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

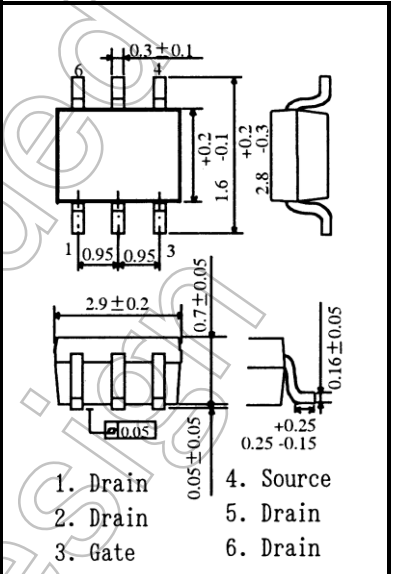
TPC6012

Notebook PC Applications

Portable Equipment Applications

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

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-3T1A

Weight: 0.011 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	20	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	20	V
Gate-source voltage		V_{GSS}	± 12	V
Drain current	DC (Note 1)	I_D	6	A
	Pulse (Note 1)	I_{DP}	24	
Drain power dissipation	(t = 5 s) (Note 2a)	P_D	2.2	W
Drain power dissipation	(t = 5 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	°C
Storage temperature range		T_{stg}	−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).

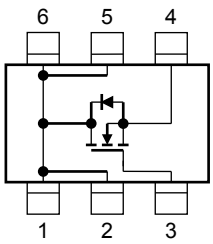
Thermal Characteristics

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

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

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

Circuit Configuration



Start of commercial production
2009-10

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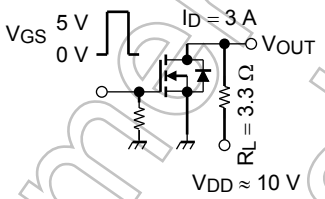
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ± 12 V, V_{DS} = 0 V	—	—	±100	nA
Drain cut-off current		I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	20	—	—	V
		$V_{(BR)\ DSX}$	I_D = 10 mA, V_{GS} = −12 V	8	—	—	
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 200 μA	0.5	—	1.2	V
Drain-source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 2.5 V, I_D = 3 A	—	25	38	mΩ
			V_{GS} = 4.5 V, I_D = 3 A	—	15	20	
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	630	—	pF
Reverse transfer capacitance		C_{rss}		—	150	—	
Output capacitance		C_{oss}		—	180	—	
Switching time	Rise time	t_r	 Duty ≤ 1%, t_w = 10 μs	—	5	—	ns
	Turn-on time	t_{on}		—	10	—	
	Fall time	t_f		—	10	—	
	Turn-off time	t_{off}		—	24	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≈ 16 V, V_{GS} = 5 V, I_D = 6 A	—	9	—	nC
Gate-source charge 1		$Q_{gs\ 1}$		—	1.8	—	
Gate-drain ("miller") charge		Q_{gd}		—	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 A, V_{GS} = 0 V	—	—	−1.2	V

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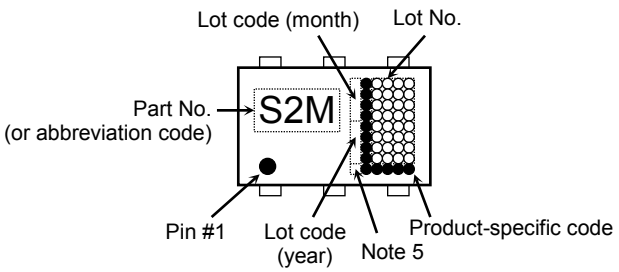
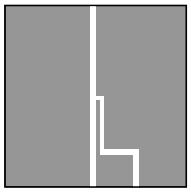
Marking (Note 5)



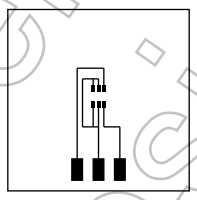
Note 1: Ensure that the channel temperature does not exceed 150°C.

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)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(a)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(b)

Note 3: V_{DD} = 16 V, T_{ch} = 25°C (initial), L = 0.2 mH, R_G = 25 Ω, 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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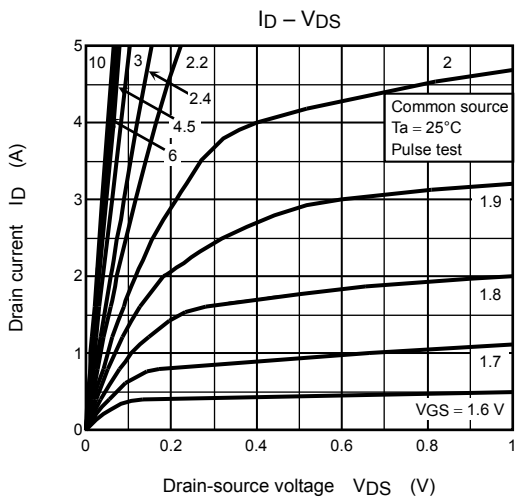

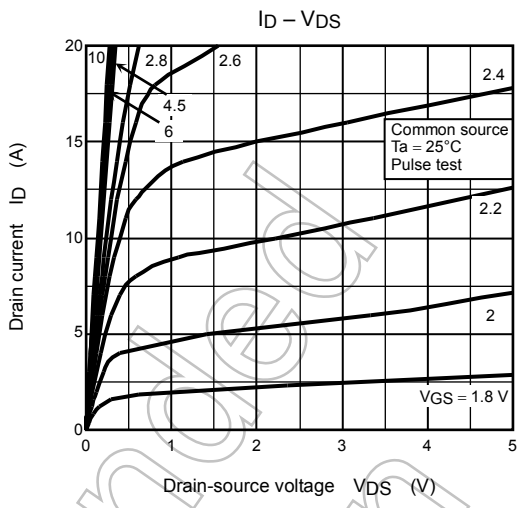

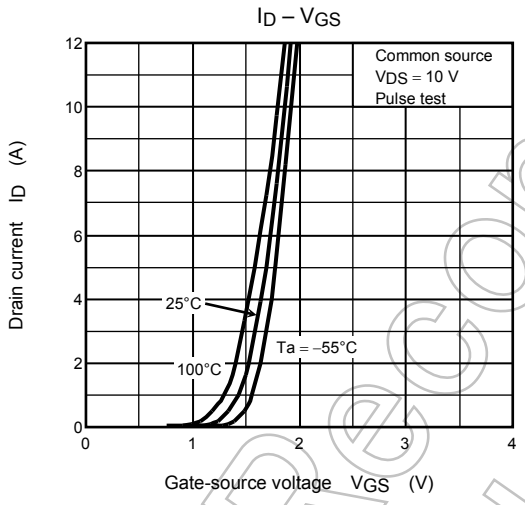

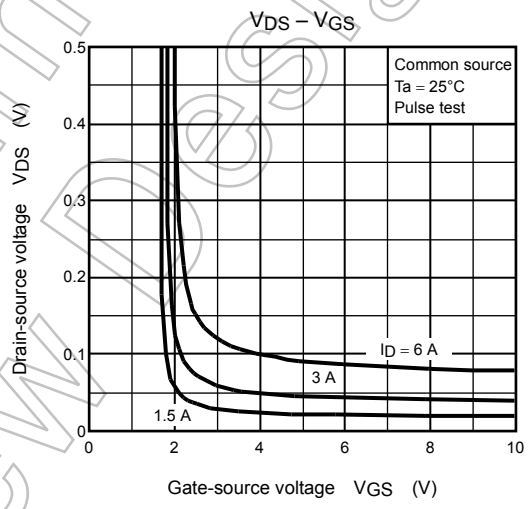

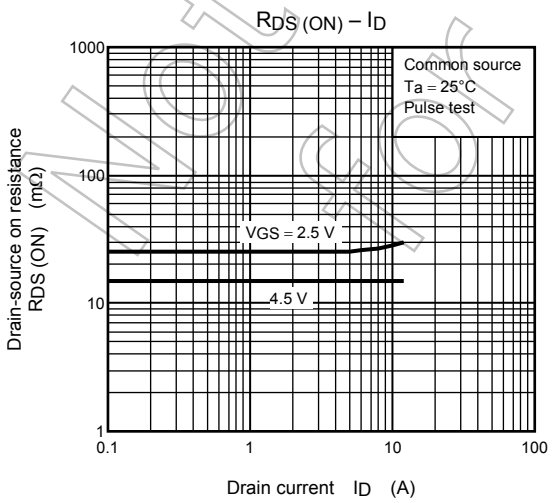

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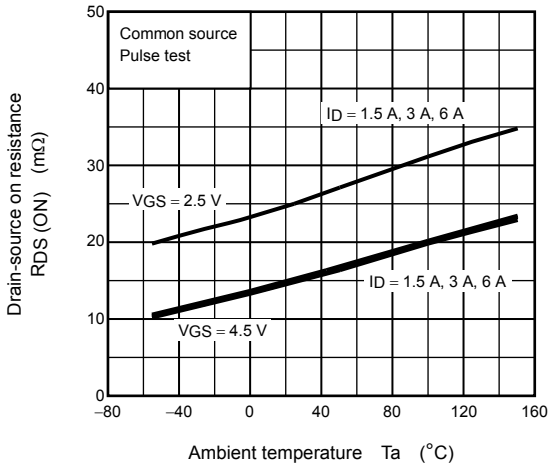
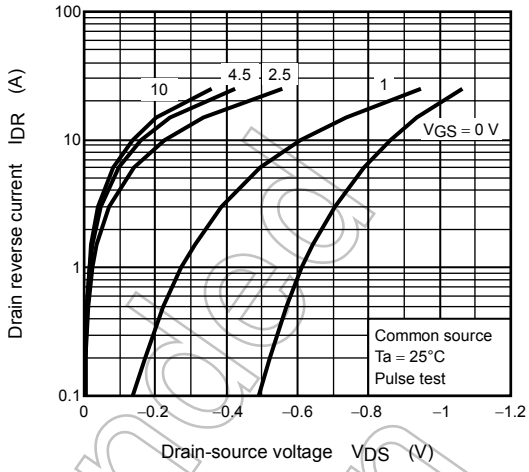
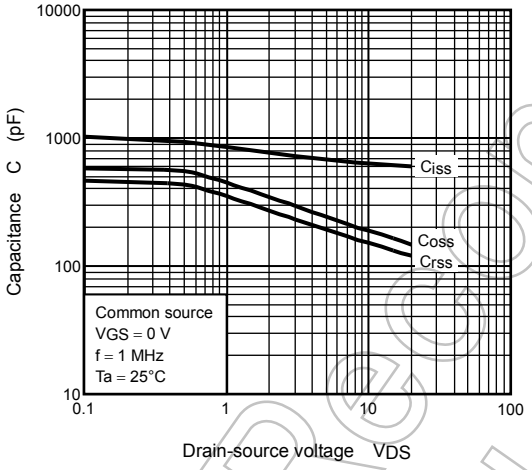
$R_{DS\ (ON)}$ – Ta



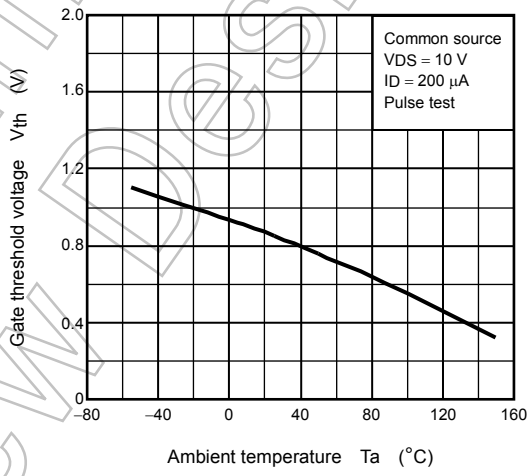
I_{DR} – V_{DS}



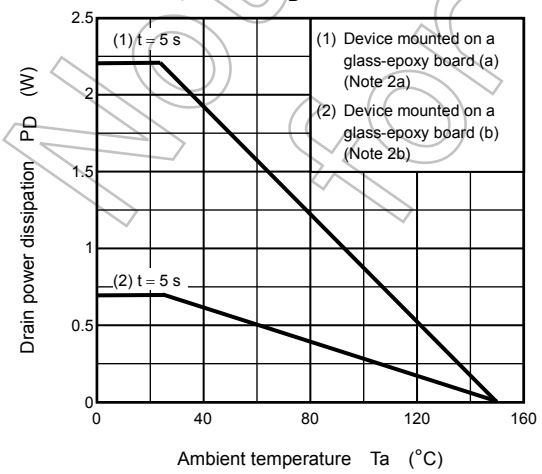
Capacitance – V_{DS}



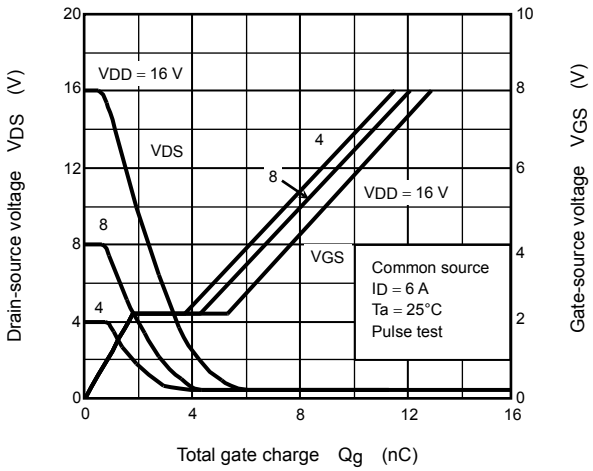
V_{th} – Ta



P_D – Ta



Dynamic input/output characteristics



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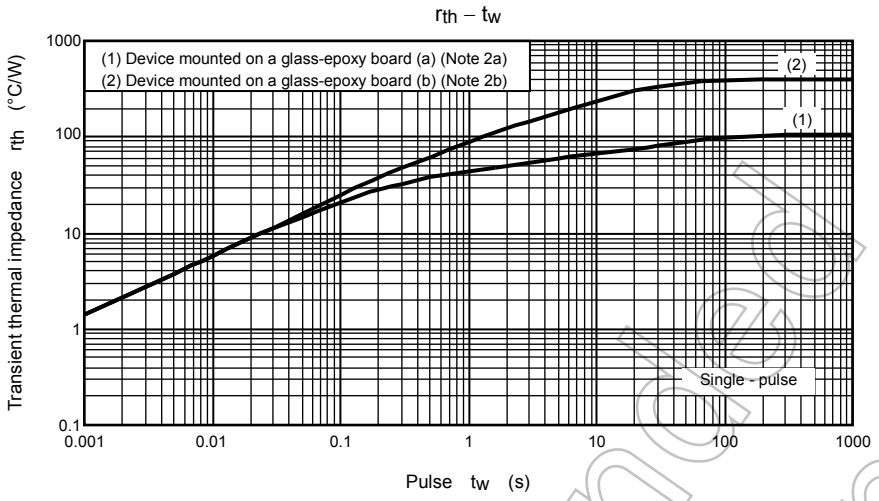

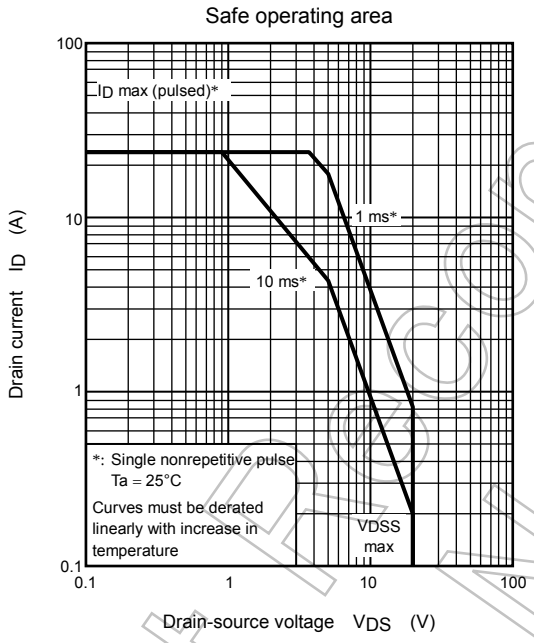

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