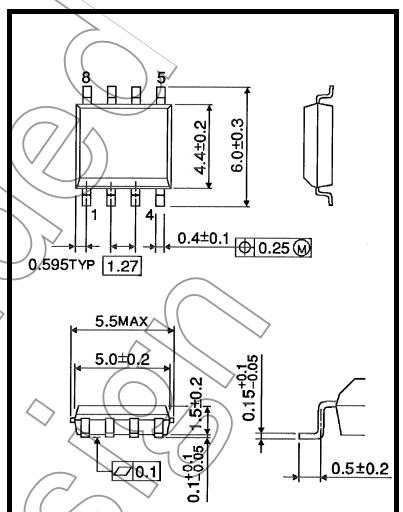
TOSHIBA Field Effect Transistor Silicon P-Channel MOS Type (High-Speed U−MOSII)

TPC8105−H

High-Efficiency DC／DC Converter Applications
Lithium Ion Battery Applications
Notebook PC Applications
Portable-Equipment Applications

- Small footprint due to a small and thin package
- High-speed switching
- Small gate charge : Q_g = 32 nC (typ.)
- Low drain−source ON-resistance : $R_{DS\ (ON)}$ = 20 mΩ (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 12 S (typ.)
- Low leakage current : I_{DSS} = −10 μA (max) (V_{DS} = −30 V)
- Enhancement mode : V_{th} = −0.8~−2.0 V (V_{DS} = −10 V, I_D = −1 mA)

Unit: mm



1, 2, 3	SOURCE
4	GATE
5, 6, 7, 8	DRAIN

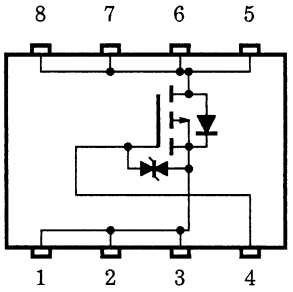
JEDEC	—
JEITA	—
TOSHIBA	2-6J1B

Weight: 0.085 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	−30	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	−30	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	DC (Note 1)	I_D	−7	A
	Pulse (Note 1)	I_{DP}	−28	
Drain power dissipation (t = 10 s) (Note 2a)		P_D	2.4	W
Drain power dissipation (t = 10 s) (Note 2b)		P_D	1.0	W
Single-pulse avalanche energy (Note 3)		E_{AS}	63.7	mJ
Avalanche current		I_{AR}	−7	A
Repetitive avalanche energy (Note 2a) (Note 4)		E_{AR}	0.24	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

Circuit Configuration



Note: For Notes 1 to 4, refer to the next page.

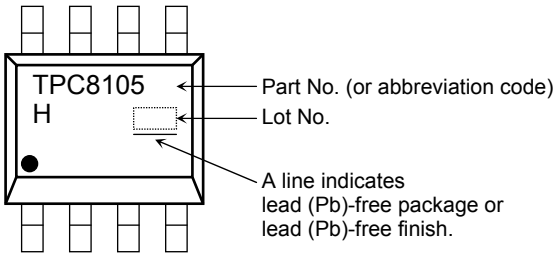
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within 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).

This transistor is an electrostatic-sensitive device. Handle with care.

Thermal Characteristics

Characteristic	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th\ (ch\text{-}a)}$	52.1	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th\ (ch\text{-}a)}$	125	°C/W

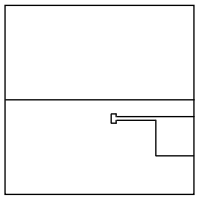
Marking (Note 5)



Note 1: The channel temperature should not exceed 150°C during use.

Note 2:

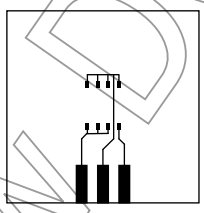
(a) Device mounted on a glass-epoxy board (a)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(a)

(b) Device mounted on a glass-epoxy board (b)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

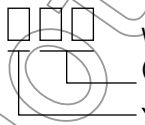
(b)

Note 3: V_{DD} = −24 V, T_{ch} = 25°C (initial), L = 1.0 mH, R_G = 25 Ω, I_{AR} = −7 A

Note 4: Reptitve rating: pulse width limited by maximum channel temperature.

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

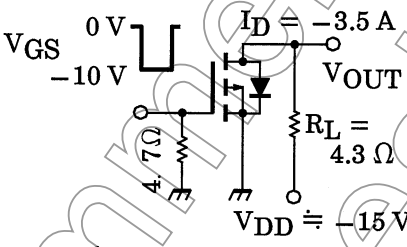
* Weekly code: (Three digits)



Week of manufacture
(01 for first week of year, continuing up to 52 or 53)

Year of manufacture
(The last digit of the calendar year)

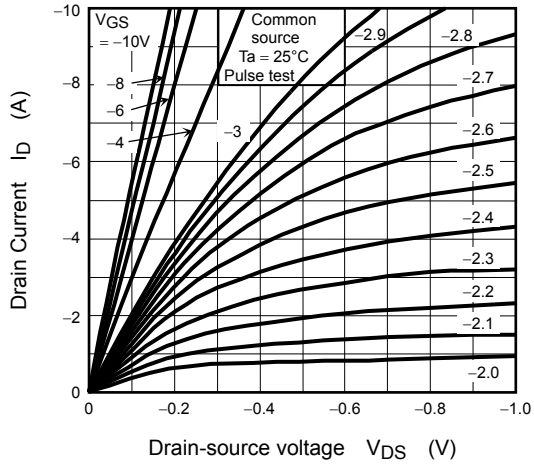
Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cutoff 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	−0.8	—	−2.0	V
Drain−source ON-resistance		$R_{DS\ (ON)}$	V_{GS} = −4 V, I_D = −3.5 A	—	34	60	mΩ
		$R_{DS\ (ON)}$	V_{GS} = −10 V, I_D = −3.5 A	—	20	40	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = −10 V, I_D = −3.5 A	5.9	12	—	S
Input capacitance		C_{iss}	V_{DS} = −10 V, V_{GS} = 0 V, f = 1 MHz	—	1440	—	pF
Reverse transfer capacitance		C_{rss}		—	330	—	
Output capacitance		C_{oss}		—	485	—	
Switching time	Rise time	t_r		—	10	—	ns
	Turn−on time	t_{on}		—	18	—	
	Fall time	t_f		—	50	—	
	Turn−off time	t_{off}		—	140	—	
Total gate charge (gate−source plus gate−drain)		Q_g	V_{DD} ≈ −24 V, V_{GS} = −10 V, I_D = −7 A	—	32	—	nC
Gate−source charge		Q_{gs}		—	23	—	
Gate−drain (“Miller”) charge		Q_{gd}		—	8	—	

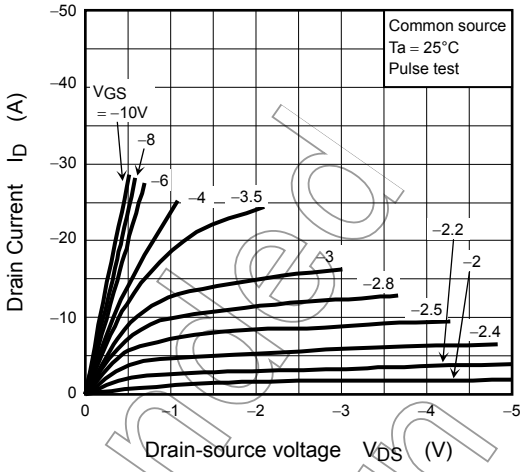
Source−Drain Ratings and Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	−28	A
Forward voltage (diode)		V_{DSF}	I_{DR} = −7 A, V_{GS} = 0 V	—	—	1.2	V

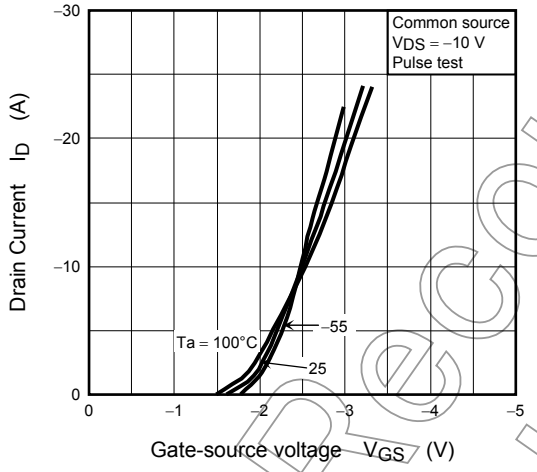
$I_D - V_{DS}$



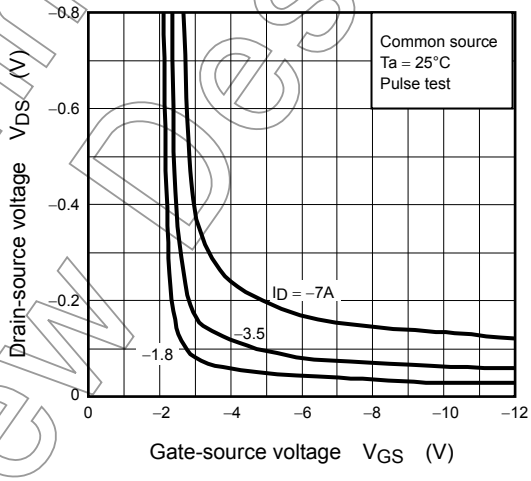
$I_D - V_{DS}$



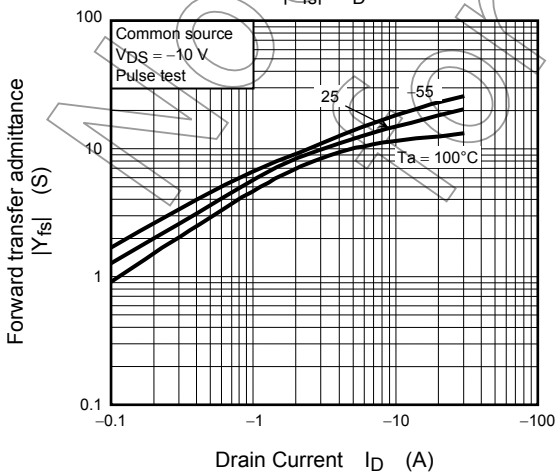
$I_D - V_{GS}$



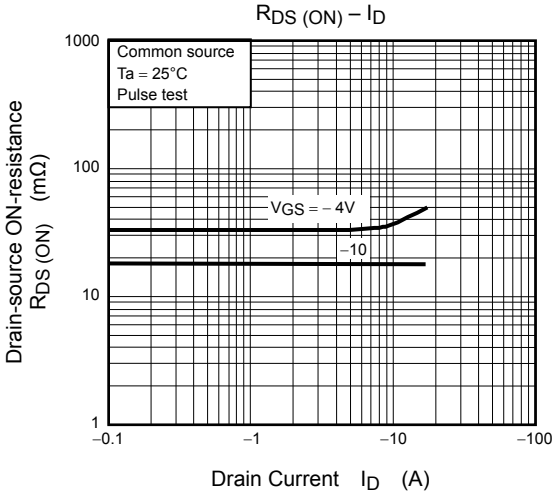
$V_{DS} - V_{GS}$



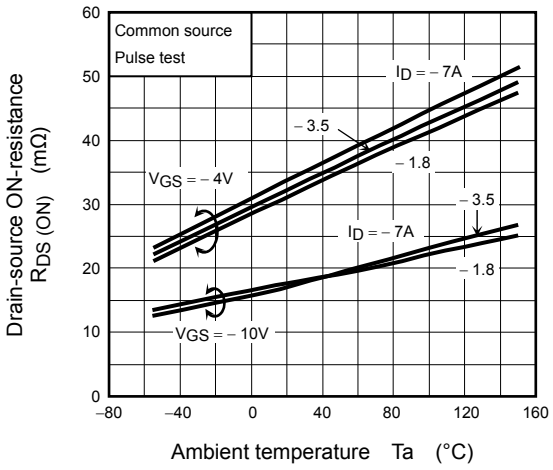
$|Y_{fs}| - I_D$



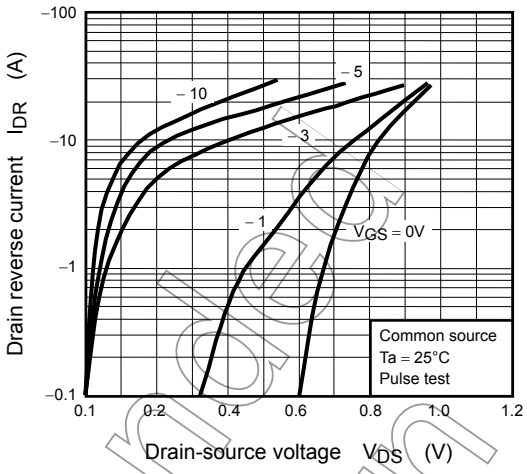
$R_{DS\ (ON)} - I_D$



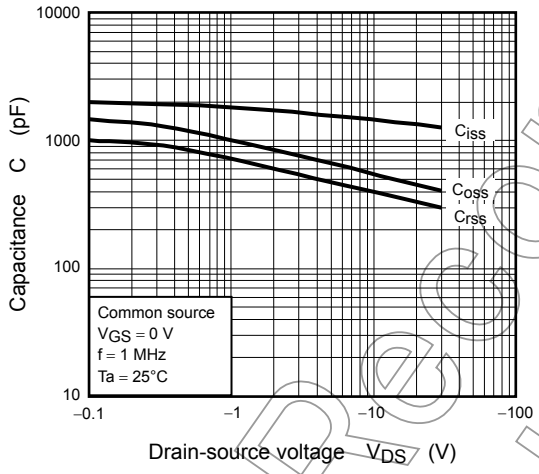
$R_{DS\ (ON)}$ – Ta



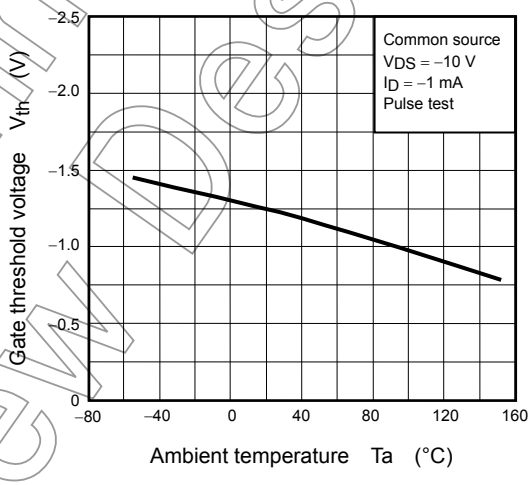
I_{DR} – V_{DS}



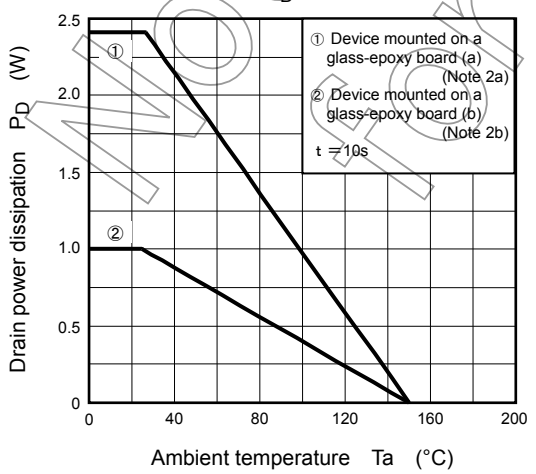
Capacitance – V_{DS}



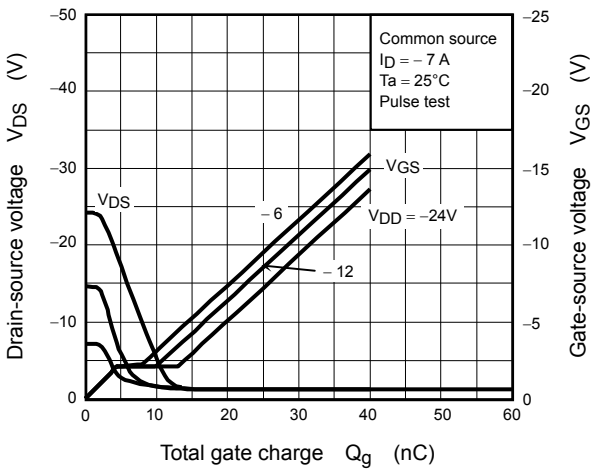
V_{th} – Ta



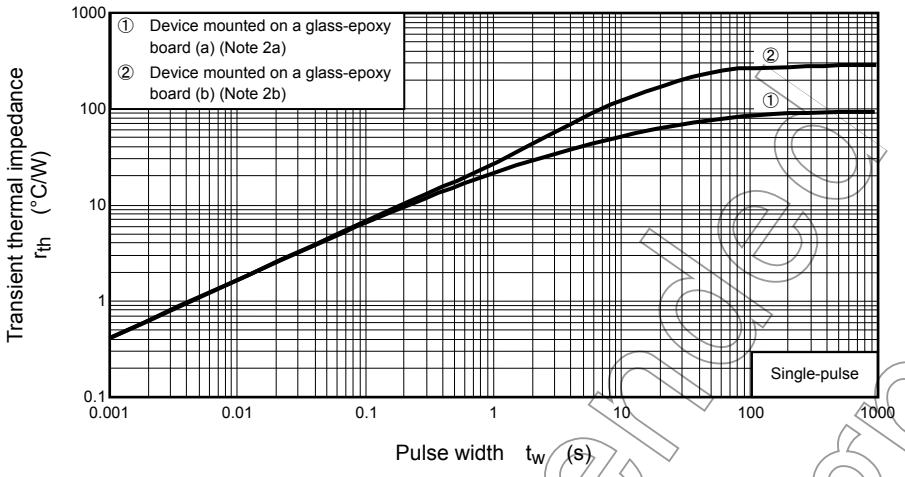
P_D – Ta



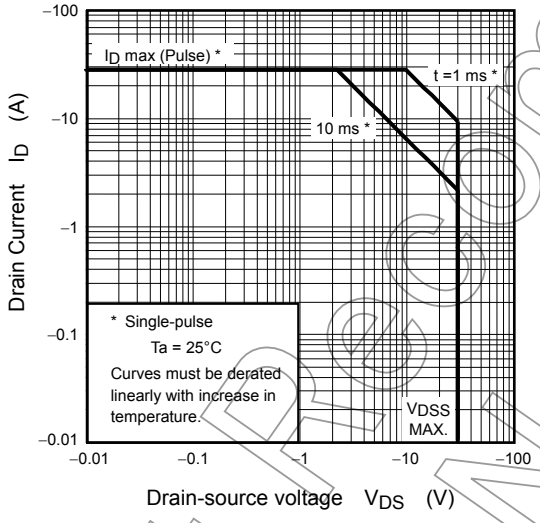
Dynamic input/output characteristics



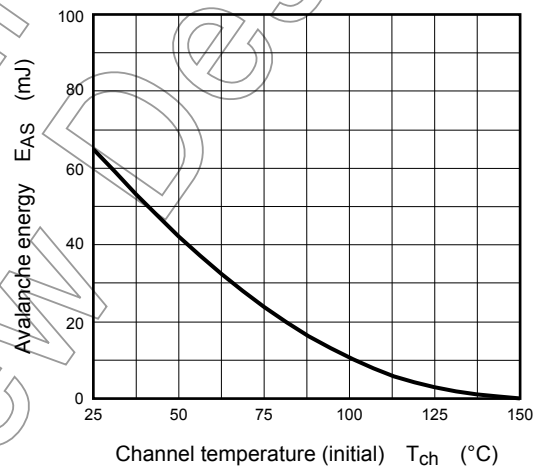
$r_{th} - t_w$

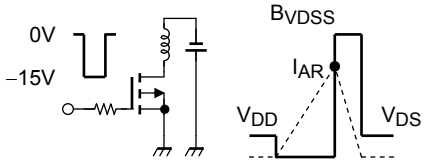


Safe Operating Area



$E_{AS} - T_{ch}$





Test Circuit Wave form

T_{ch} = 25°C (Initial)
Peak I_{AR} = −7 A, R_G = 25 Ω
V_{DD} = −24 V, L = 1.0 mH

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

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20070701-EN

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