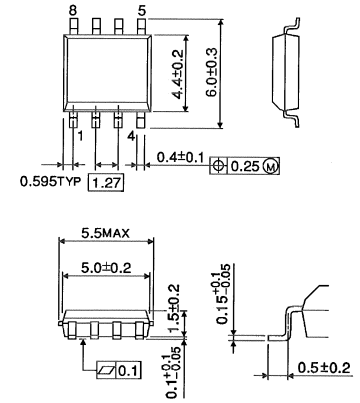
TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (High-speed U-MOSIII)

TPC8009-H

High-Efficiency DC／DC Converter Applications
Notebook PC Applications
Portable-Equipment Applications

- Small footprint due to a small and thin package
- High-speed switching
- Small gate charge: Q_{SW} = 9.1 nC (typ.)
- Low drain-source ON-resistance: $R_{DS\ (ON)}$ = 8 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: 0.085 g (typ.)

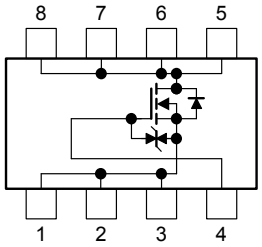
Maximum Ratings (Ta = 25°C)

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	13	A
	Pulse (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 1 : For Notes 1 to 4, refer to the next page.

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

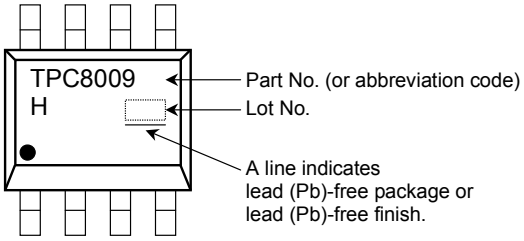
Circuit Configuration



Thermal Characteristics

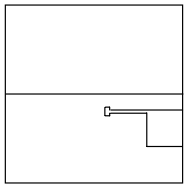
Characteristic	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th\ (ch\text{-}a)}$	65.8	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th\ (ch\text{-}a)}$	125	°C/W

Marking (Note 5)

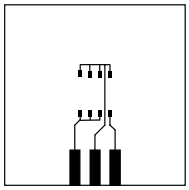


Note 1: The channel temperature should not exceed 150°C during use.

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



(a)



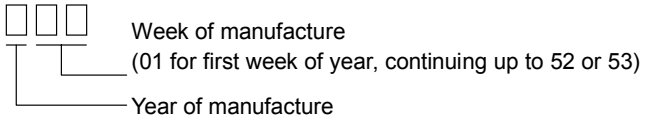
(b)

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

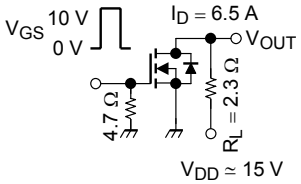
Note 4: Repetitive rating: pulse width limited by max channel temperature.

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

* Weekly code: (Three digits)



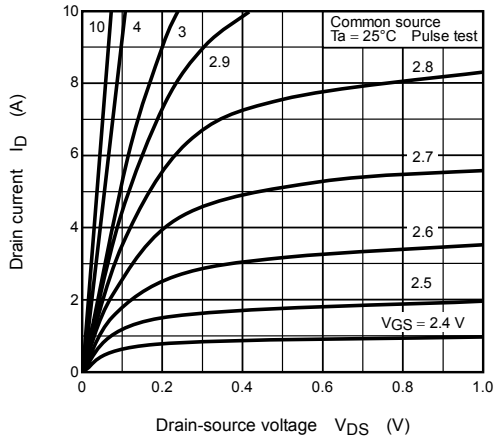
Electrical Characteristics (Ta = 25°C)

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	1.1	—	2.3	V
Drain-source ON-resistance		$R_{DS\ (ON)}$	V_{GS} = 4.5 V, I_D = 6.5 A	—	11	15	mΩ
			V_{GS} = 10 V, I_D = 6.5 A	—	8	10	
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	 Duty ≦ 1%, t_w = 10 μs	—	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	—	

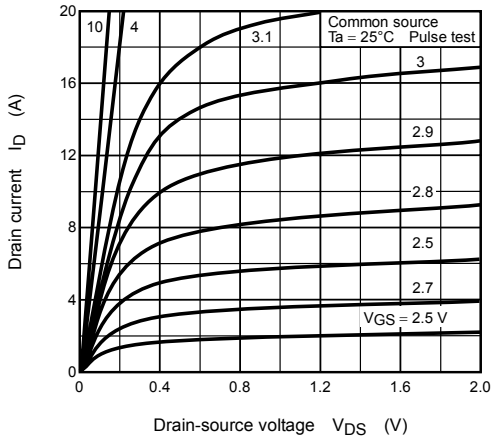
Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristic		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

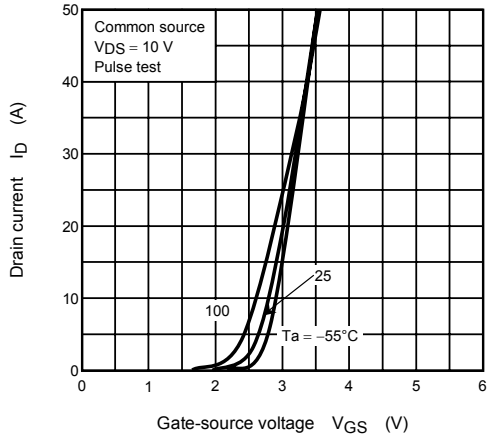
$I_D - V_{DS}$



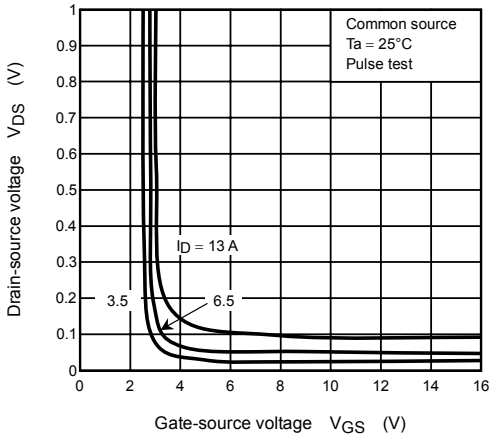
$I_D - V_{DS}$



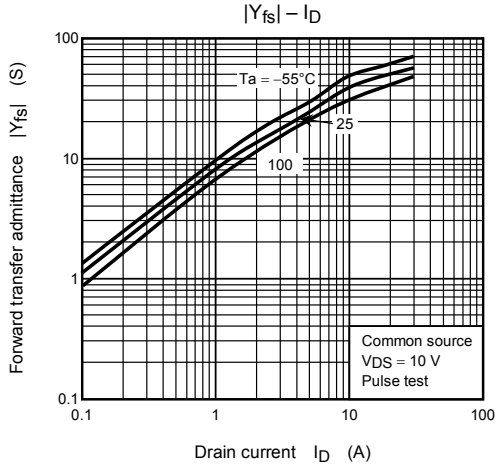
$I_D - V_{GS}$



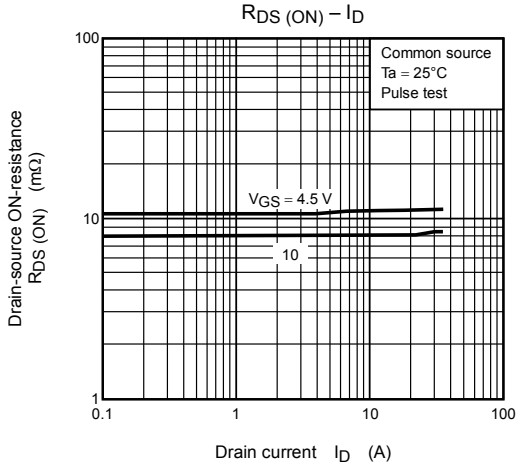
$V_{DS} - V_{GS}$



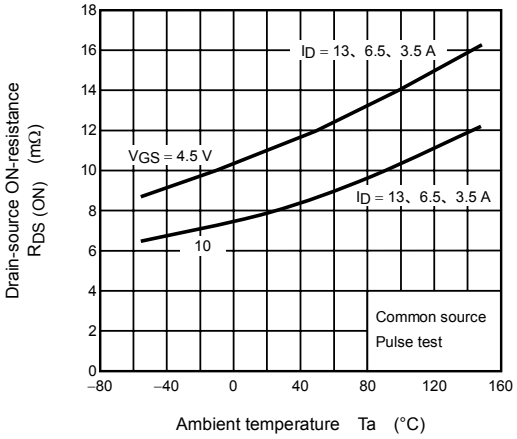
$|Y_{fs}| - I_D$



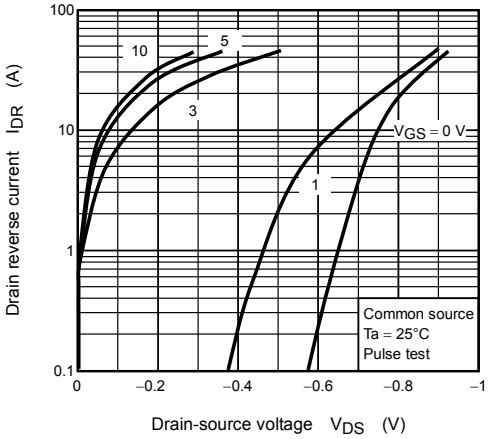
$R_{DS\ (ON)} - I_D$



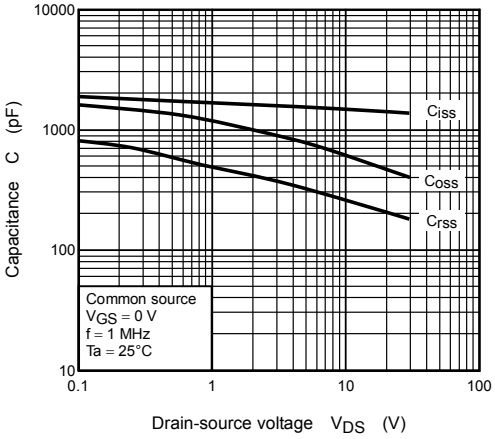
$R_{DS\ (ON)}$ – Ta



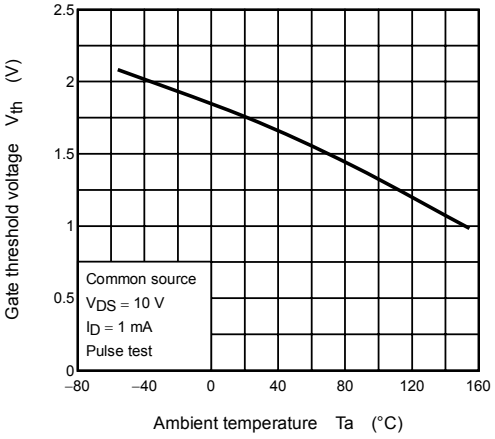
I_{DR} – V_{DS}



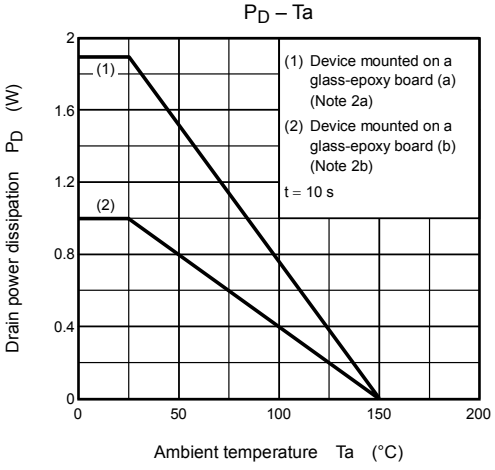
Capacitance – V_{DS}



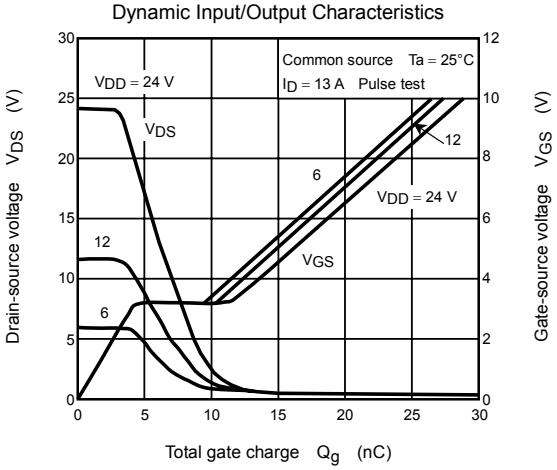
V_{th} – Ta



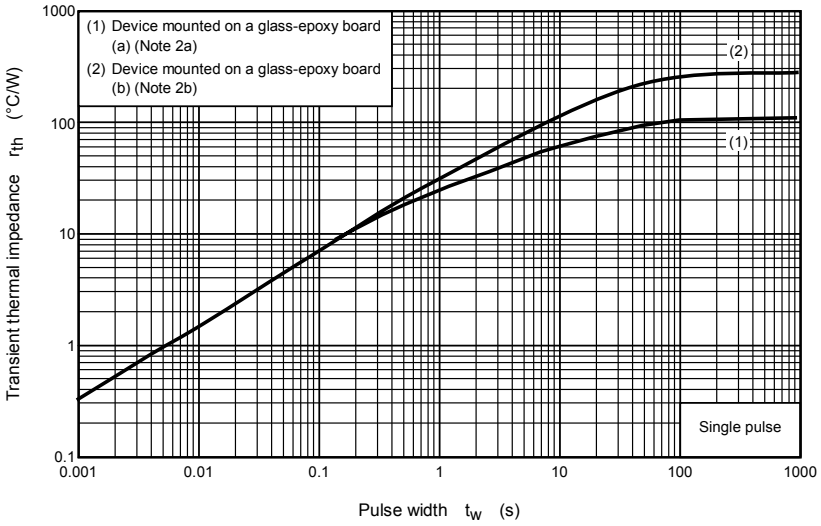
P_D – Ta



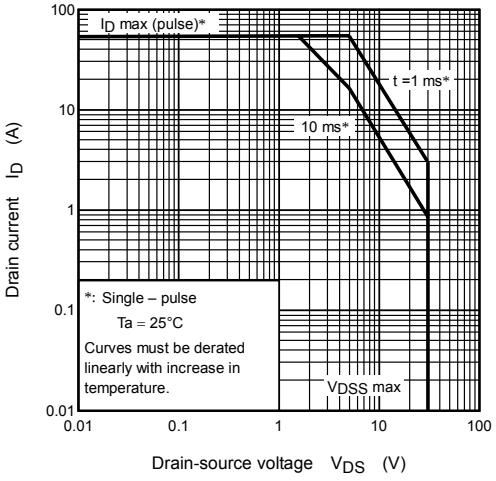
Dynamic Input/Output Characteristics



$r_{th} - t_w$



Safe Operating Area



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