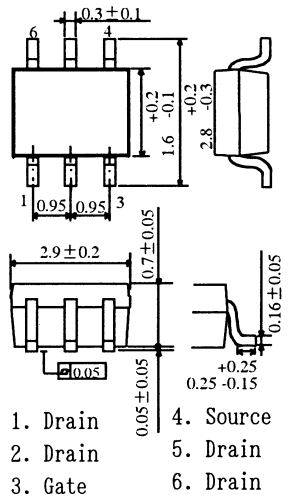
TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (U-MOS II)

TPC6106

Notebook PC Applications
Portable Equipment Applications

- Small footprint due to small and thin package
- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 58 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 5.5 S (typ.)
- Low leakage current: I_{DSS} = −10 μA (max) (V_{DS} = −40 V)
- Enhancement model: V_{th} = −0.8 to −2.0 V
  (V_{DS} = −10 V, I_D = −1 mA)

Unit: mm



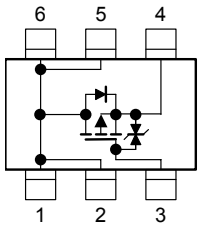
JEDEC	—
JEITA	—
TOSHIBA	2-3T1A

Weight: 0.011 g (typ.)

Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	−40	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	−40	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	DC (Note 1)	I_D	−3.9	A
	Pulse (Note 1)	I_{DP}	−15.6	
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}	1.7	mJ
Avalanche current		I_{AR}	−1.9	A
Repetitive avalanche energy (Note 4)		E_{AR}	0.22	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

Circuit Configuration



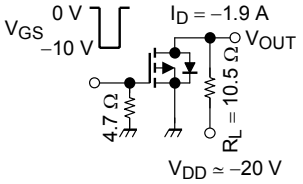
Thermal Characteristics

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 1, Note 2, Note 3, Note 4 and Note 5: See the next page.

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

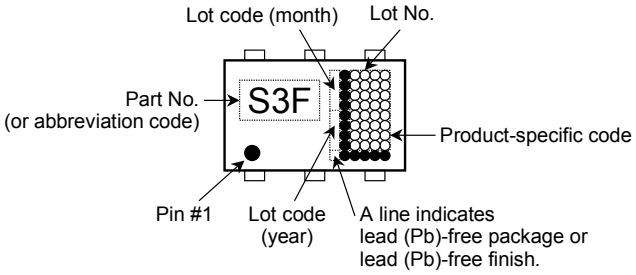
Electrical Characteristics (Ta = 25°C)

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}	$V_{DS} = -40$ V, $V_{GS} = 0$ V	—	—	−10	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	$I_D = -10$ mA, $V_{GS} = 0$ V	−40	—	—	V
		$V_{(BR)\ DSX}$	$I_D = -10$ mA, $V_{GS} = 20$ V	−25	—	—	
Gate threshold voltage		V_{th}	$V_{DS} = -10$ V, $I_D = -1$ mA	−0.85	—	−2.0	V
Drain-source ON resistance		$R_{DS\ (ON)}$	$V_{GS} = -4.5$ V, $I_D = -1.9$ A	—	90	120	mΩ
		$R_{DS\ (ON)}$	$V_{GS} = -10$ V, $I_D = -1.9$ A	—	58	75	
Forward transfer admittance		$\|Y_{fs}\|$	$V_{DS} = -10$ V, $I_D = -1.9$ A	2.7	5.5	—	S
Input capacitance		C_{iss}	$V_{DS} = -10$ V, $V_{GS} = 0$ V, f = 1 MHz	—	460	—	pF
Reverse transfer capacitance		C_{rss}		—	85	—	
Output capacitance		C_{oss}		—	140	—	
Switching time	Rise time	t_r	 Duty ≦ 1%, $t_w = 10$ μs	—	7	—	ns
	Turn-on time	t_{on}		—	11	—	
	Fall time	t_f		—	33	—	
	Turn-off time	t_{off}		—	86	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \simeq -32$ V, $V_{GS} = -10$ V, $I_D = -3.9$ A	—	12	—	nC
Gate-source charge		Q_{gs}		—	9	—	
Gate-drain ("miller") charge		Q_{gd}		—	3	—	

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

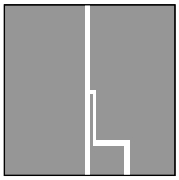
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	−15.6	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = -3.9$ A, $V_{GS} = 0$ V	—	—	1.2	V

Marking (Note 5)



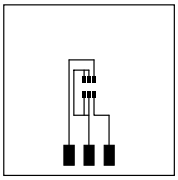
Note 1: Ensure that the channel temperature does not exceed 150℃.

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)



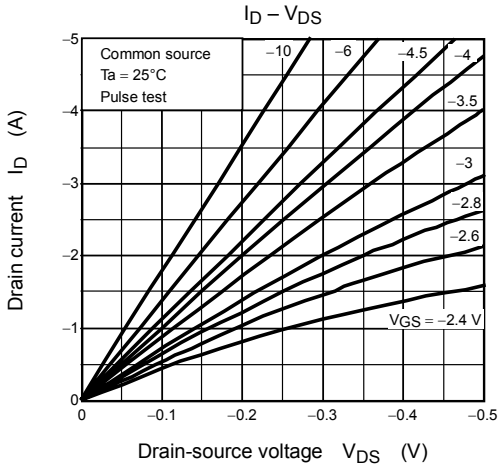
FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

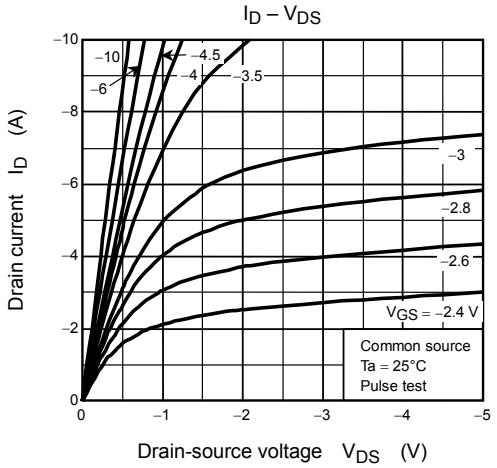
(b)

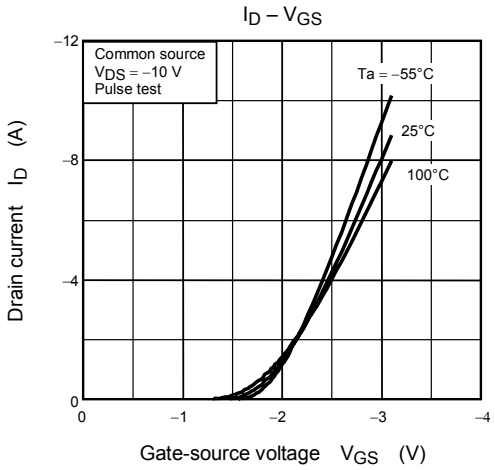
Note 3: $V_{DD} = -24$ V, $T_{ch} = 25°C$ (initial), L = 0.5 mH, $R_G = 25\ \Omega$, $I_{AR} = -1.9$ A

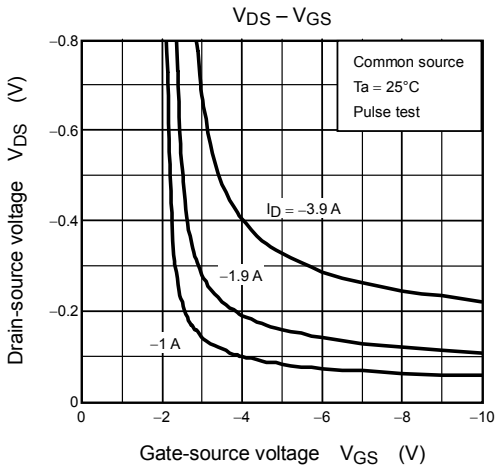
Note 4: Repetitive rating pulse width limited by maximum channel temperature

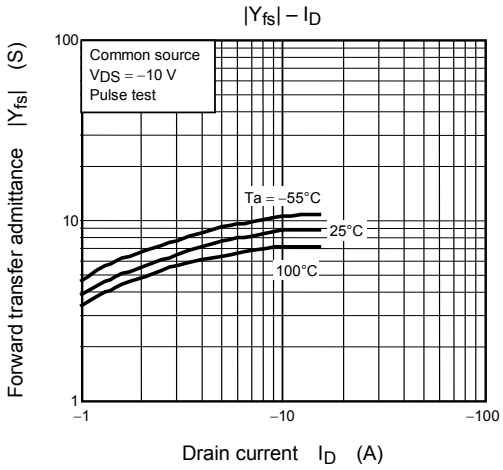
Note 5: • on the lower left of the marking indicates Pin 1.

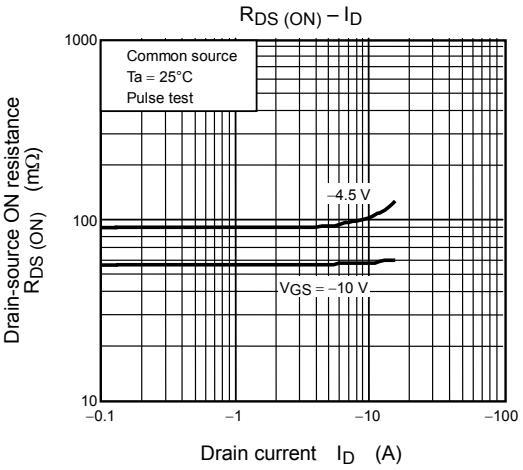

$I_D - V_{DS}$
Common source
Ta = 25°C
Pulse test
−10
−6
−4.5
−4
−3.5
−3
−2.8
−2.6
V_{GS} = −2.4 V
Drain current I_D (A)
Drain-source voltage V_{DS} (V)


$I_D - V_{DS}$
−10
−6
−4.5
−4
−3.5
−3
−2.8
−2.6
V_{GS} = −2.4 V
Common source
Ta = 25°C
Pulse test
Drain current I_D (A)
Drain-source voltage V_{DS} (V)

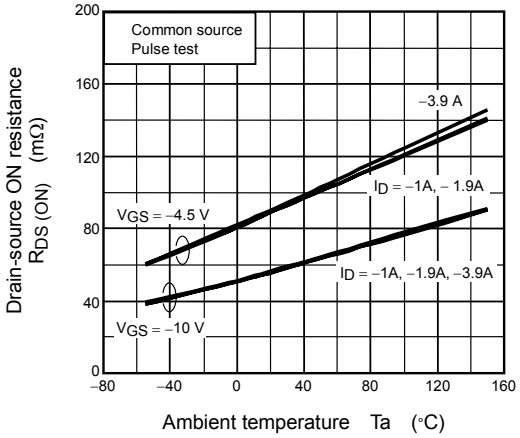

$I_D - V_{GS}$
Common source
V_{DS} = −10 V
Pulse test
Ta = −55°C
25°C
100°C
Drain current I_D (A)
Gate-source voltage V_{GS} (V)


$V_{DS} - V_{GS}$
Common source
Ta = 25°C
Pulse test
I_D = −3.9 A
−1.9 A
−1 A
Drain-source voltage V_{DS} (V)
Gate-source voltage V_{GS} (V)

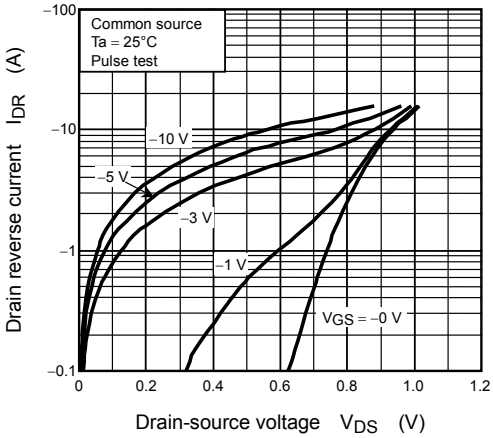

$|Y_{fs}| - I_D$
Common source
V_{DS} = −10 V
Pulse test
Ta = −55°C
25°C
100°C
Forward transfer admittance $|Y_{fs}|$ (S)
Drain current I_D (A)


$R_{DS\ (ON)} - I_D$
Common source
Ta = 25°C
Pulse test
−4.5 V
V_{GS} = −10 V
Drain-source ON resistance $R_{DS\ (ON)}$ (mΩ)
Drain current I_D (A)

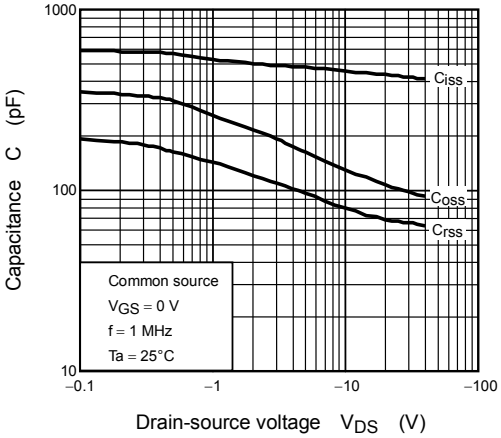
$R_{DS\ (ON)}$ – Ta



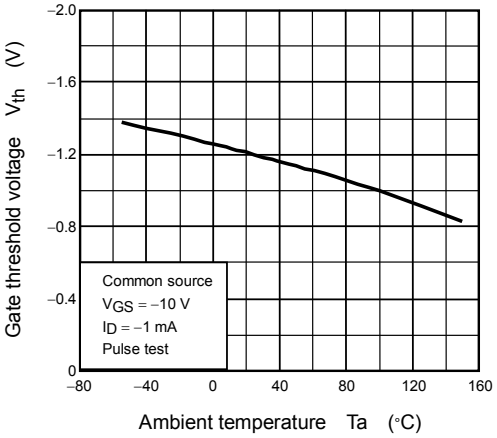
I_{DR} – V_{DS}



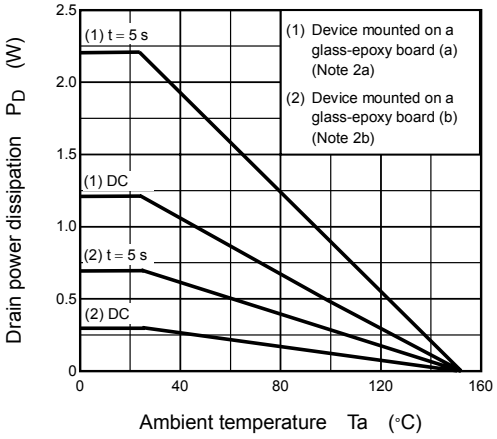
C – V_{DS}



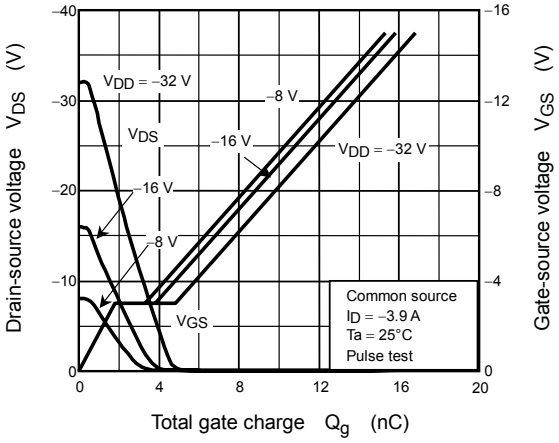
V_{th} – Ta

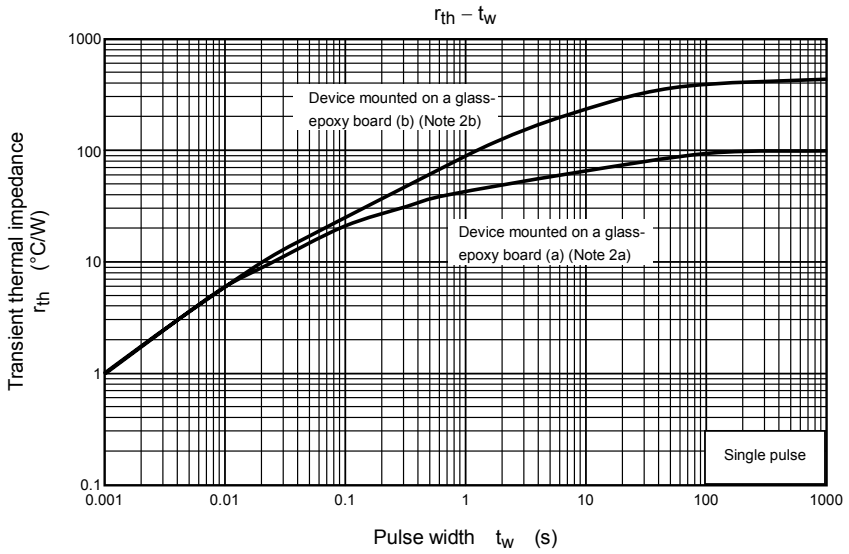


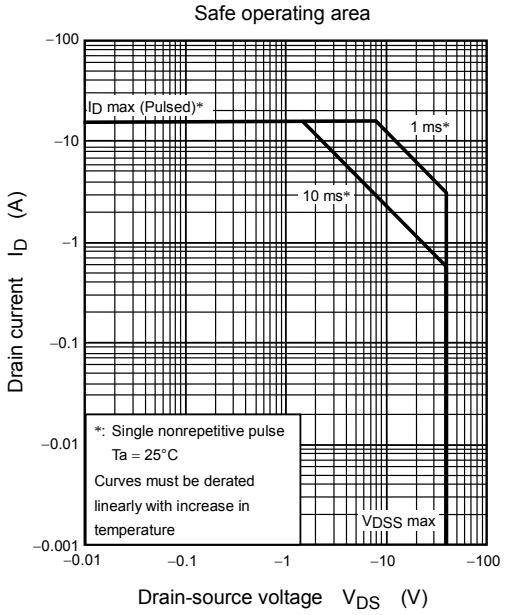
P_D – Ta



Dynamic input/output characteristics




rth – tw
Transient thermal impedance rth (°C/W)
1000
100
10
1
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
Pulse width tw (s)


Safe operating area
Drain current ID (A)
−100
−10
−1
−0.1
−0.01
−0.001
−0.01
−0.1
−1
−10
−100
ID max (Pulsed)*
1 ms*
10 ms*
*: Single nonrepetitive pulse
Ta = 25°C
Curves must be derated linearly with increase in temperature
VDSS max
Drain-source voltage VDS (V)

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