

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

## TPC6011

Notebook PC Applications

Portable Equipment Applications

- Low drain-source ON-resistance:  $R_{DS(ON)} = 16 \text{ m}\Omega$  (typ.)  
( $V_{GS} = 10 \text{ V}$ )
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 30 \text{ V}$ )
- Enhancement mode:  $V_{th} = 1.3 \text{ to } 2.5 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

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

Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	30	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	30	V
Gate-source voltage		$V_{GSS}$	$\pm 20$	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.).

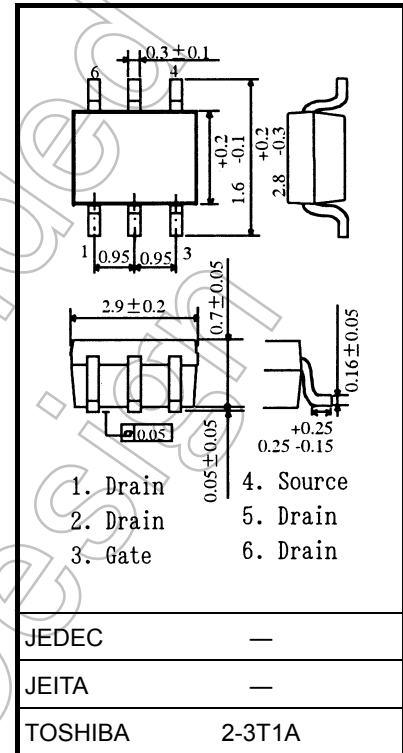
### Thermal Characteristics

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.

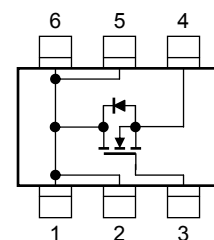
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm

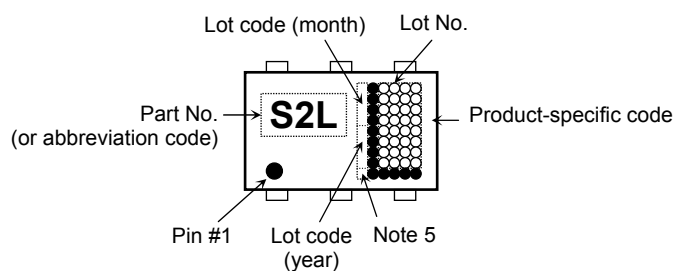


Weight: 0.011 g (typ.)

### Circuit Configuration



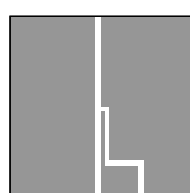
## Marking (Note 4)



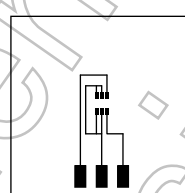
Note 1: Ensure that the channel temperature does not exceed 150°C.

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:  $V_{DD} = 24$  V,  $T_{ch} = 25^{\circ}\text{C}$  (initial),  $L = 200$   $\mu\text{H}$ ,  $R_G = 25$   $\Omega$ ,  $I_{AR} = 3$  A

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

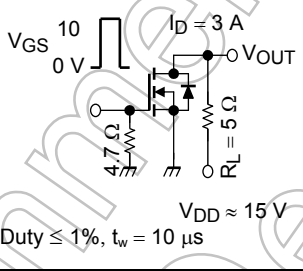
Note 5: A dot marking identifies the indication of product Labels.

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

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

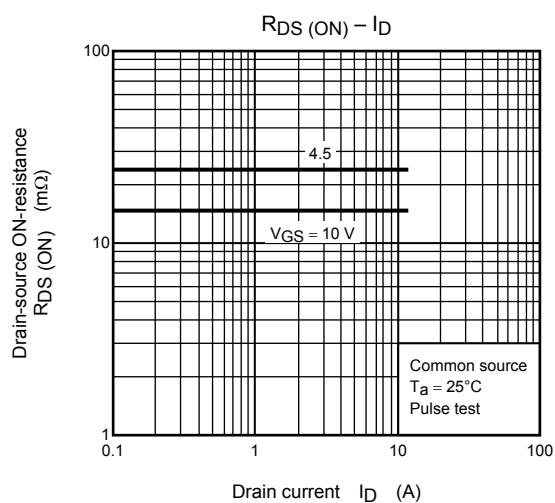
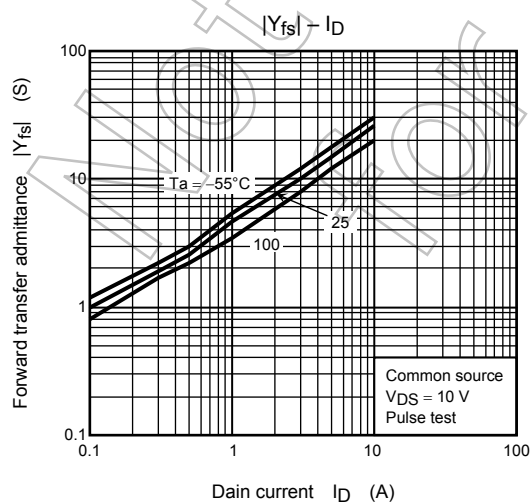
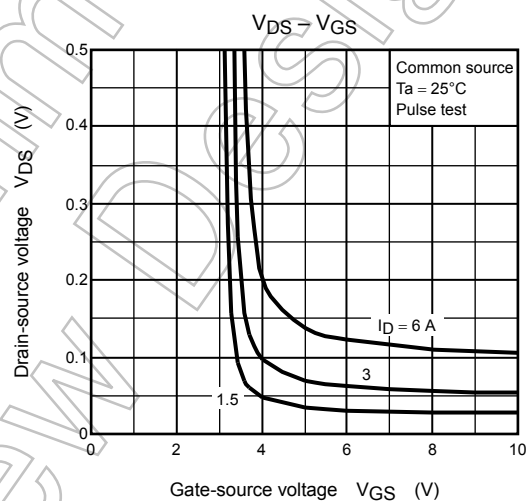
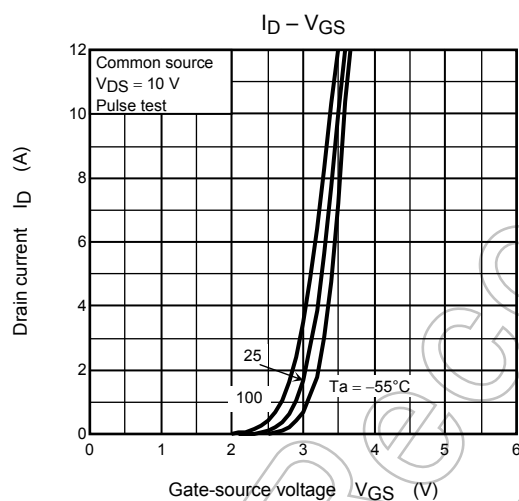
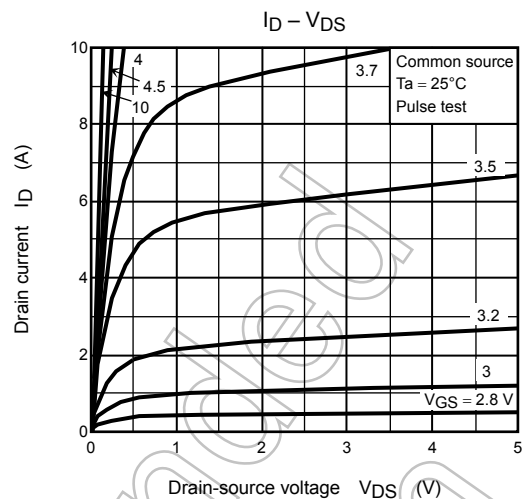
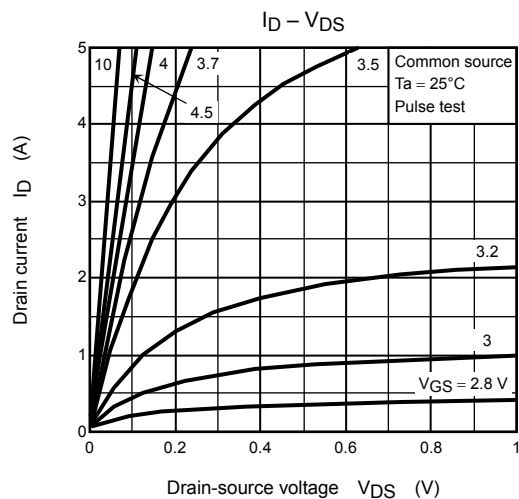
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

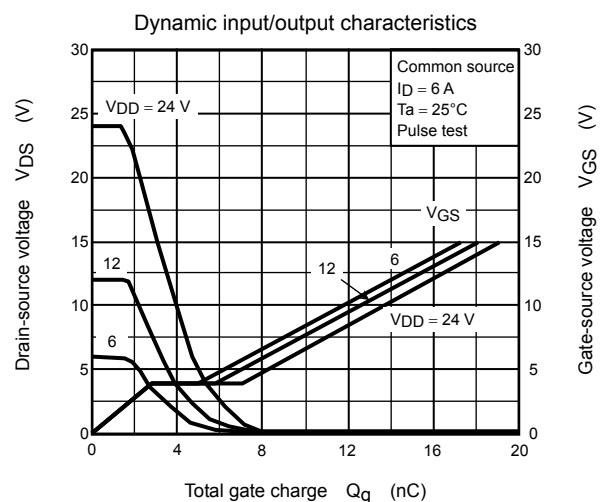
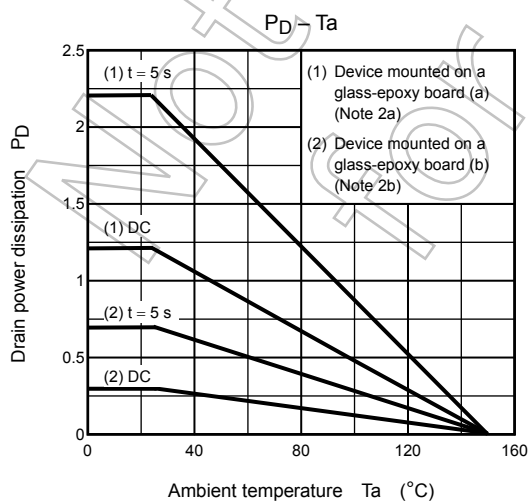
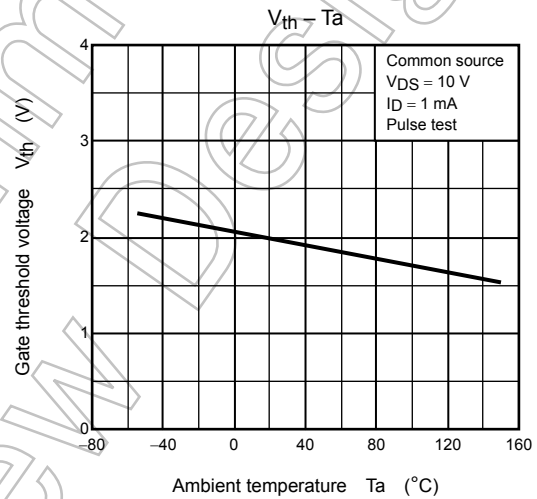
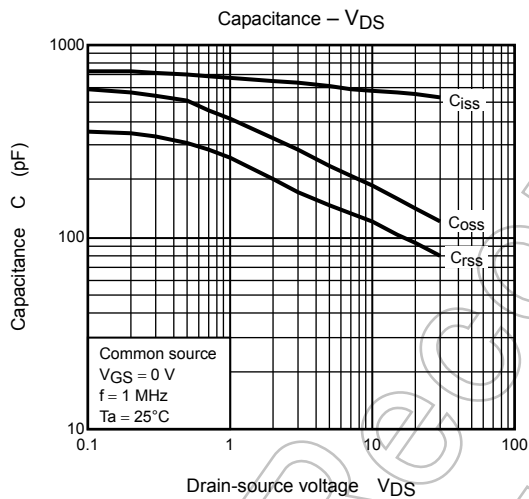
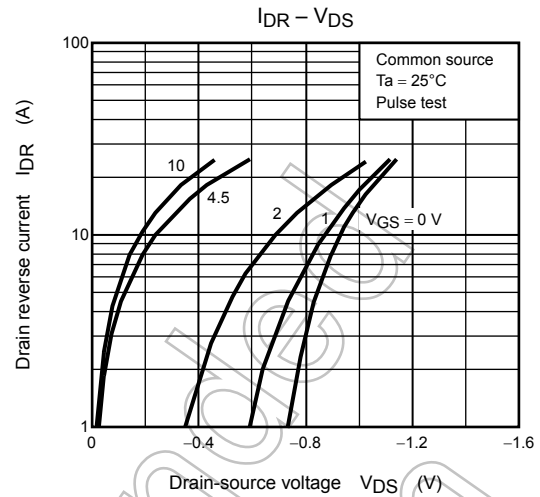
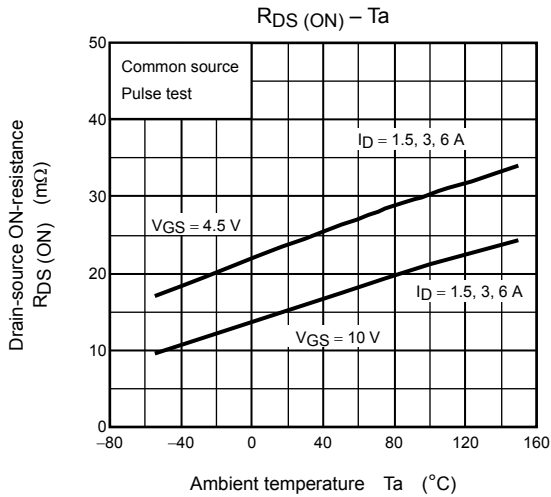
## Electrical Characteristics (Ta = 25°C)

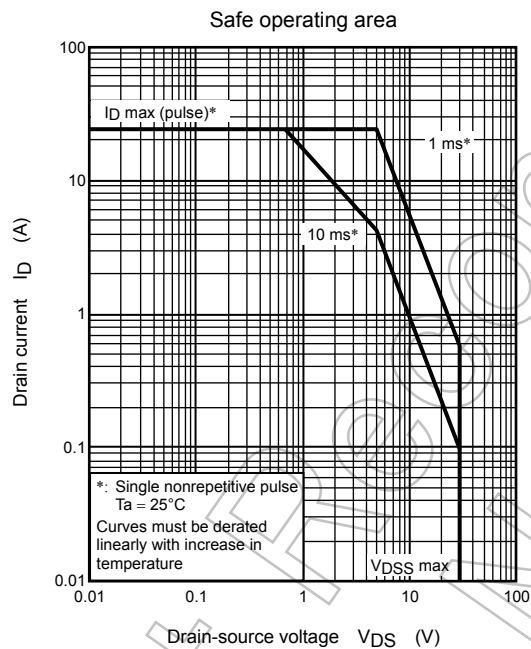
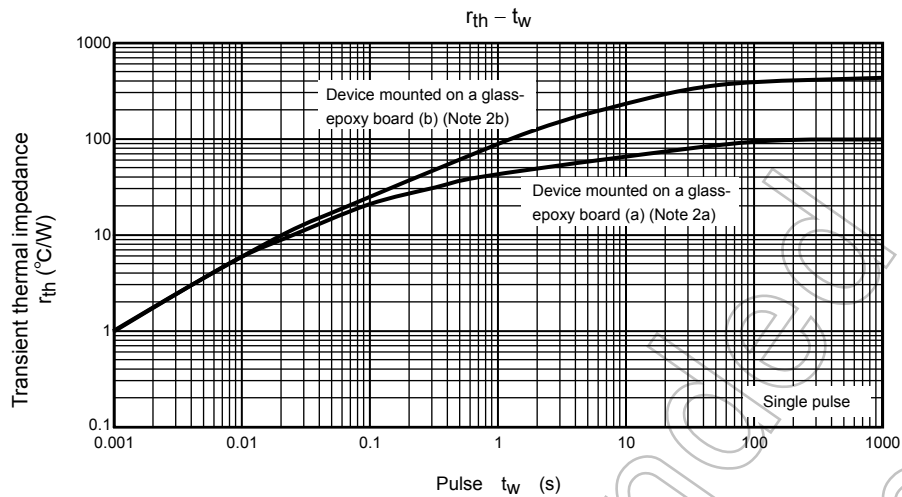
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	$\pm 100$	nA
Drain cut-off current		$I_{DSS}$	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage	$V_{(BR) DSS}$		$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	30	—	—	V
	$V_{(BR) DSX}$		$I_D = 10 \text{ mA}, V_{GS} = -20 \text{ V}$	10	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$	1.3	—	2.5	V
Drain-source ON-resistance	$R_{DS(ON)}$		$V_{GS} = 4.5 \text{ V}, I_D = 3 \text{ A}$	—	24	32	$\text{m}\Omega$
	$R_{DS(ON)}$		$V_{GS} = 10 \text{ V}, I_D = 3 \text{ A}$	—	16	20	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 3 \text{ A}$	5	10	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	640	—	pF
Reverse transfer capacitance		$C_{rss}$		—	125	—	
Output capacitance		$C_{oss}$		—	185	—	
Switching time	Rise time	$t_r$	 <p><math>V_{DD} \approx 15 \text{ V}</math> Duty <math>\leq 1\%</math>, <math>t_w = 10 \mu\text{s}</math></p>	—	5.8	—	ns
	Turn-on time	$t_{on}$		—	12	—	
	Fall time	$t_f$		—	8	—	
	Turn-off time	$t_{off}$		—	24.5	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 24 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 6 \text{ A}$	—	14	—	nC
Gate-source charge 1		$Q_{gs1}$		—	2.7	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	4.2	—	

## 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







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