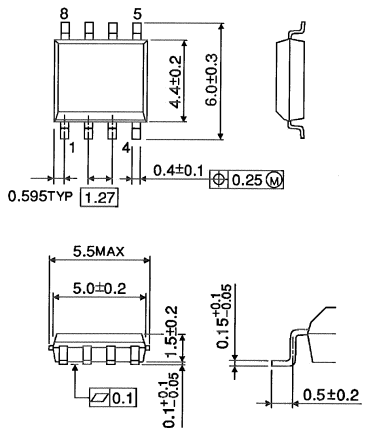
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (High speed U-MOSIII)

TPC8015-H

High Speed and High Efficiency DC-DC Converters
Notebook PC Applications
Portable Equipment Applications

- Small footprint due to small and thin package
- High speed switching
- Small gate charge: Q_g = 29 nC (typ.)
- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 5.2 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 16 S (typ.)
- Low leakage current: I_{DSS} = 10 μA (max) (V_{DS} = 30 V)
- Enhancement mode: V_{th} = 1.1 to 2.3 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: 0.080 g (typ.)

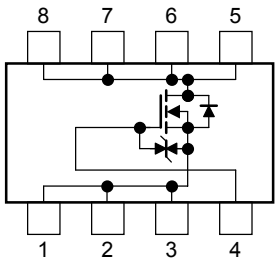
Maximum Ratings (Ta = 25°C)

Characteristics		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	13	A
	Pulsed (Note 1)	I_{DP}	52	
Drain power dissipation (t = 10 s) (Note 2a)		P_D	1.9	W
Drain power dissipation (t = 10 s) (Note 2b)		P_D	1.0	W
Single pulse avalanche energy (Note 3)		E_{AS}	219	mJ
Avalanche current		I_{AR}	13	A
Repetitive avalanche energy (Note 2a) (Note 4)		E_{AR}	0.19	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

Note: For (Note 1), (Note 2), (Note 3), (Note 4), please refer to the next page.

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

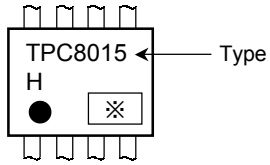
Circuit Configuration



Thermal Characteristics

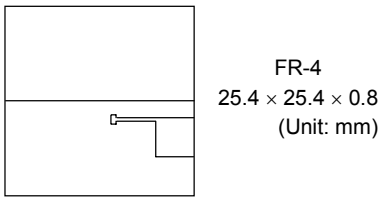
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th\ (ch\text{-}a)}$	65.8	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th\ (ch\text{-}a)}$	125	°C/W

Marking (Note 5)

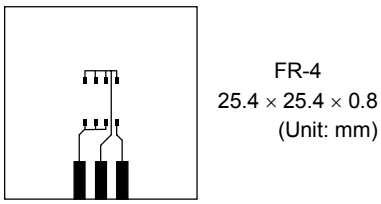


Note 1: Please use devices on condition that the channel temperature is below 150°C.

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



(a)



(b)

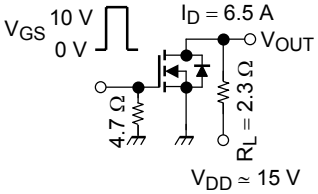
Note 3: V_{DD} = 24 V, T_{ch} = 25°C (initial), L = 1.0 mH, R_G = 25 Ω, I_{AR} = 13 A

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

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

※ shows lot number. (year of manufacture: last decimal digit of the year of manufacture, month of manufacture: January to December are denoted by letters A to L respectively.)

Electrical Characteristics (Ta = 25°C)

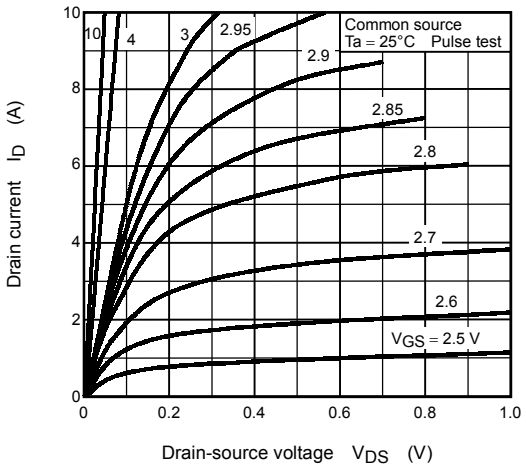
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut-OFF current		I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	30	—	—	V
		$V_{(BR)\ DSX}$	I_D = 10 mA, V_{GS} = −20 V	15	—	—	
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	1.1	—	2.3	V
Drain-source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 4.5 V, I_D = 6.5 A	—	7.7	10	mΩ
			V_{GS} = 10 V, I_D = 6.5 A	—	5.2	7.5	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 6.5 A	8	16	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	1460	—	pF
Reverse transfer capacitance		C_{rss}		—	250	—	
Output capacitance		C_{oss}		—	600	—	
Switching time	Rise time	t_r		—	5	—	ns
	Turn-ON time	t_{on}		—	13	—	
	Fall time	t_f		—	12	—	
	Turn-OFF time	t_{off}		—	37	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≃ 24 V, V_{GS} = 10 V, I_D = 13 A	—	29	—	nC
			V_{DD} ≃ 24 V, V_{GS} = 5 V, I_D = 13 A	—	16	—	
Gate-source charge 1		Q_{gs1}	V_{DD} ≃ 24 V, V_{GS} = 10 V, I_D = 13 A	—	4.2	—	
Gate-drain (“miller”) charge		Q_{gd}		—	7.3	—	
Gate switch charge		Q_{SW}		—	9.1	—	

Duty ≦ 1%, t_w = 10 μs

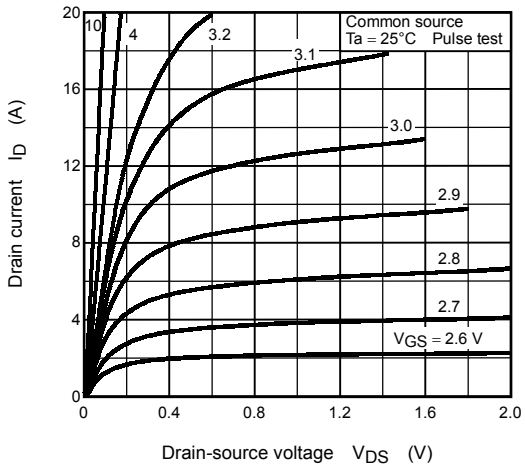
Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	52	A
Forward voltage (diode)		V_{DSF}	I_{DR} = 13 A, V_{GS} = 0 V	—	—	−1.2	V

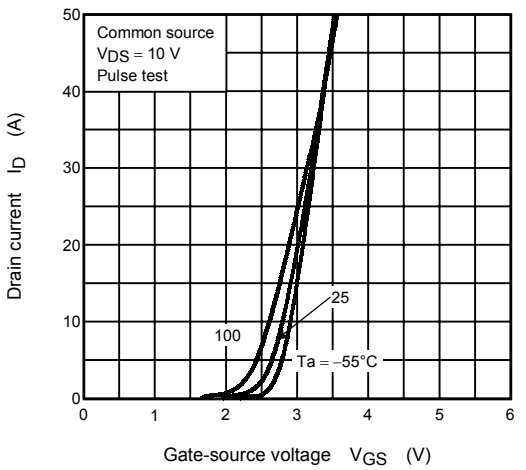
$I_D - V_{DS}$



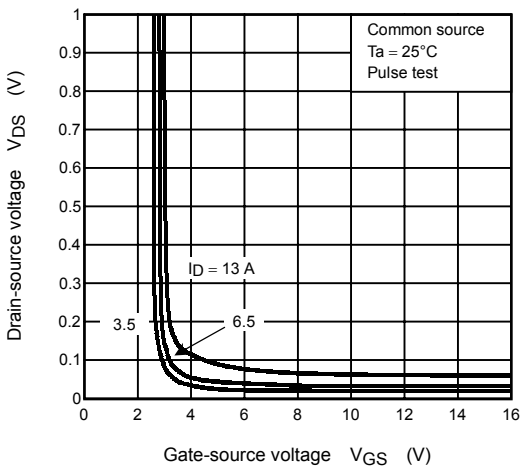
$I_D - V_{DS}$



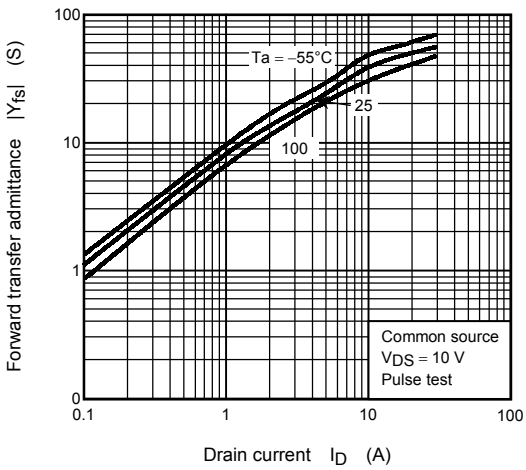
$I_D - V_{GS}$



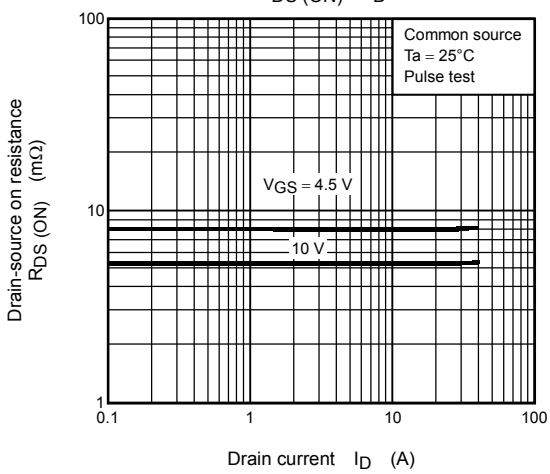
$V_{DS} - V_{GS}$



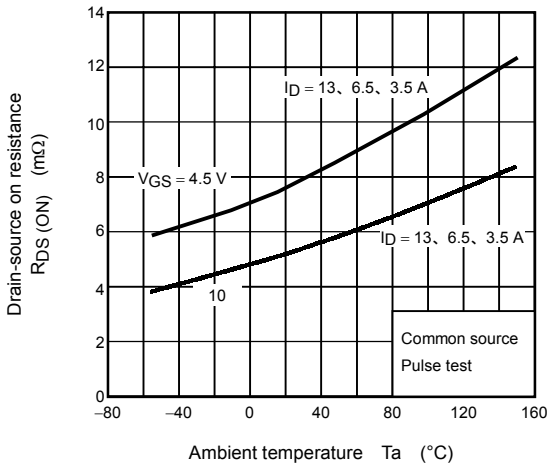
$|Y_{fs}| - I_D$



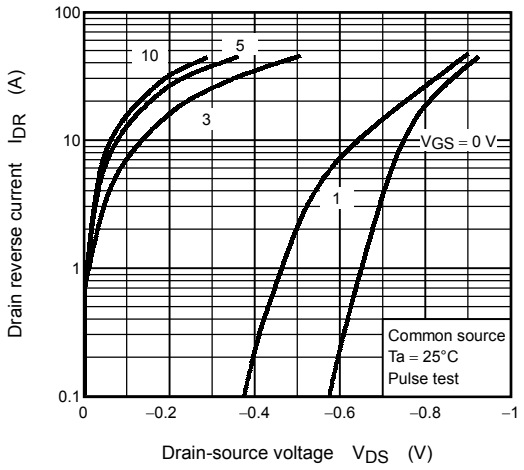
$R_{DS\ (ON)} - I_D$



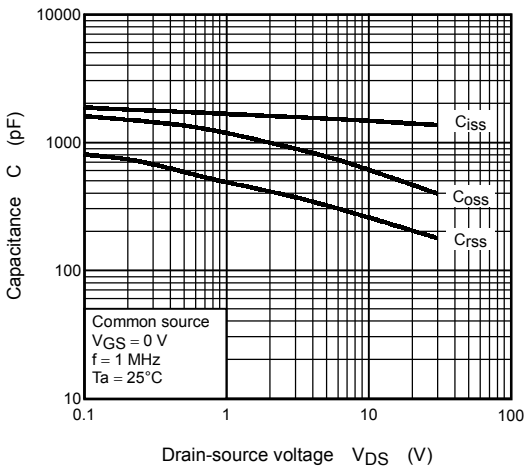
$R_{DS\ (ON)}$ – Ta



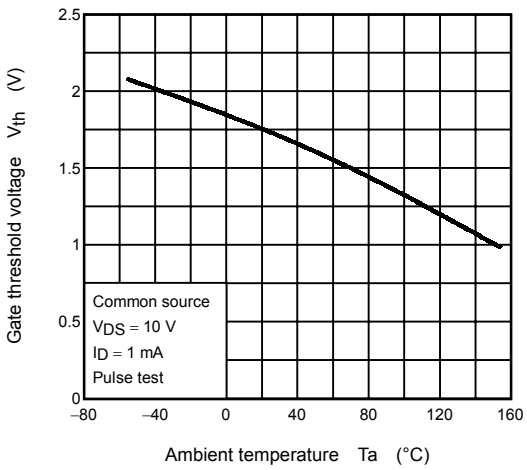
I_{DR} – V_{DS}



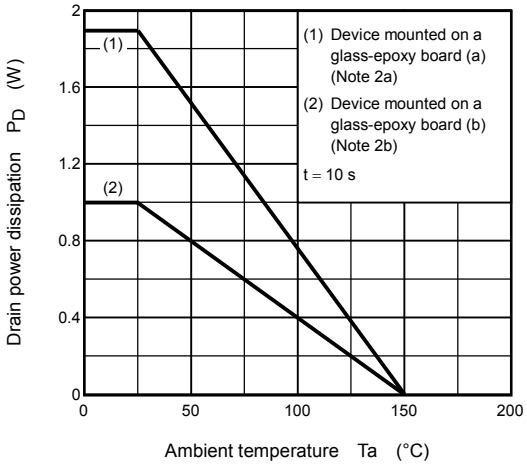
Capacitance – V_{DS}



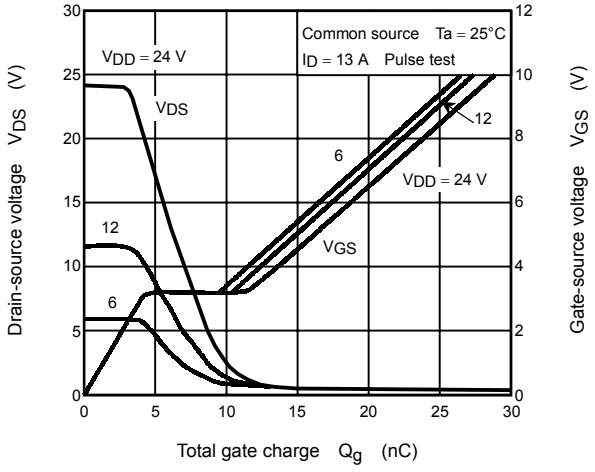
V_{th} – Ta

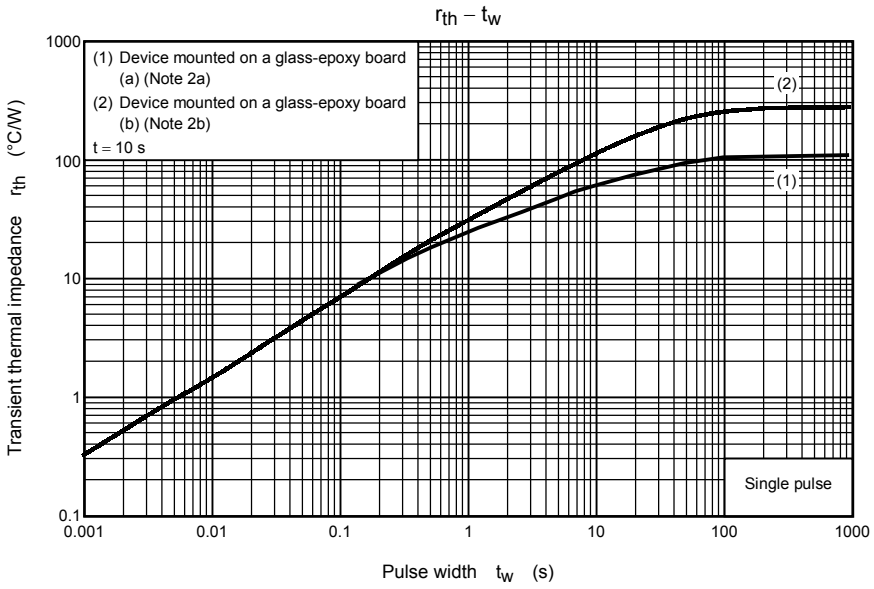


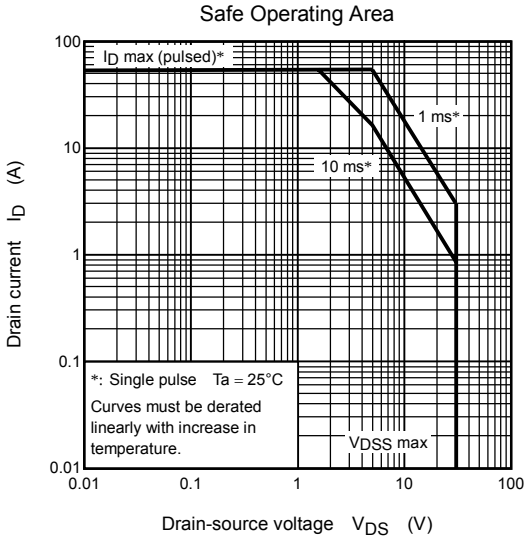
P_D – Ta



Dynamic Input/Output Characteristics




$r_{th} - t_w$
(1) Device mounted on a glass-epoxy board (a) (Note 2a)
(2) Device mounted on a glass-epoxy board (b) (Note 2b)
t = 10 s
Single pulse
(1)
(2)
Transient thermal impedance r_{th} (°C/W)
Pulse width t_w (s)
1000
100
10
1
0.1
0.001
0.01
0.1
1
10
100
1000


Safe Operating Area
I_D max (pulsed)*
1 ms*
10 ms*
*: Single pulse Ta = 25°C
Curves must be derated linearly with increase in temperature.
V_{DSS} max
Drain current I_D (A)
Drain-source voltage V_{DS} (V)
100
10
1
0.1
0.01
0.01
0.1
1
10
100

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