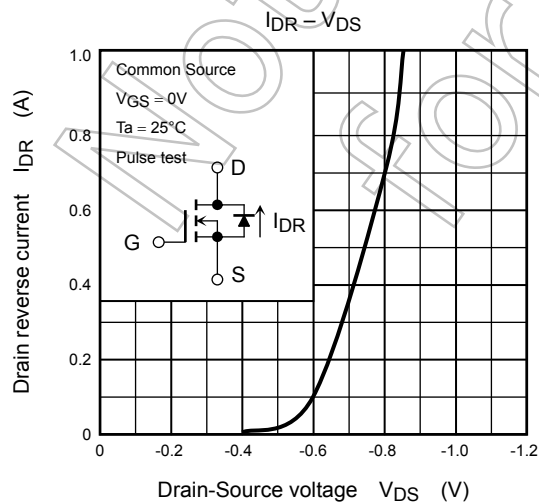
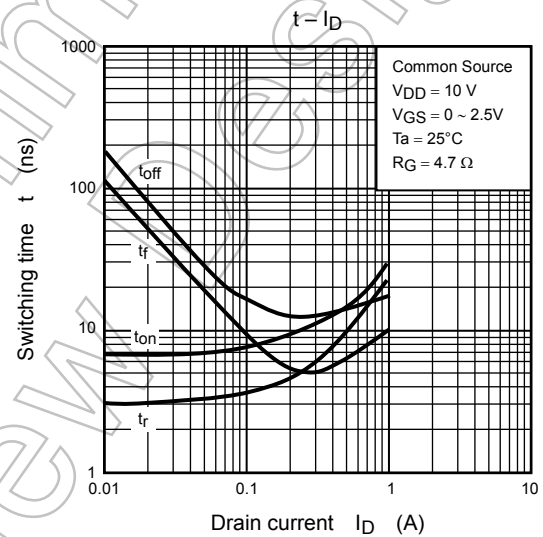
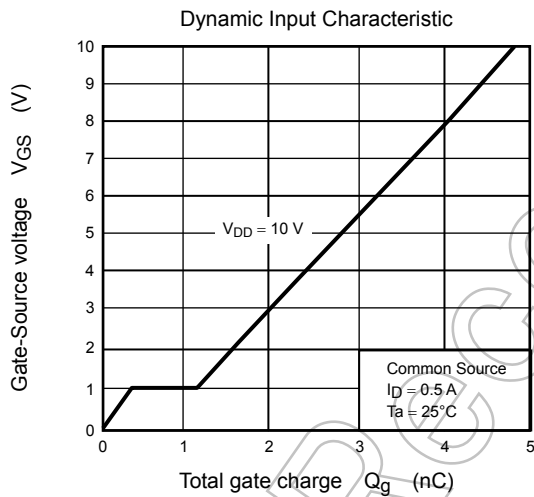
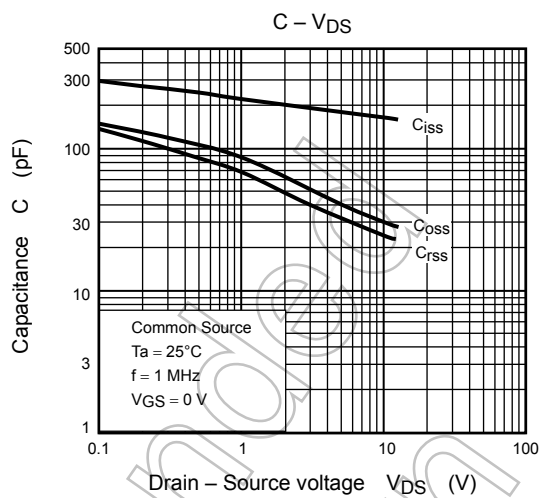
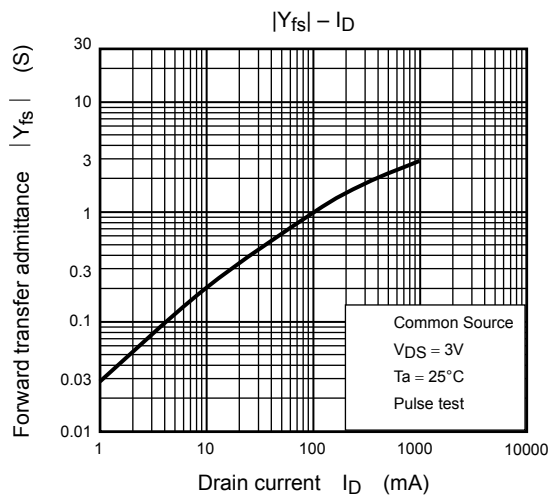
(b) V_{IN} (c) V_{OUT}

Precaution

V_{th} can be expressed as the voltage between the gate and source when the low operating current value is $I_D = 1\text{ mA}$ for this product. For normal switching operation, $V_{GS(ON)}$ requires a higher voltage than V_{th} and $V_{GS(OFF)}$ requires a lower voltage than V_{th} . (The relationship can be established as follows: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$.)

Be sure to take this into consideration when using the device.





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