

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

# TPC6105

Notebook PC Applications

Portable Equipment Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 72 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 4.7 \text{ S}$  (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		$V_{GSS}$	$\pm 8$	V
Drain current	DC (Note 1)	$I_D$	-2.7	A
	Pulse (Note 1)	$I_{DP}$	-10.8	
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)		$E_{AS}$	1.2	mJ
Avalanche current		$I_{AR}$	-1.35	A
Repetitive avalanche energy (Note 4)		$E_{AR}$	0.22	mJ
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55~150	$^\circ\text{C}$

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).

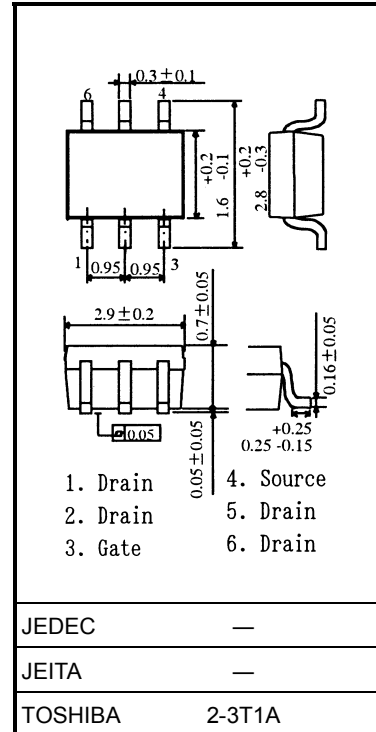
## Thermal Characteristics

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

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

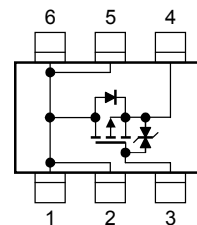
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



Weight: 0.011 g (typ.)

## Circuit Configuration



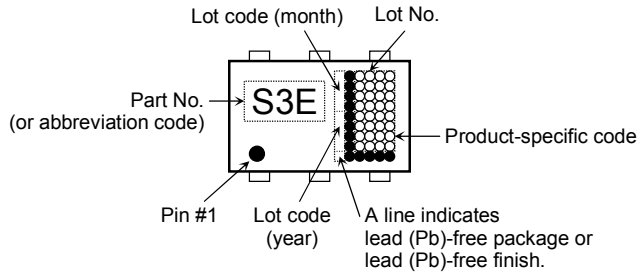
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 8 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = -20 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	-10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10 \text{ mA}, V_{GS} = 0 \text{ V}$	-20	—	—	V
		$V_{(BR)DSX}$	$I_D = -10 \text{ mA}, V_{GS} = 8 \text{ V}$	-12	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = -10 \text{ V}, I_D = -200 \mu\text{A}$	-0.5	—	-1.2	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = -1.8 \text{ V}, I_D = -0.7 \text{ A}$	—	215	300	m $\Omega$
		$R_{DS(ON)}$	$V_{GS} = -2.5 \text{ V}, I_D = -1.4 \text{ A}$	—	110	160	
		$R_{DS(ON)}$	$V_{GS} = -4.5 \text{ V}, I_D = -1.4 \text{ A}$	—	72	110	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10 \text{ V}, I_D = -1.4 \text{ A}$	2.4	4.7	—	S
Input capacitance		$C_{iss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	470	—	pF
Reverse transfer capacitance		$C_{rss}$		—	70	—	
Output capacitance		$C_{oss}$		—	80	—	
Switching time	Rise time	$t_r$	<p> <math>V_{GS} = 0 \text{ V}</math>  <math>V_{GS} = -5 \text{ V}</math>  <math>I_D = -1.4 \text{ A}</math>  <math>V_{OUT}</math>  <math>4.7 \Omega</math>  <math>R_L = 7.14 \Omega</math>  <math>V_{DD} \approx -10 \text{ V}</math>                      Duty <math>\leq 1\%</math>, <math>t_w = 10 \mu\text{s}</math> </p>	—	5	—	ns
	Turn-on time	$t_{on}$		—	9	—	
	Fall time	$t_f$		—	8	—	
	Turn-off time	$t_{off}$		—	26	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx -16 \text{ V}, V_{GS} = -5 \text{ V}, I_D = -2.7 \text{ A}$	—	6	—	nC
Gate-source charge		$Q_{gs}$		—	4	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	2	—	

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

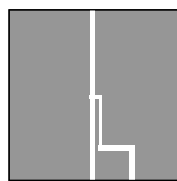
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	-10.8	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = -2.7 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	1.2	V

## Marking (Note 5)



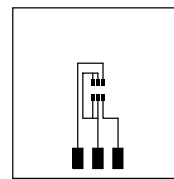
Note 1: Ensure that the channel temperature does not exceed 150°C.

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)



(a)

FR-4  
 25.4 × 25.4 × 0.8  
 (Unit: mm)



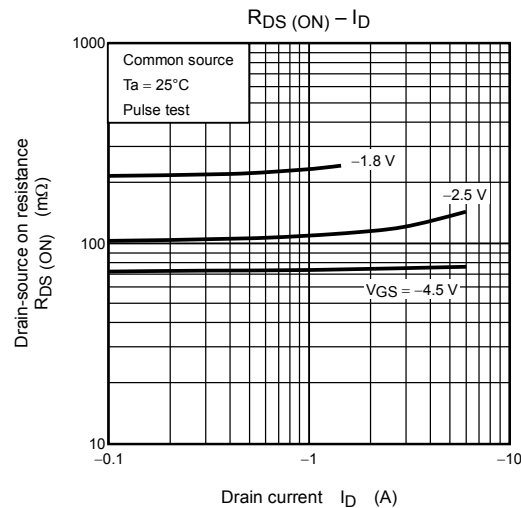
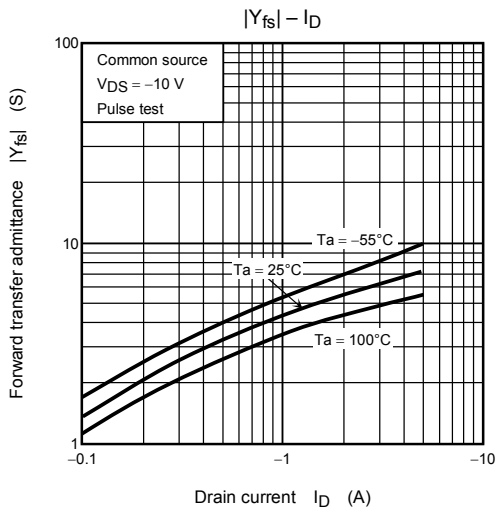
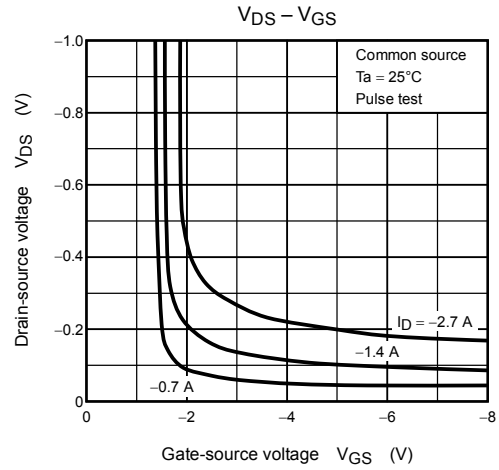
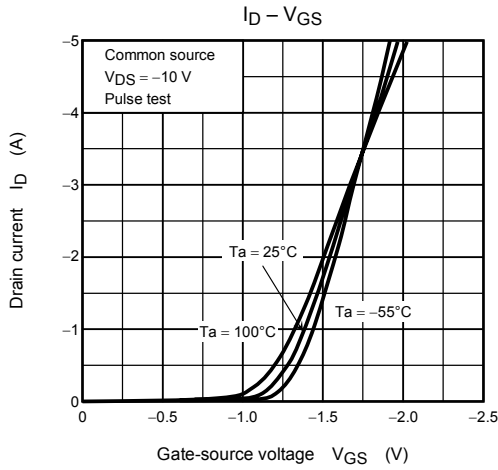
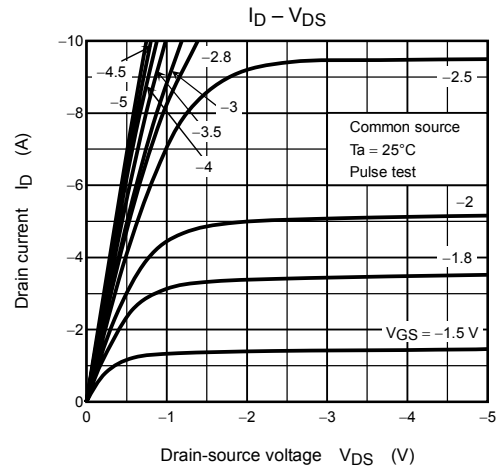
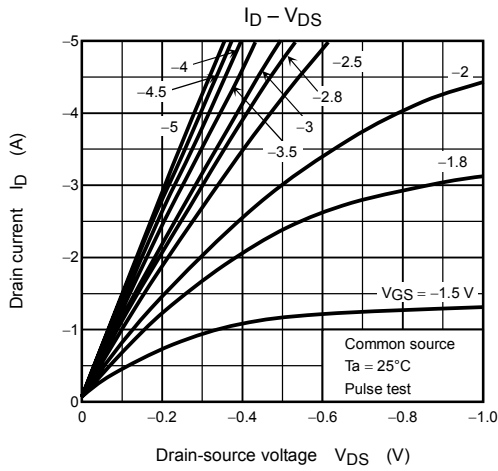
(b)

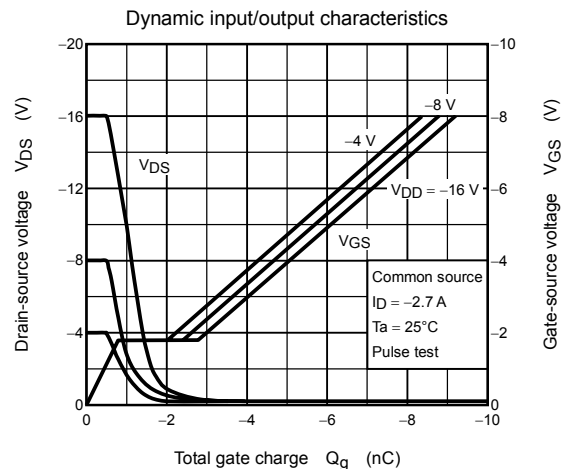
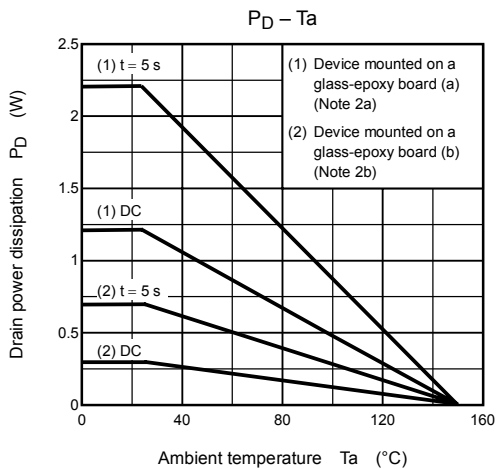
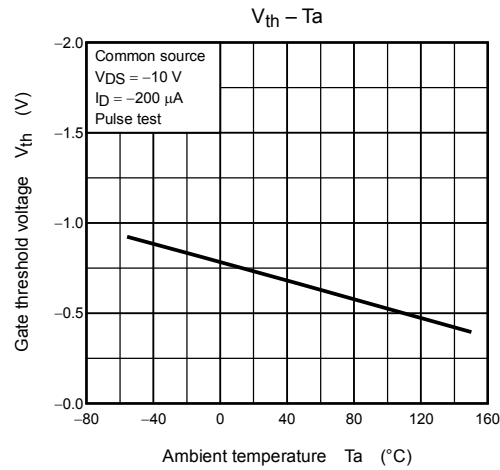
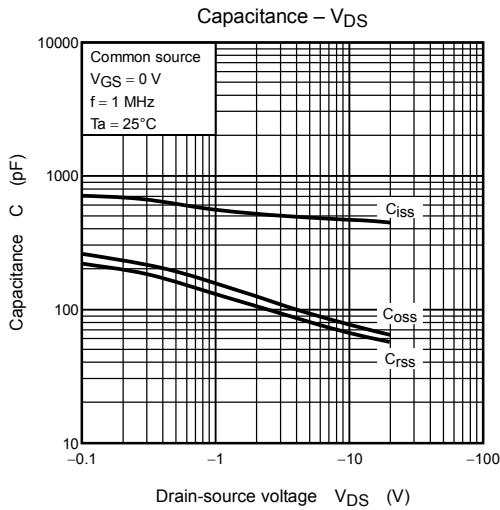
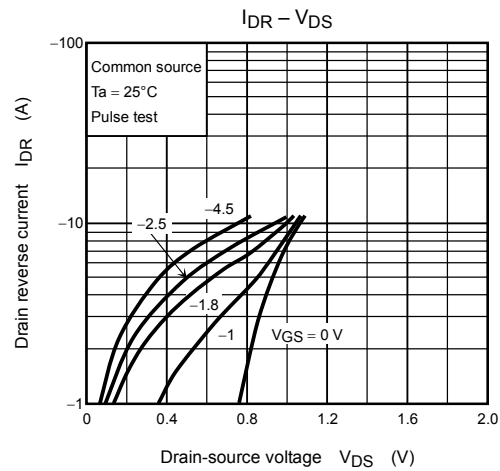
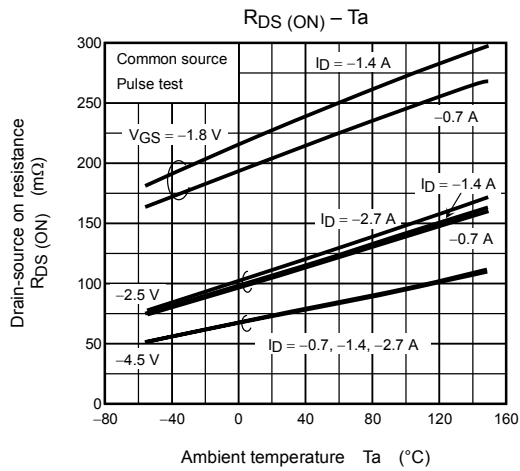
FR-4  
 25.4 × 25.4 × 0.8  
 (Unit: mm)

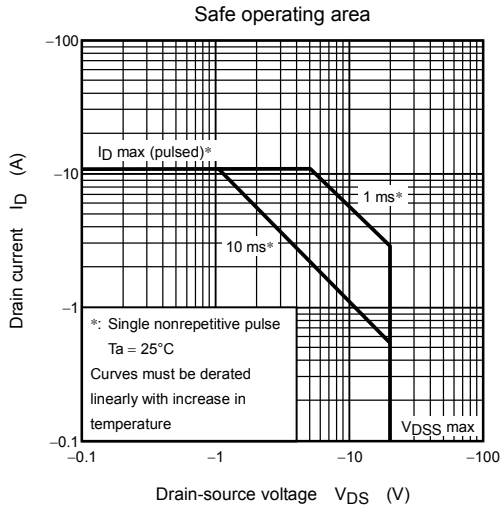
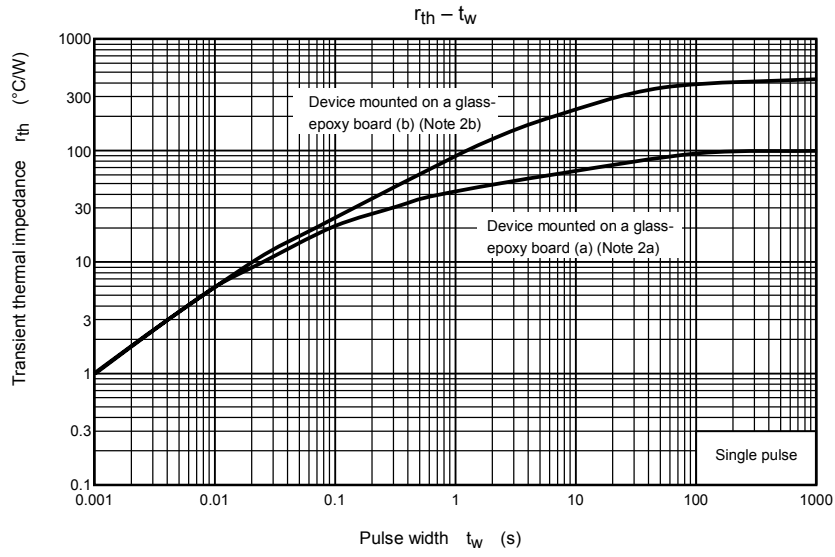
Note 3:  $V_{DD} = -16\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.5\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = -1.35\text{ A}$

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

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







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