

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.).

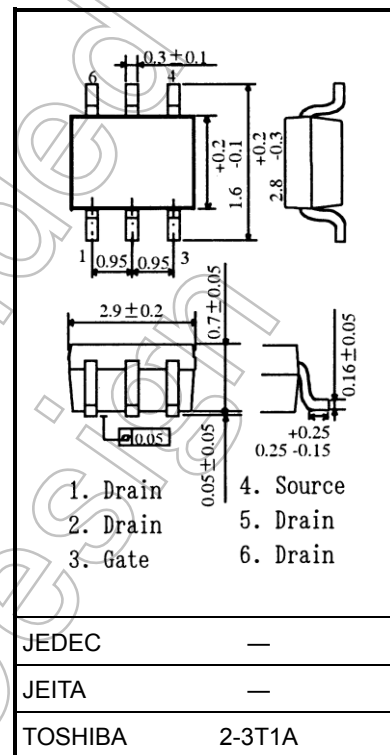
### Thermal Characteristics

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.

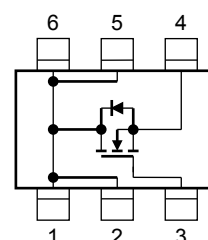
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



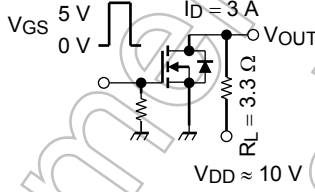
Weight: 0.011 g (typ.)

### Circuit Configuration



Start of commercial production  
2009-10

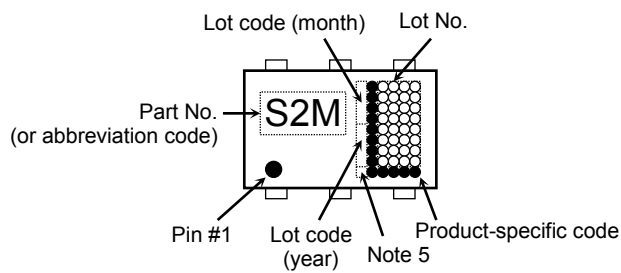
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		IGSS	VGS = ± 12 V, VDS = 0 V	—	—	±100	nA
Drain cut-off current		IDSS	VDS = 20 V, VGS = 0 V	—	—	10	μA
Drain-source breakdown voltage		V (BR) DSS	ID = 10 mA, VGS = 0 V	20	—	—	V
		V (BR) DSX	ID = 10 mA, VGS = -12 V	8	—	—	
Gate threshold voltage		Vth	VDS = 10 V, ID = 200 μA	0.5	—	1.2	V
Drain-source ON resistance		RDS (ON)	VGS = 2.5 V, ID = 3 A	—	25	38	mΩ
			VGS = 4.5 V, ID = 3 A	—	15	20	
Input capacitance		Ciss	VDS = 10 V, VGS = 0 V, f = 1 MHz	—	630	—	pF
Reverse transfer capacitance		Crss		—	150	—	
Output capacitance		Coss		—	180	—	
Switching time	Rise time	tr		—	5	—	ns
	Turn-on time	ton		—	10	—	
	Fall time	tf		—	10	—	
	Turn-off time	toff		—	24	—	
Total gate charge (gate-source plus gate-drain)		Qg	VDD ≈ 16 V, VGS = 5 V, ID = 6 A	—	9	—	nC
Gate-source charge 1		Qgs1		—	1.8	—	
Gate-drain ("miller") charge		Qgd		—	3.4	—	

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

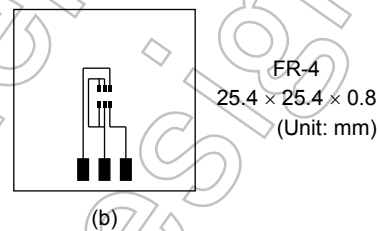
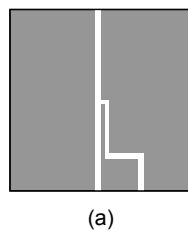
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	IDRP	—	—	—	24	A
Forward voltage (diode)		VDSF	IDR = 6 A, VGS = 0 V	—	—	-1.2	V

## 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)



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

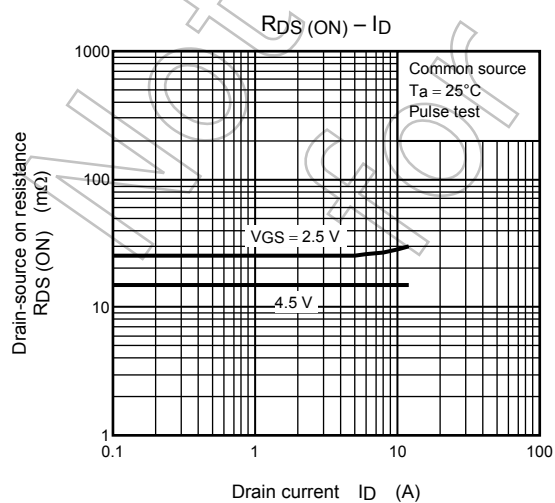
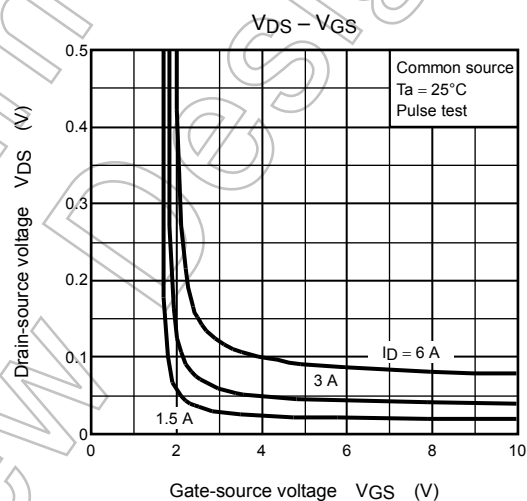
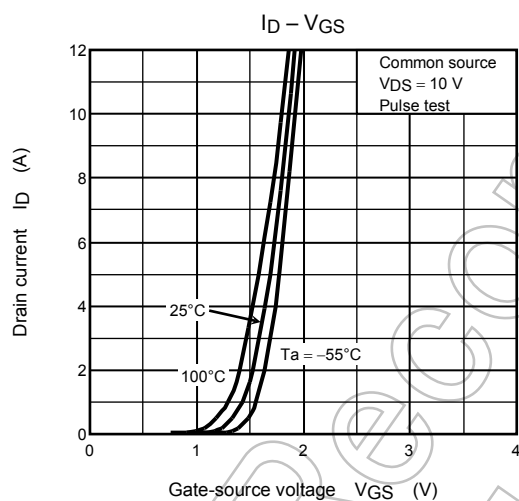
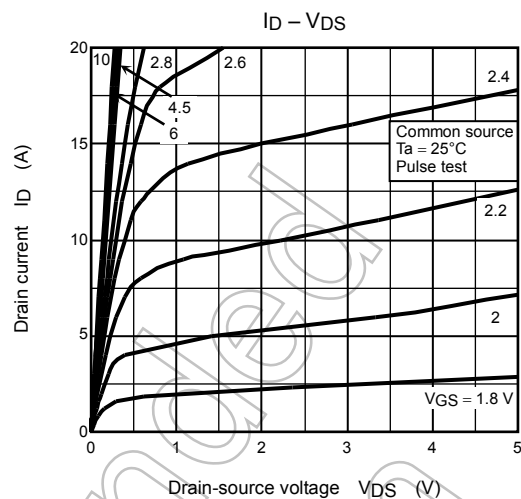
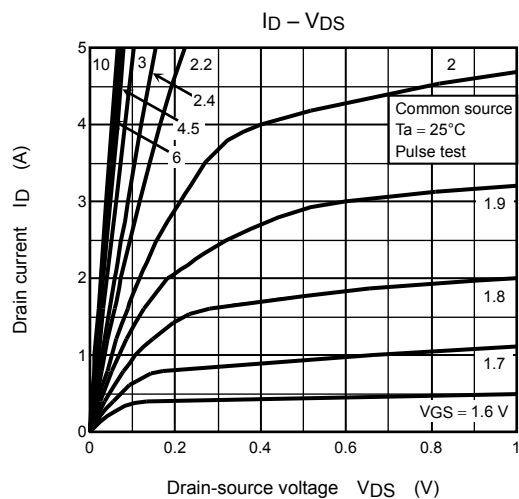
Note 4: • on lower left of the marking indicates Pin 1.

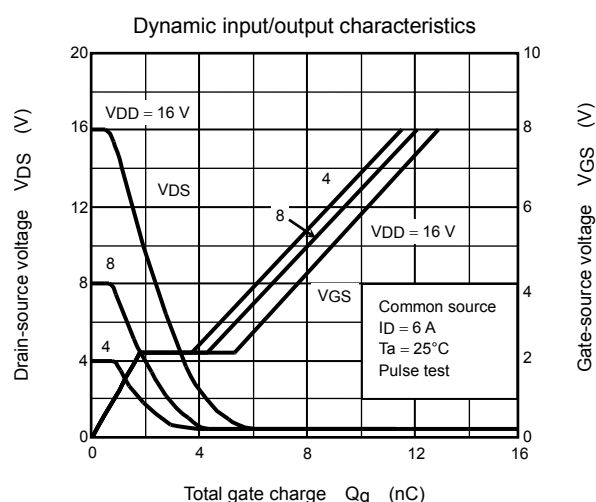
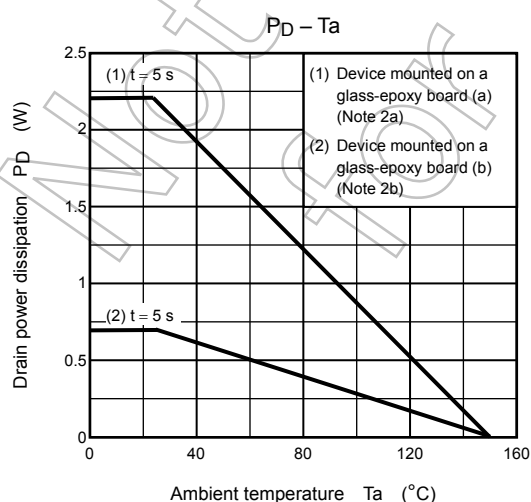
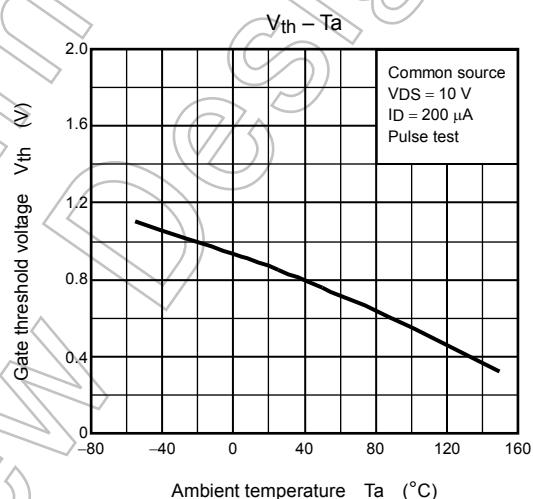
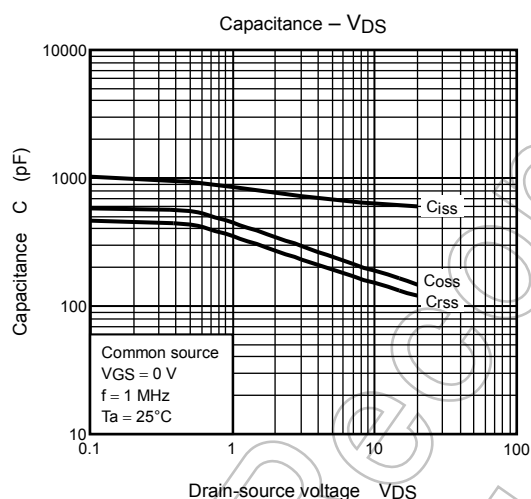
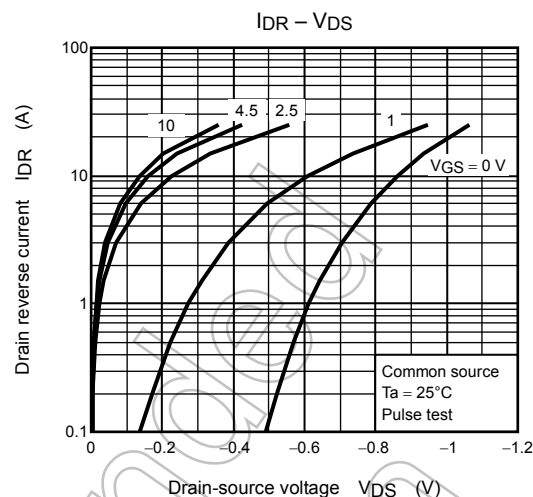
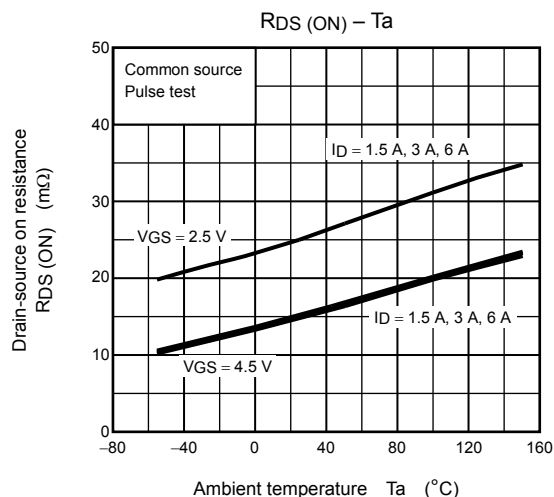
Note 5: A dot marking for identifying the indication of product Labels.

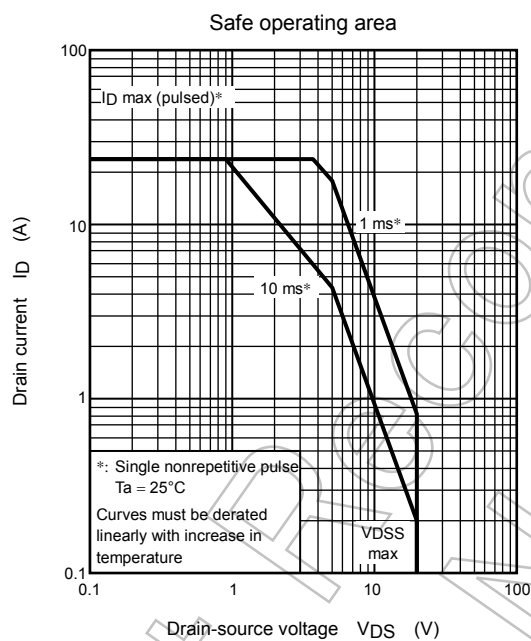
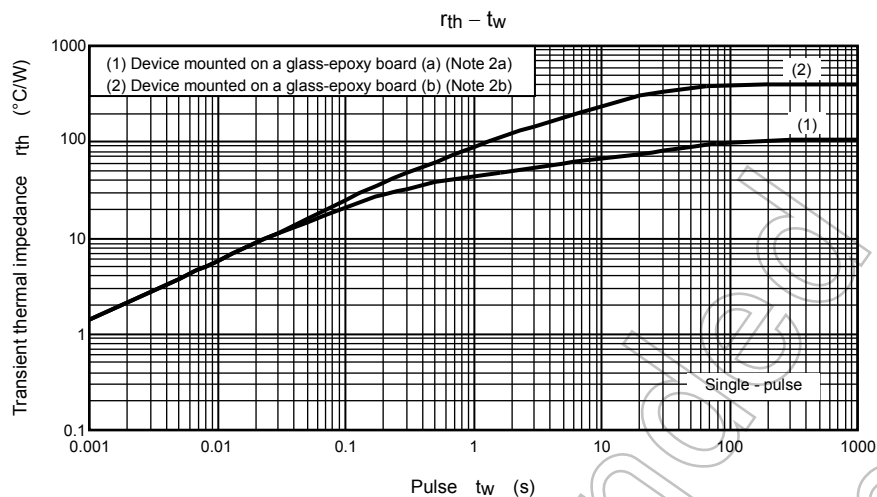
Without a dot: [[Pb]]/INCLUDES > MCV

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

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.







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