

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type

SSM6P16FE

High Speed Switching Applications
Analog Switch Applications

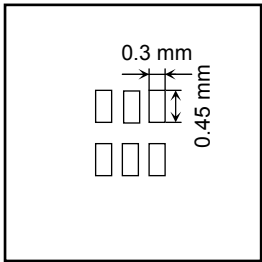
- Small package
- Low on-resistance : $R_{on} = 8\ \Omega$ (max) (@ $V_{GS} = -4\text{ V}$)
: $R_{on} = 12\ \Omega$ (max) (@ $V_{GS} = -2.5\text{ V}$)
: $R_{on} = 45\ \Omega$ (max) (@ $V_{GS} = -1.5\text{ V}$)

Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 Common)

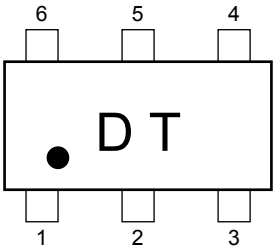
Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	-20	V
Gate-Source voltage		V_{GSS}	±10	V
Drain current	DC	I_D	-100	mA
	Pulse	I_{DP}	-200	
Drain power dissipation (Ta = 25°C)		P_D (Note 1)	150	mW
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	-55~150	°C

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).

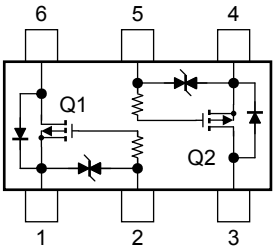
Note 1: Total rating, mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 0.135 mm² × 6)



Marking



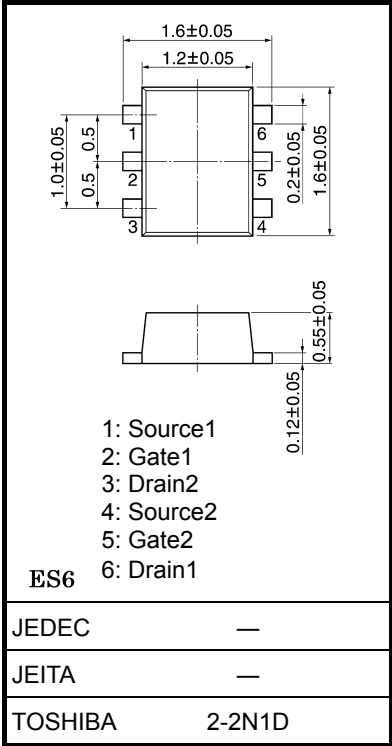
Equivalent Circuit (top view)



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.

Unit: mm

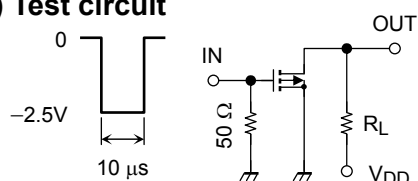


Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

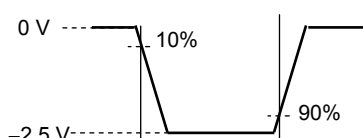
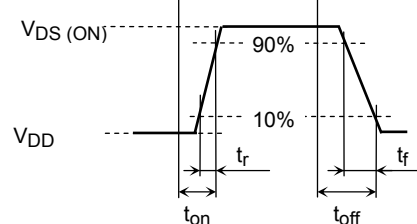
Characteristic	Symbol	Test Condition	MIN.	TYP.	MAX.	UNIT
Gate leakage current	I_{GSS}	$V_{GS} = \pm 10 \text{ V}, V_{DS} = 0$	—	—	± 1	μA
Drain-Source breakdown voltage	$V_{(BR) DSS}$	$I_D = -0.1 \text{ mA}, V_{GS} = 0$	-20	—	—	V
Drain cut-off current	I_{DSS}	$V_{DS} = -20 \text{ V}, V_{GS} = 0$	—	—	-1	μA
Gate threshold voltage	V_{th}	$V_{DS} = -3 \text{ V}, I_D = -0.1 \text{ mA}$	-0.6	—	-1.1	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = -3 \text{ V}, I_D = -10 \text{ mA}$	25	—	—	mS
Drain-Source on-resistance	$R_{DS(ON)}$	$I_D = -10 \text{ mA}, V_{GS} = -4 \text{ V}$	—	6	8	Ω
		$I_D = -10 \text{ mA}, V_{GS} = -2.5 \text{ V}$	—	8	12	
		$I_D = -1 \text{ mA}, V_{GS} = -1.5 \text{ V}$	—	18	45	
Input capacitance	C_{iss}	$V_{DS} = -3 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	11	—	pF
Reverse transfer capacitance	C_{rss}		—	3.7	—	pF
Output capacitance	C_{oss}		—	10	—	pF
Switching time	Turn-on time	t_{on}	$V_{DD} = -3 \text{ V}, I_D = -10 \text{ mA},$ $V_{GS} = 0 \sim -2.5 \text{ V}$	—	130	ns
	Turn-off time	t_{off}		—	190	

Switching Time Test Circuit

(a) Test circuit



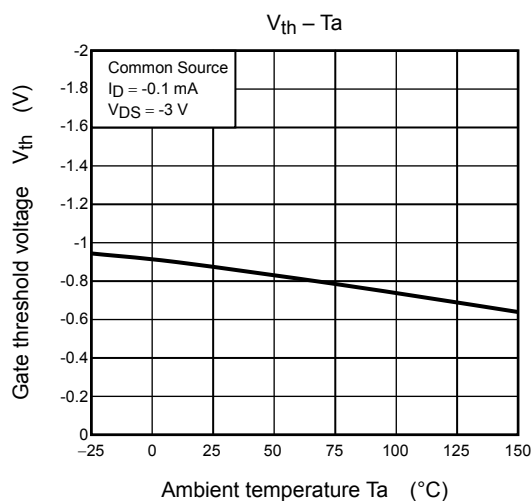
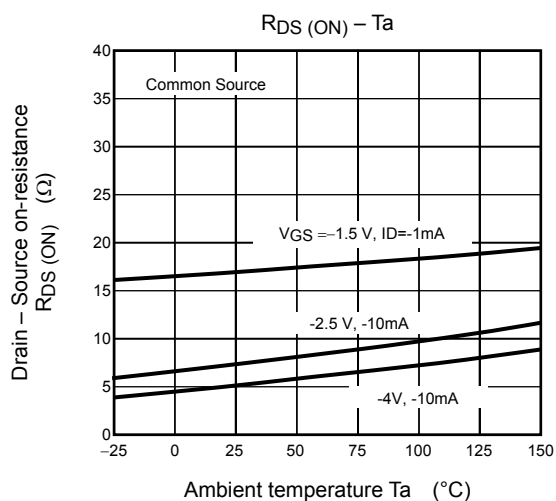
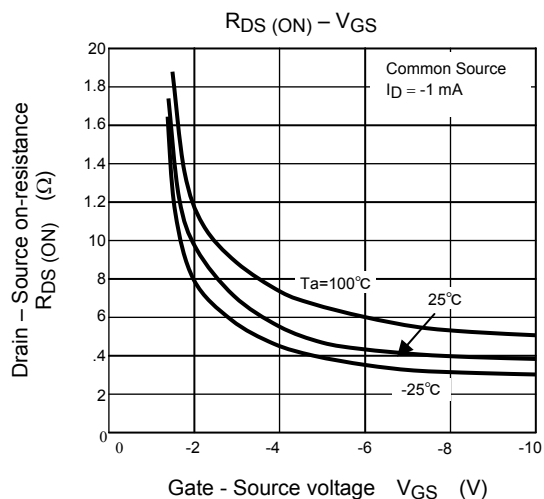
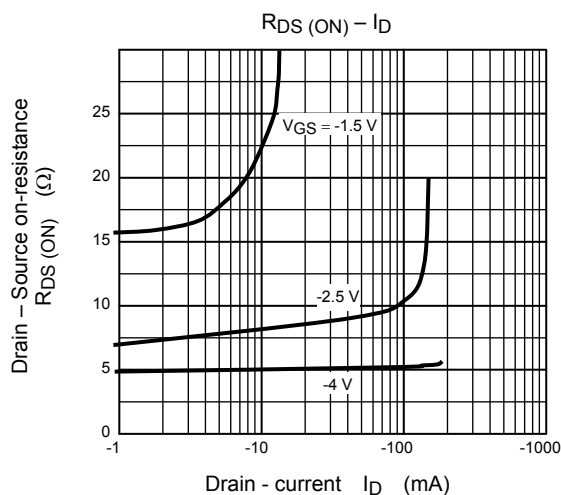
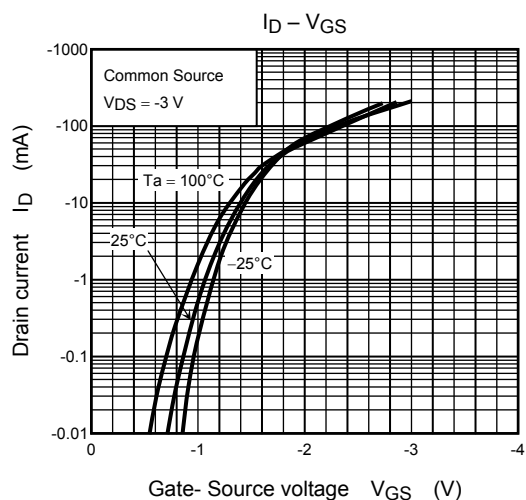
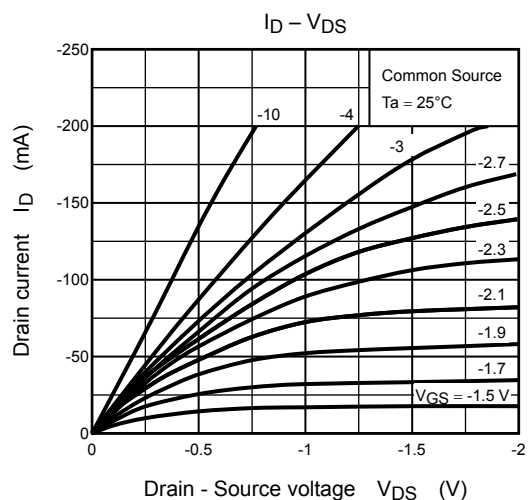
$V_{DD} = -3 \text{ V}$
 Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5 \text{ ns}$
 $(Z_{out} = 50 \Omega)$
 Common Source
 $T_a = 25^\circ\text{C}$

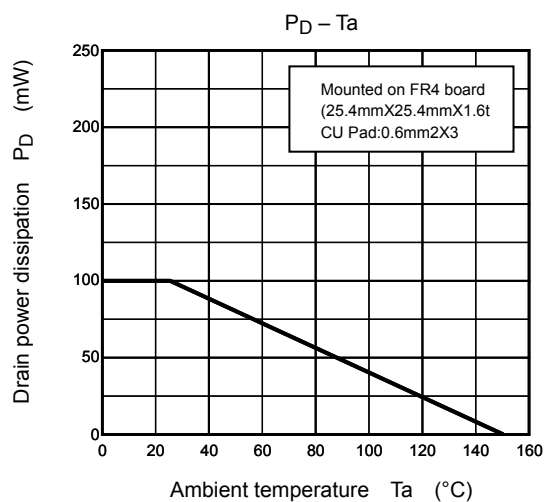
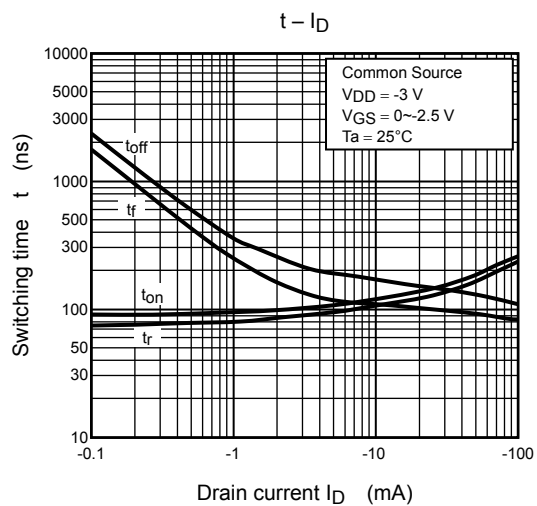
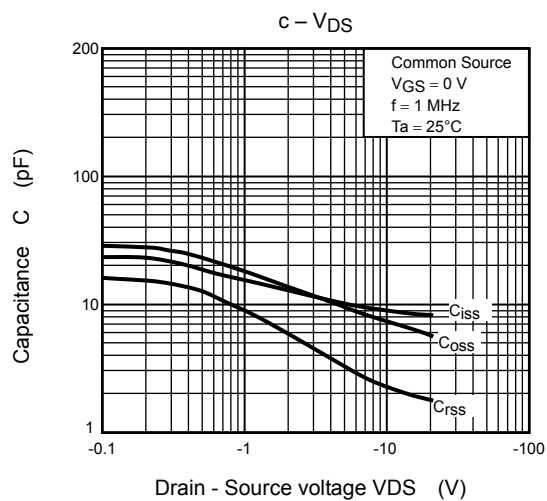
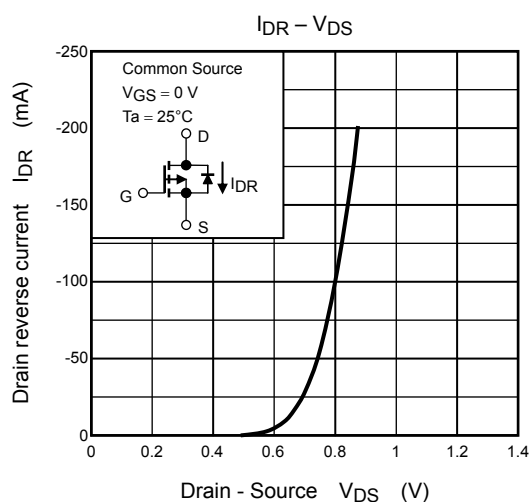
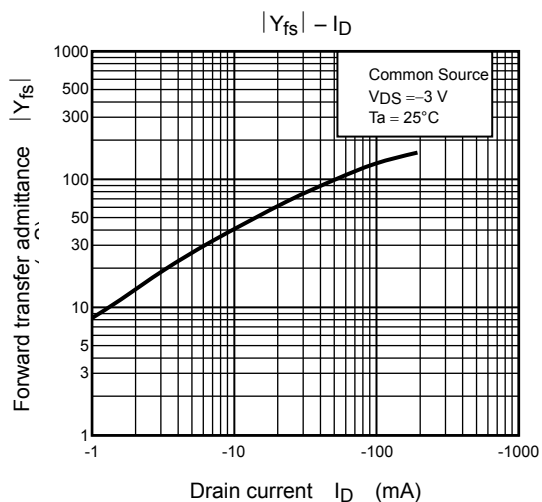
(b) V_{IN} (c) V_{OUT} 

Precaution

V_{th} can be expressed as the voltage between the gate and source when the low operating current value is $I_D = 100 \mu\text{A}$ 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.





RESTRICTIONS ON PRODUCT USE

20070701-EN GENERAL

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- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc.
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