TOSHIBA Field Effect Transistor Silicon P Channel MOS Type

# SSM3J36TU

### Power Management Switches

• 1.5-V drive

Low ON-resistance: R<sub>on</sub> = 3.60 Ω (max) (@V<sub>GS</sub> = -1.5 V)

:  $R_{on}$  = 2.70  $\Omega$  (max) (@V<sub>GS</sub> = -1.8 V) :  $R_{on}$  = 1.60  $\Omega$  (max) (@V<sub>GS</sub> = -2.8 V) :  $R_{on}$  = 1.31  $\Omega$  (max) (@V<sub>GS</sub> = -4.5 V)

### Absolute Maximum Ratings (Ta = 25 °C)

Characteristics		Symbol	Rating	Unit	
Drain-source voltage		$V_{DSS}$	-20	V	
Gate-source voltage		$V_{GSS}$	±8	V	
Drain current	DC	I <sub>D</sub>	-330	mA	
	Pulse	I <sub>DP</sub>	-660		
Drain power dissipation		P <sub>D</sub> (Note1)	500	mW	
Drain power dissipation		P <sub>D</sub> (Note2)	800	11100	
Channel temperature		T <sub>ch</sub>	150	°C	
Storage temperature range		T <sub>stg</sub>	-55 to 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).

Note1: Mounted on an FR4 board

 $(25.4 \text{ mm} \times 25.4 \text{ mm} \times 1.6 \text{ mm}, \text{Cu Pad: } 645 \text{ mm}^2)$ 

Note2: Mounted on a ceramic board.

 $(25.4 \text{ mm} \times 25.4 \text{ mm} \times 0.8 \text{ mm}, \text{Cu Pad: } 645 \text{ mm}^2)$ 

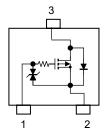
# 1: Gate UFM 2: Source 3: Drain Unit: mm 2: 1±0.1 1.7

Weight: 6.6 mg (typ.)

### 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.

### **Usage Considerations**

Let  $V_{th}$  be the voltage applied between gate and source that causes the drain current ( $I_D$ ) to below –1 mA for the SSM3J36TU). Then, for normal switching operation,  $V_{GS(on)}$  must be higher than  $V_{th}$ , and  $V_{GS(off)}$  must be lower than  $V_{th}$ . This relationship can be expressed as:  $V_{GS(off)} < V_{th} < V_{GS(on)}$ . Take this into consideration when using the device.

Start of commercial production 2008-06

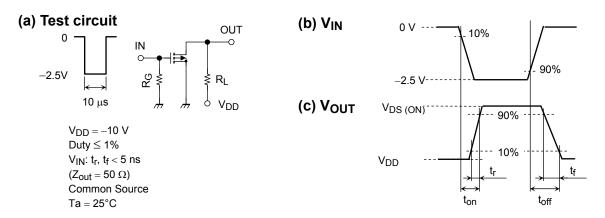


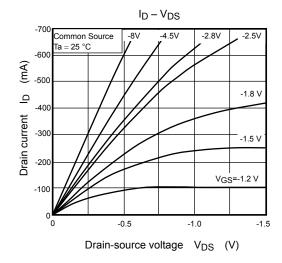
# **Electrical Characteristics (Ta = 25°C)**

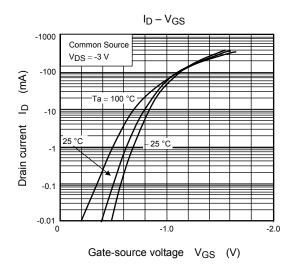
Character	ristics	Symbol	Test Conditions		Min	Тур.	Max	Unit
Drain-source breakdown voltage		V <sub>(BR)DSS</sub>	$I_D = -1 \text{ mA}, V_{GS} = 0 \text{ V}$		-20			V
		V <sub>(BR)DSX</sub>	$I_D = -1 \text{ mA}, V_{GS} = 8 \text{ V}$		-12			_
Drain cutoff current		I <sub>DSS</sub>	$V_{DS} = -16 \text{ V}, V_{GS} = 0 \text{ V}$		_	_	-10	μΑ
Gate leakage curre	nt	I <sub>GSS</sub>	$V_{GS} = \pm 8 \text{ V}, V_{DS} = 0 \text{ V}$		_		±1	μА
Gate threshold volta	age	V <sub>th</sub>	$V_{DS} = -3 \text{ V}, I_{D} = -1 \text{ mA}$		-0.3	_	-1.0	٧
Forward transfer ad	Imittance	Y <sub>fs</sub>	$V_{DS} = -3 \text{ V}, I_{D} = -100 \text{mA}$	(Note3)	190	_	_	mS
		R <sub>DS (ON)</sub>	$I_D = -100 \text{mA}, V_{GS} = -4.5 \text{ V}$	(Note3)	_	0.95	1.31	Ω
Drain-source ON-resistance	$I_D = -80 \text{mA}, V_{GS} = -2.8 \text{ V}$		(Note3)	_	1.22	1.60		
Drain-source ON-resistance			$I_D = -40 \text{mA}, V_{GS} = -1.8 \text{ V}$	(Note3)	_	1.80	2.70	
			$I_D = -30 \text{mA}, V_{GS} = -1.5 \text{ V}$	(Note3)	_	2.23	3.60	
				_	43			
		Coss	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		_	10.3	_	pF
Reverse transfer capacitance		C <sub>rss</sub>			_	6.1	_	
Total Gate Charge		Qg			_	1.2		
Gate-Source Charge Gate-Drain Charge		Q <sub>gs</sub>	$V_{DS} = -10 \text{ V}, I_{DS} = -330 \text{mA}$	_	0.85	_	nC	
		Q <sub>gd</sub>	$V_{GS} = -4 V$		_	0.35		_
Switching time	Turn-on time	t <sub>on</sub>	$V_{DD}$ = -10 V, $I_{D}$ = -100mA $V_{GS}$ = 0 to -2.5 V, $R_{G}$ = 50 $\Omega$		_	90		
	Turn-off time	t <sub>off</sub>			_	200	_	ns
Drain-source forward voltage		V <sub>DSF</sub>	I <sub>D</sub> =330mA, V <sub>GS</sub> = 0 V	(Note3)	_	0.88	1.2	V

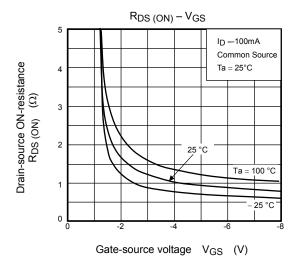
Note3: Pulse test

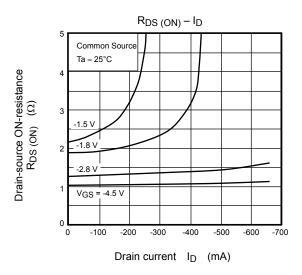
# **Switching Time Test Circuit**

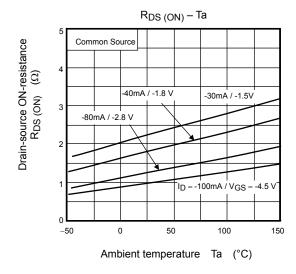


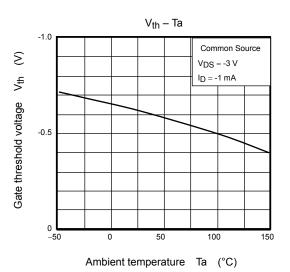


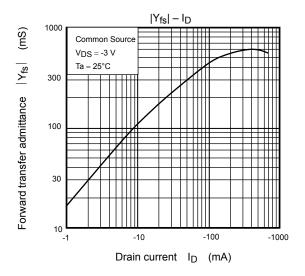


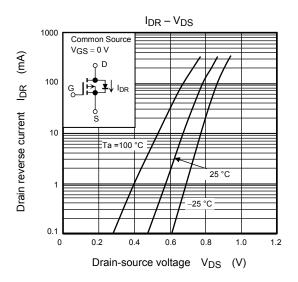


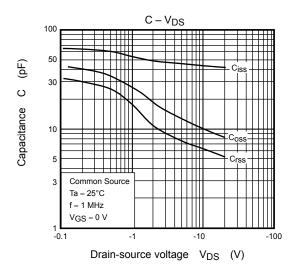


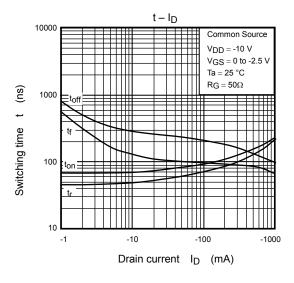


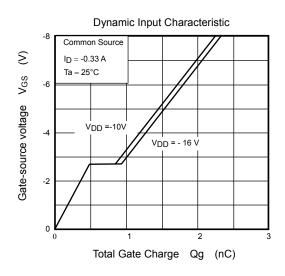


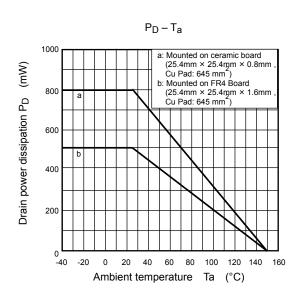












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