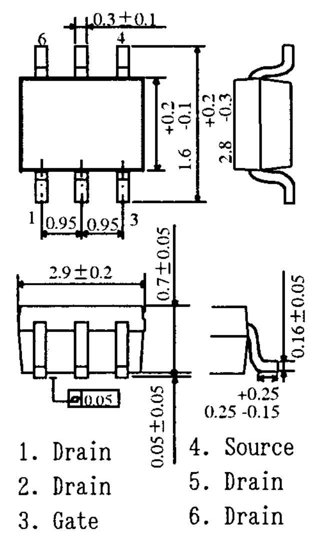
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSIII)

TPC6003

Notebook PC Applications

Portable Equipment Applications

Unit: mm



JEDEC	―
JEITA	―
TOSHIBA	2-3T1A

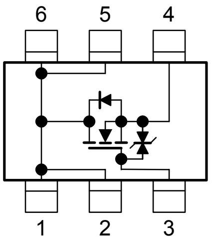
Weight: 0.011 g (typ.)

- Low drain-source ON resistance: $R_{DS\ (ON)} = 19\ \text{m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 7$ S (typ.)
- Low leakage current: $I_{DSS} = 10\ \mu A$ (max) ($V_{DS} = 30$ V)
- Enhancement-model: $V_{th} = 1.3$ to 2.5 V ($V_{DS} = 10$ V, $I_D = 1$ mA)

Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	30	V
Drain-gate voltage ($R_{GS} = 20\ k\Omega$)		V_{DGR}	30	V
Gate-source voltage		V_{GSS}	±20	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}	5.8	mJ
Avalanche current		I_{AR}	3	A
Repetitive avalanche energy (Note 4)		E_{AR}	0.22	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

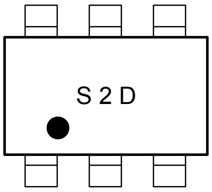
Circuit Configuration



Thermal Characteristics

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

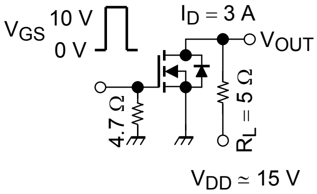
Marking (Note 5)



Note: (Note 1), (Note 2), (Note 3), (Note 4), (Note 5) Please see next page.

This transistor is an electrostatically sensitive device. Please handle it with caution.

Electrical Characteristics (Ta = 25°C)

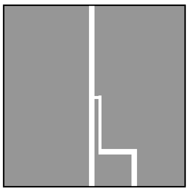
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16$ V, $V_{DS} = 0$ V	—	—	±10	μA
Drain cut-OFF current		I_{DSS}	$V_{DS} = 30$ V, $V_{GS} = 0$ V	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10$ mA, $V_{GS} = 0$ V	30	—	—	V
		$V_{(BR)DSX}$	$I_D = 10$ mA, $V_{GS} = -20$ V	15	—	—	
Gate threshold voltage		V_{th}	$V_{DS} = 10$ V, $I_D = 1$ mA	1.3	—	2.5	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 4.5$ V, $I_D = 3$ A	—	25	32	mΩ
			$V_{GS} = 10$ V, $I_D = 3$ A	—	19	24	
Forward transfer admittance		$\|Y_{fs}\|$	$V_{DS} = 10$ V, $I_D = 3$ A	3.5	7	—	S
Input capacitance		C_{iss}	$V_{DS} = 10$ V, $V_{GS} = 0$ V, f = 1 MHz	—	1250	—	pF
Reverse transfer capacitance		C_{rss}		—	155	—	
Output capacitance		C_{oss}		—	170	—	
Switching time	Rise time	t_r	 Duty ≦ 1%, $t_w = 10$ μs	—	5	—	ns
	Turn-ON time	t_{on}		—	11	—	
	Fall time	t_f		—	9	—	
	Turn-OFF time	t_{off}		—	63	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \simeq 24$ V, $V_{GS} = 10$ V, $I_D = 6$ A	—	25	—	nC
Gate-source charge		Q_{gs}		—	20	—	
Gate-drain ("miller") charge		Q_{gd}		—	5	—	

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

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

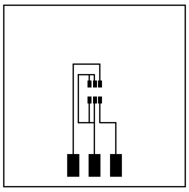
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



FR-4
2510 ms*

(a)



FR-4
25.4 × 25.4 × 0.8
Unit: (mm)

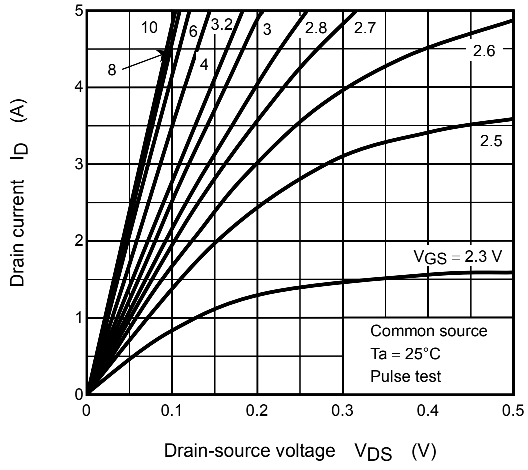
(b)

Note 3: $V_{DD} = 24$ V, $T_{ch} = 25$°C (initial), L = 0.5 mH, $R_G = 25\ \Omega$, $I_{AR} = 3.0$ A

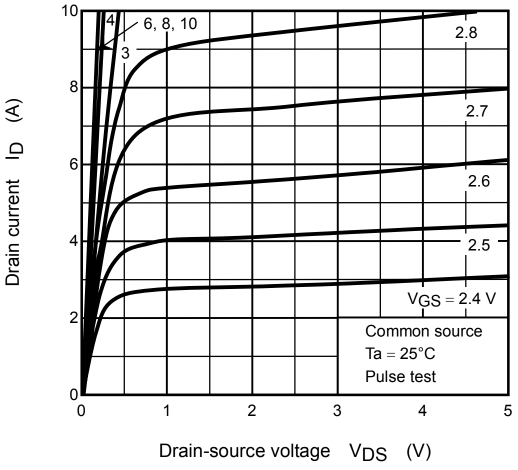
Note 4: Repetitive rating; pulse width limited by maximum channel temperature

Note 5: Black round marking "•" locates on the left lower side of parts number marking "S2D" indicates terminal No.1.

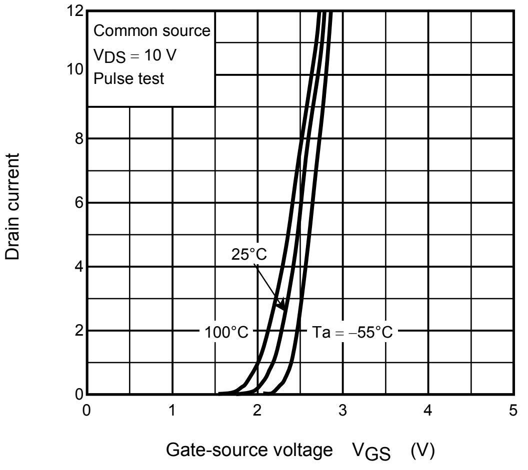
$I_D – V_{DS}$



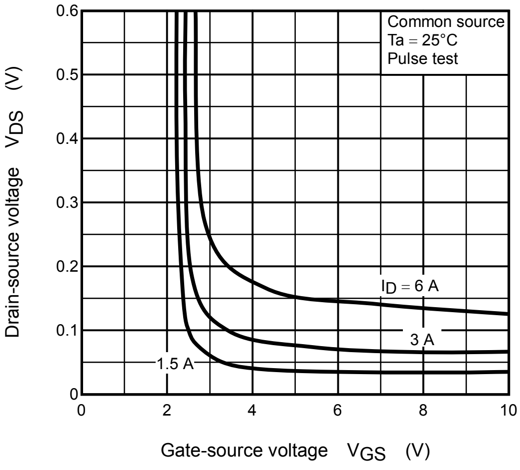
$I_D – V_{DS}$



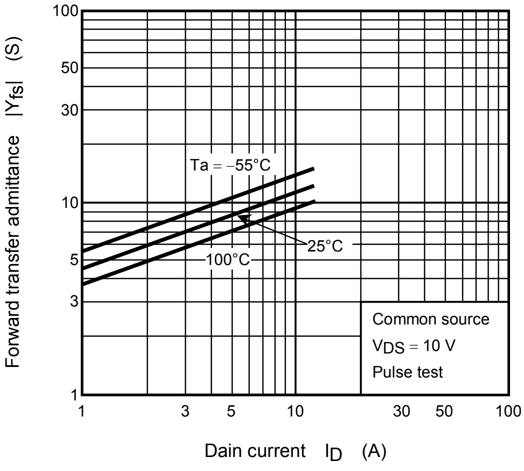
$I_D – V_{GS}$



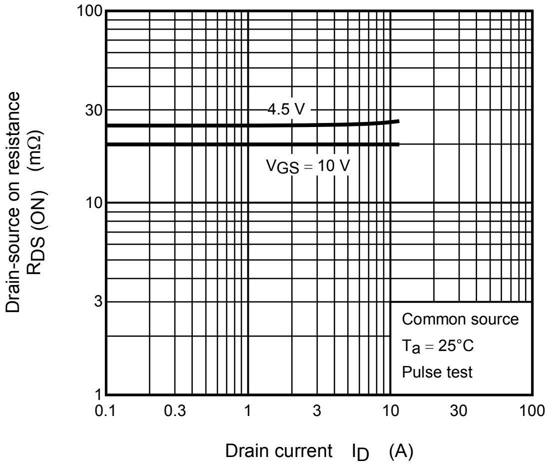
$V_{DS} – V_{GS}$

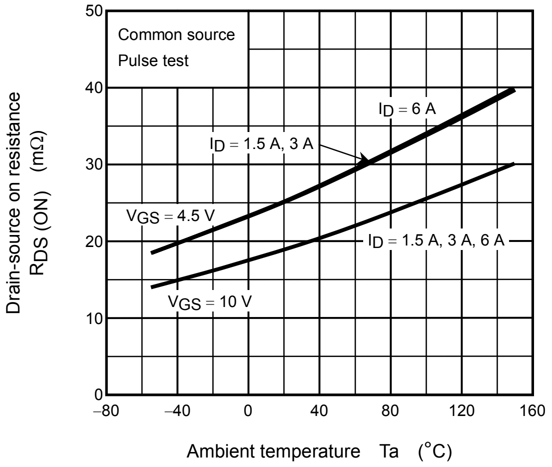


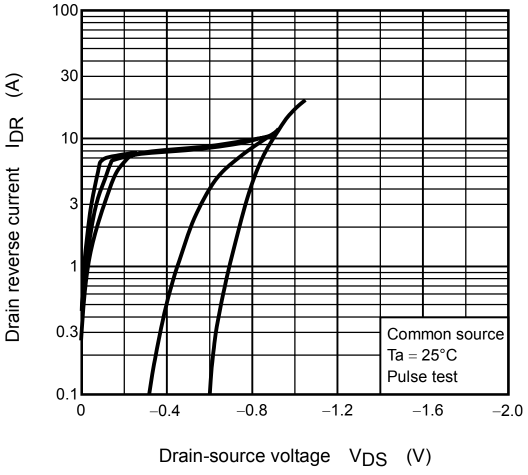
$|Y_{fs}| – I_D$

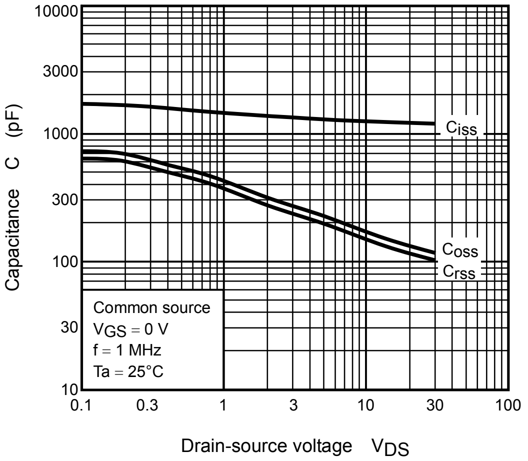


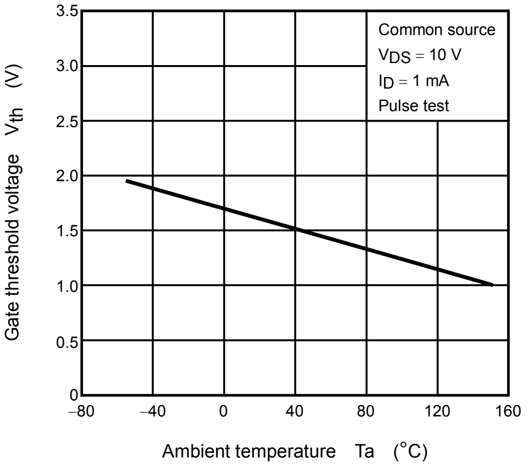
$R_{DS\ (ON)} – I_D$

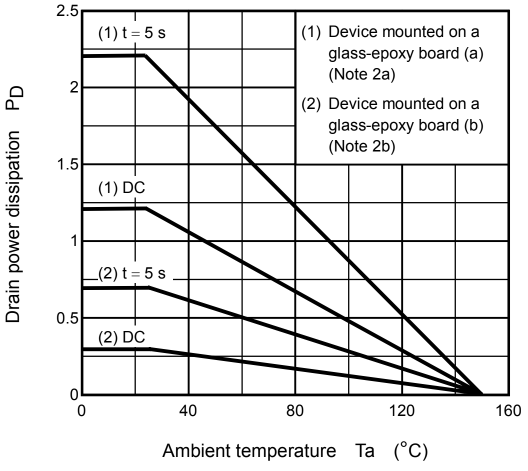


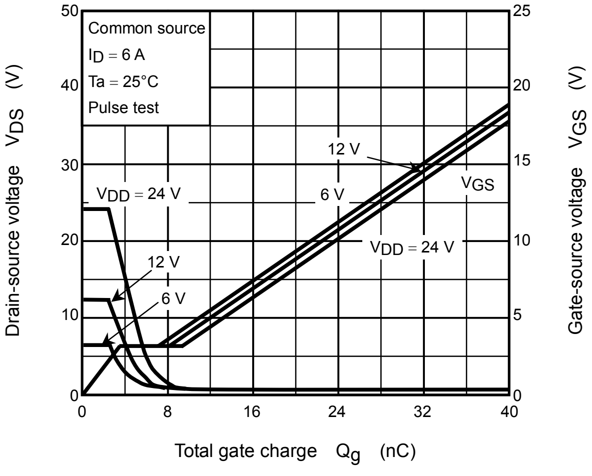

$R_{DS\,(ON)}$ – Ta

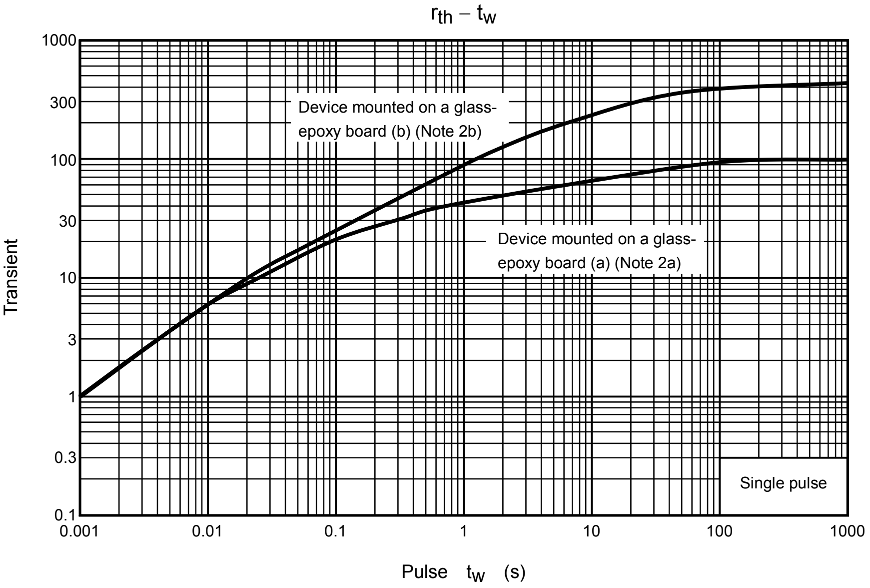

I_{DR} – V_{DS}

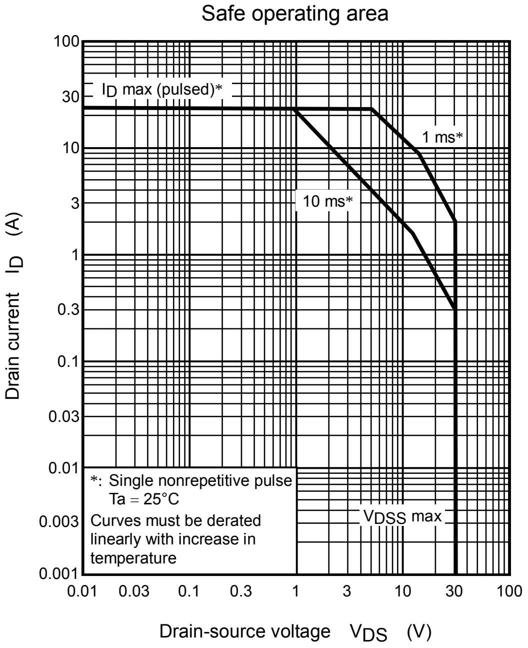

Capacitance – V_{DS}


V_{th} – Ta


P_D – Ta


Dynamic input/output characteristics


$r_{th} – t_w$
Transient
Pulse t_w (s)
1000
300
100
30
10
3
1
0.3
0.1
0.001
0.01
0.1
1
10
100
1000
Device mounted on a glass-epoxy board (b) (Note 2b)
Device mounted on a glass-epoxy board (a) (Note 2a)
Single pulse


Safe operating area
Drain current I_D (A)
Drain-source voltage V_{DS} (V)
100
30
10
3
1
0.3
0.1
0.03
0.01
0.003
0.001
0.01
0.03
0.1
0.3
1
3
10
30
100
I_D max (pulsed)*
1 ms*
10 ms*
V_{DSS} max
*: Single nonrepetitive pulse
Ta = 25°C
Curves must be derated linearly with increase in temperature

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