

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

## TPC6012

Notebook PC Applications

Portable Equipment Applications

- Small footprint due to small and thin package
- Low drain-source ON resistance:  $R_{DS(ON)} = 20 \text{ m}\Omega$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 20 \text{ V}$ )
- Enhancement mode:  $V_{th} = 0.5 \text{ to } 1.2 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 200 \text{ }\mu\text{A}$ )

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

Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	20	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	20	V
Gate-source voltage		$V_{GSS}$	$\pm 12$	V
Drain current	DC (Note 1)	$I_D$	6	A
	Pulse (Note 1)	$I_{DP}$	24	
Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2a)		$P_D$	2.2	W
Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2b)		$P_D$	0.7	W
Single pulse avalanche energy (Note 3)		$E_{AS}$	2.3	mJ
Avalanche current		$I_{AR}$	3	A
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).

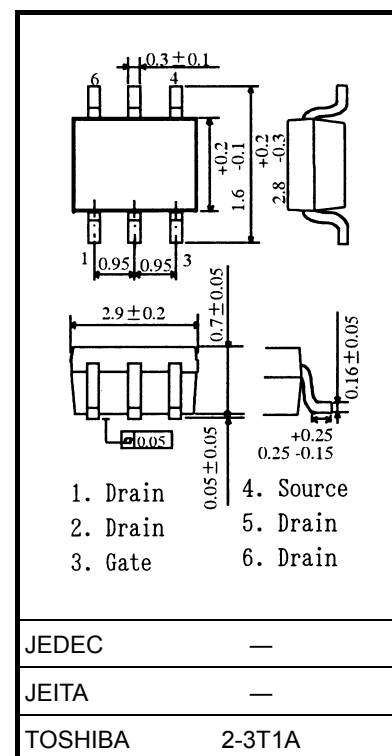
### Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient ( $t = 5 \text{ s}$ ) (Note 2a)	$R_{th(ch-a)}$	56.8	$^\circ\text{C/W}$
Thermal resistance, channel to ambient ( $t = 5 \text{ s}$ ) (Note 2b)	$R_{th(ch-a)}$	178.5	$^\circ\text{C/W}$

Note: (Note 1), (Note 2), (Note 3): See other pages.

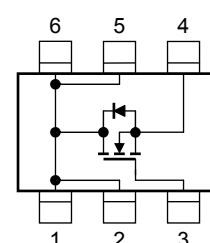
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm

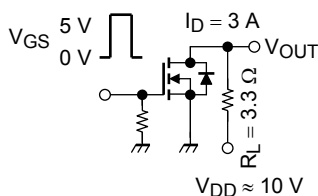


Weight: 0.011 g (typ.)

### Circuit Configuration



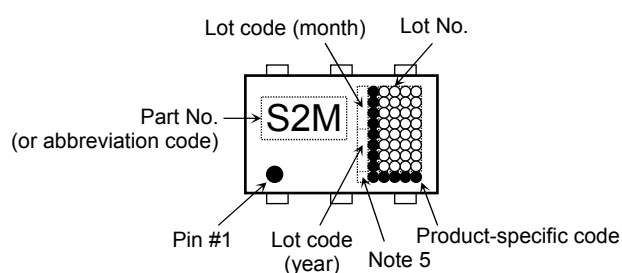
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	V <sub>GS</sub> = ± 12 V, V <sub>DS</sub> = 0 V	—	—	±100	nA
Drain cut-off current		I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V	—	—	10	μA
Drain-source breakdown voltage	V <sub>(BR)</sub> DSS	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	20	—	—	V	
	V <sub>(BR)</sub> DSX	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = -12 V	8	—	—		
Gate threshold voltage		V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 200 μA	0.5	—	1.2	V
Drain-source ON resistance	R <sub>DS</sub> (ON)	V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 3 A	—	25	38	mΩ	
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 3 A	—	15	20		
Input capacitance		C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	630	—	pF
Reverse transfer capacitance		C <sub>rss</sub>		—	150	—	
Output capacitance		C <sub>oss</sub>		—	180	—	
Switching time	Rise time	t <sub>r</sub>		—	5	—	ns
	Turn-on time	t <sub>on</sub>		—	10	—	
	Fall time	t <sub>f</sub>		—	10	—	
	Turn-off time	t <sub>off</sub>	Duty ≤ 1%, t <sub>w</sub> = 10 μs	—	24	—	
Total gate charge (gate-source plus gate-drain)		Q <sub>g</sub>	V <sub>DD</sub> ≈ 16 V, V <sub>GS</sub> = 5 V, I <sub>D</sub> = 6 A	—	9	—	nC
Gate-source charge 1		Q <sub>gs</sub> 1		—	1.8	—	
Gate-drain ("miller") charge		Q <sub>gd</sub>		—	3.4	—	

## Source-Drain Ratings and Characteristics (Ta = 25°C)

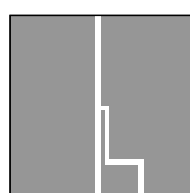
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	24	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 6 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.2	V

## Marking (Note 5)

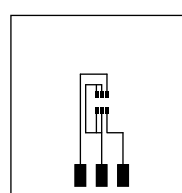


Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) ( $t = 5$  s)  
(b) Device mounted on a glass-epoxy board (b) ( $t = 5$  s)



(a)



(b)

Note 3:  $V_{DD} = 16$  V,  $T_{ch} = 25^{\circ}\text{C}$  (initial),  $L = 0.2$  mH,  $R_G = 25\ \Omega$ ,  $I_{AR} = 3$  A

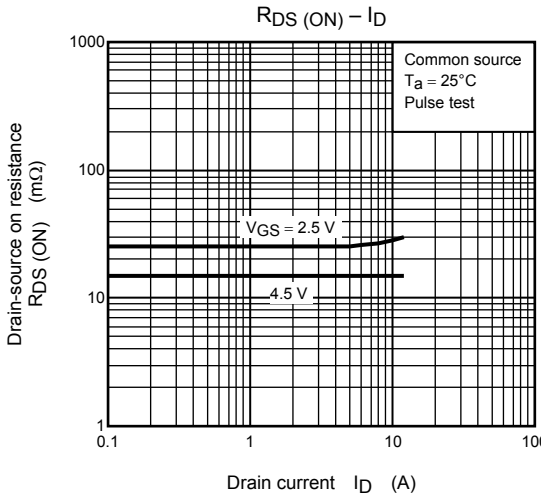
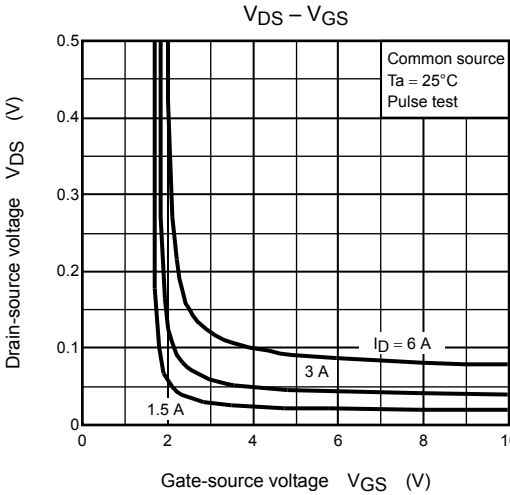
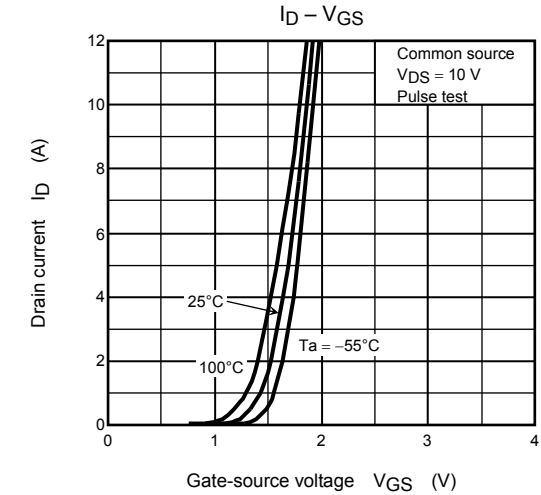
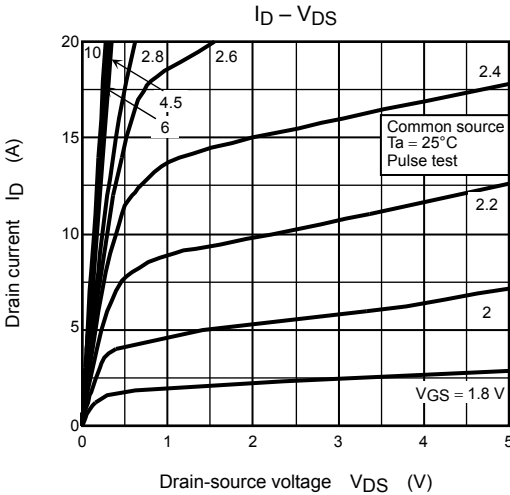
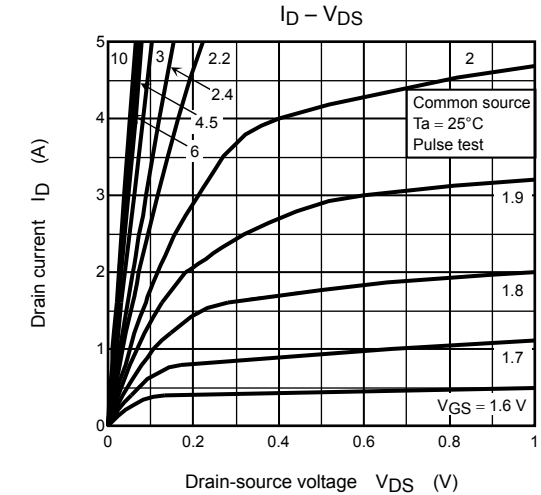
Note 4: • on lower left of the marking indicates Pin 1.

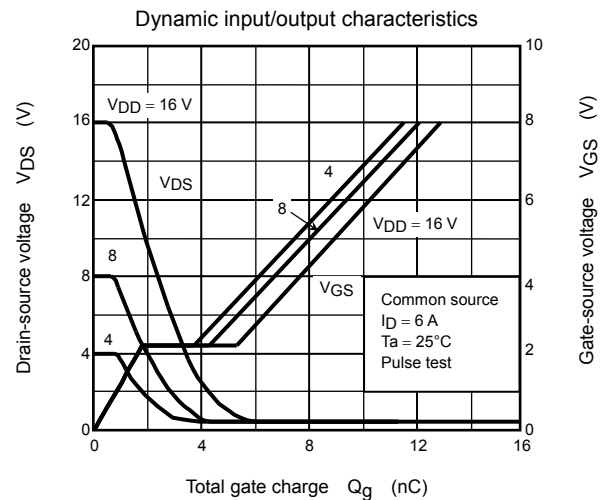
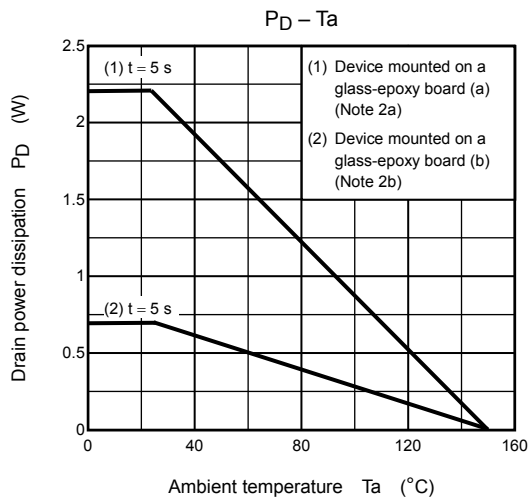
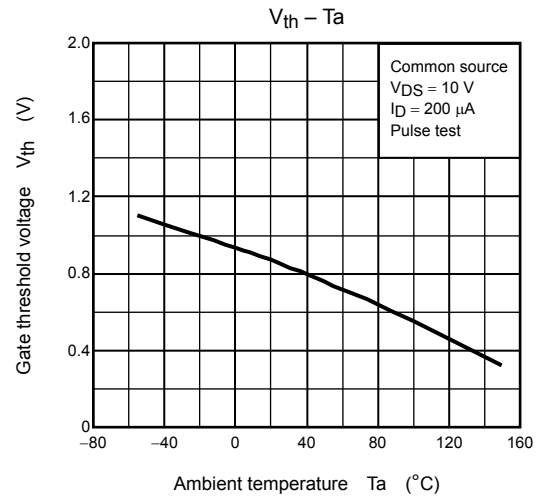
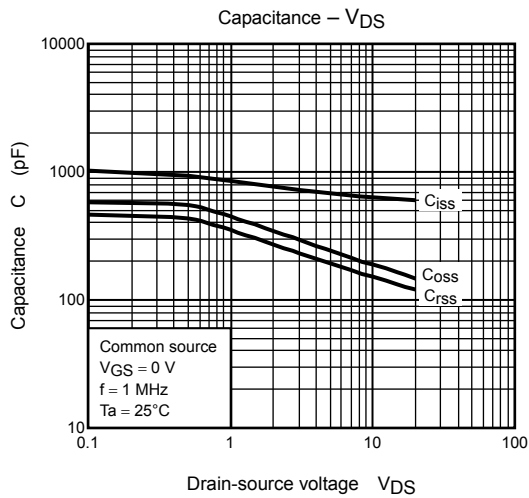
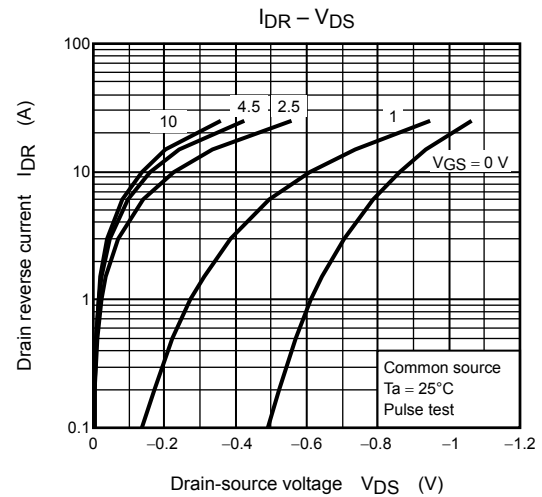
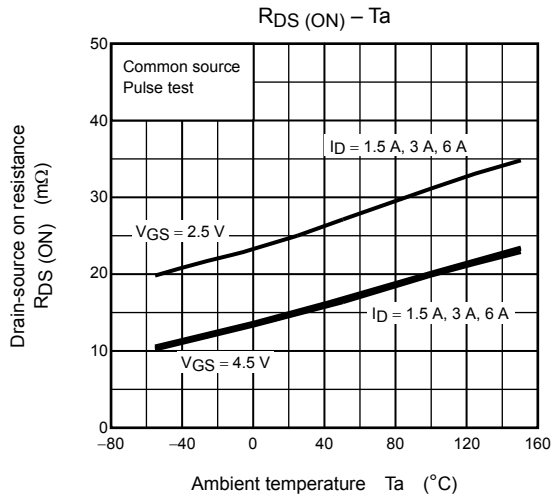
Note 5: A dot marking for identifying the indication of product Labels.

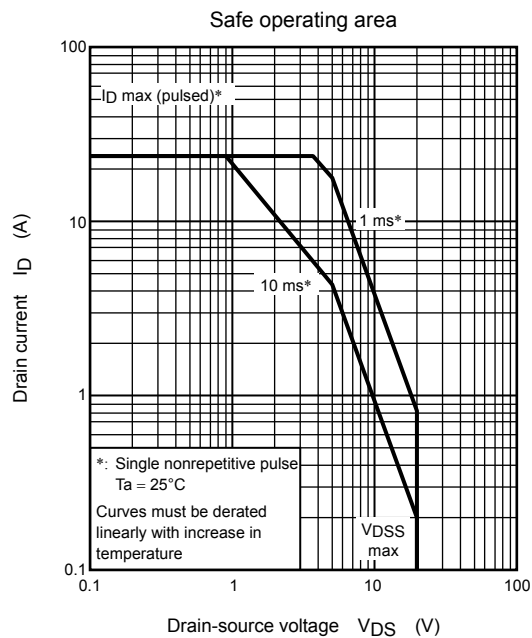
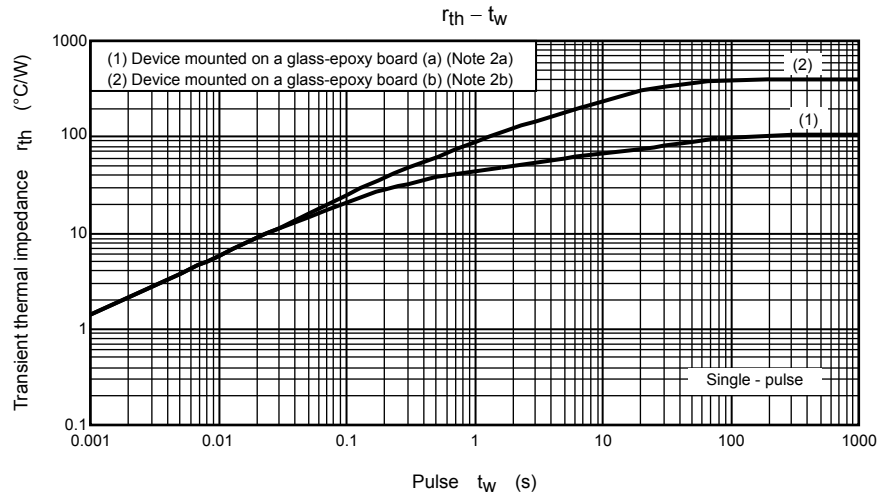
Without a dot: [[Pb]]/INCLUDES > MCV

With a dot: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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