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

TPCF8304

Notebook PC Applications

Portable Equipment Applications

- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 60 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 5.9 S (typ.)
- Low leakage current: I_{DSS} = −10 μA (max) (V_{DS} = −30 V)
- Enhancement model: V_{th} = −0.8 to −2.0 V,
  (V_{DS} = −10 V, I_D = −1 mA)

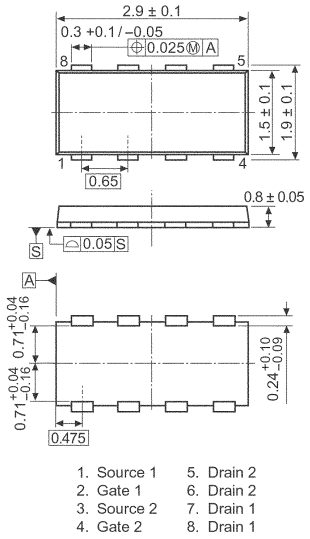
Maximum Ratings (Ta = 25°C)

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	-3.2	A
	Pulse (Note 1)	I_{DP}	-12.8	
Drain power dissipation (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	$P_{D\ (1)}$	1.35	W
	Single-device value at dual operation (Note 3b)	$P_{D\ (2)}$	1.12	
Drain power dissipation (t = 5 s) (Note 2b)	Single-device operation (Note 3a)	$P_{D\ (1)}$	0.53	
	Single-device value at dual operation (Note 3b)	$P_{D\ (2)}$	0.33	
Single-pulse avalanche energy (Note 4)		E_{AS}	0.67	mJ
Avalanche current		I_{AR}	-1.6	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		E_{AR}	0.11	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	-55~150	°C

For Notes 1 to 6, see the next page.

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

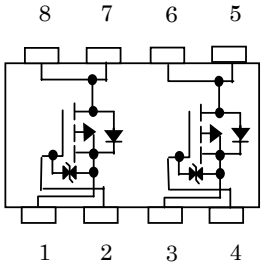
Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-3U1B

Weight: 0.011 g (typ.)

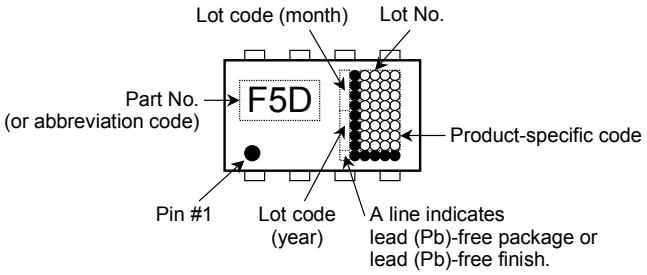
Circuit Configuration



Thermal Characteristics

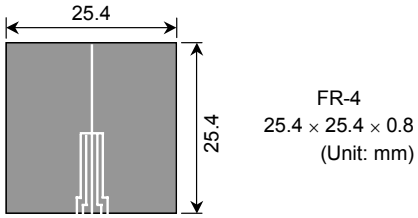
Characteristic		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	92.6	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	111.6	
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	235.8	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	378.8	

Marking (Note 6)

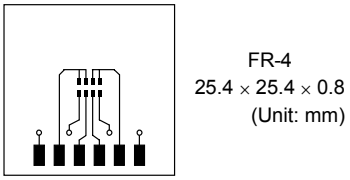


Note 1: Ensure that the channel temperature does not exceed 150°C.

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



(a)



(b)

Note 3: a) The power dissipation and thermal resistance values shown are for a single device. (During single-device operation, power is applied to one device only.)

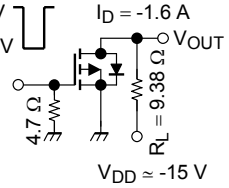
b) The power dissipation and thermal resistance values shown are for a single device. (During dual operation, power is evenly applied to both devices.)

Note 4: V_{DD} = -24 V, T_{ch} = 25°C (initial), L = 0.2 mH, R_G = 25 Ω, I_{AR} = -1.6 A

Note 5: Repetitive rating; pulse width limited by max channel temperature

Note 6: ● to the lower left of the Part No. marking indicates Pin 1.

Electrical Characteristics (Ta = 25°C)

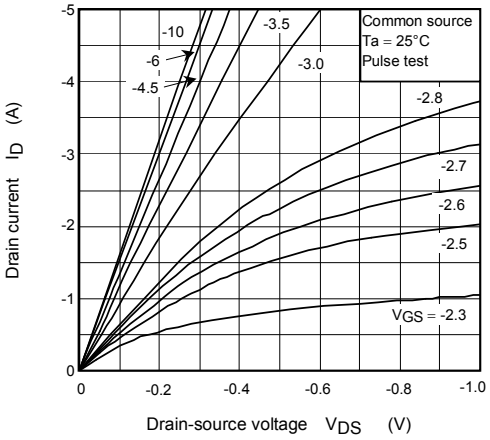
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut-off current		I_{DSS}	V_{DS} = -30 V, V_{GS} = 0 V	—	—	-10	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = -10 mA, V_{GS} = 0 V	-30	—	—	V
		$V_{(BR)\ DSX}$	I_D = -10 mA, V_{GS} = 20 V	-15	—	—	
Gate threshold voltage		V_{th}	V_{DS} = -10 V, I_D = -1 mA	-0.5	—	-1.2	V
Drain-source ON resistance		$R_{DS\ (ON)}$	V_{GS} = -4.5 V, I_D = -1.6 A	—	80	105	mΩ
		$R_{DS\ (ON)}$	V_{GS} = -10 V, I_D = -1.6 A	—	60	72	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = -10 V, I_D = -1.6 A	2.9	5.9	—	S
Input capacitance		C_{iss}	V_{DS} = -10 V, V_{GS} = 0 V, f = 1 MHz	—	600	—	pF
Reverse transfer capacitance		C_{rss}		—	60	—	
Output capacitance		C_{oss}		—	70	—	
Switching time	Rise time	t_r		—	5.3	—	ns
	Turn-on time	t_{on}		—	12	—	
	Fall time	t_f		—	8.4	—	
	Turn-off time	t_{off}		—	34	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≃ -24 V, V_{GS} = -10 V, I_D = -3.2 A	—	14	—	nC
Gate-source charge 1		Q_{gs1}		—	1.4	—	
Gate-drain (“Miller”) charge		Q_{gd}		—	2.7	—	

Duty ≦ 1%, t_w = 10 μs

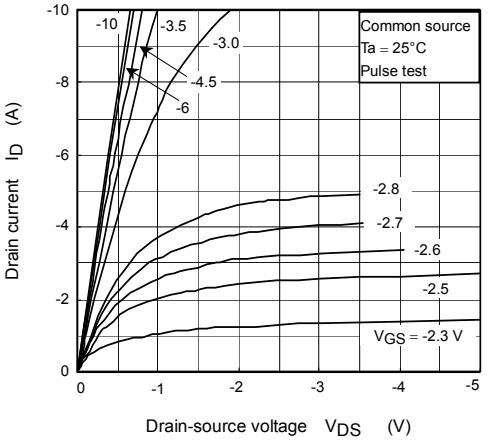
Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	-12.8	A
Forward voltage (diode)		V_{DSF}	I_{DR} = -3.2 A, V_{GS} = 0 V	—	—	1.2	V

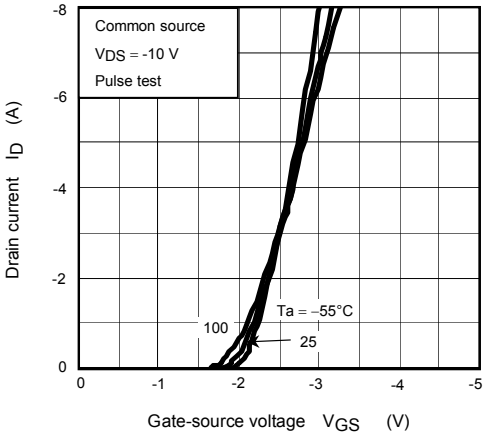
$I_D - V_{DS}$



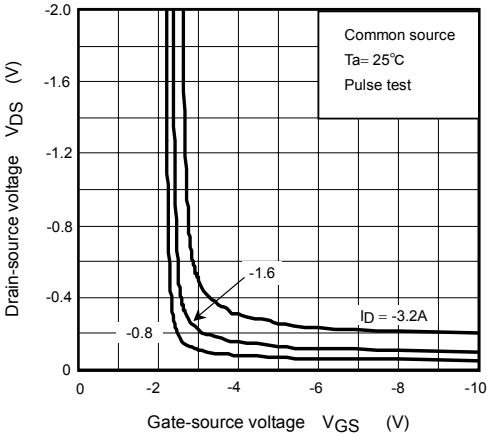
$I_D - V_{DS}$



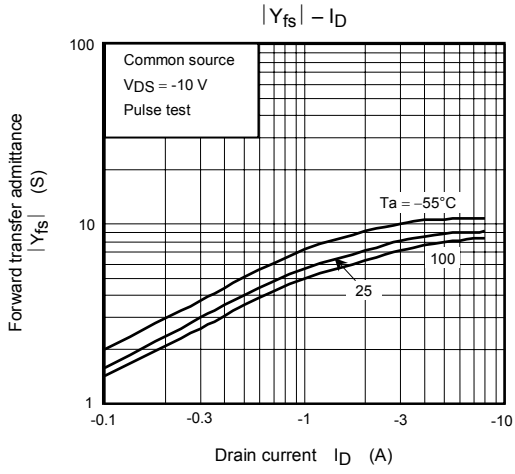
$I_D - V_{GS}$



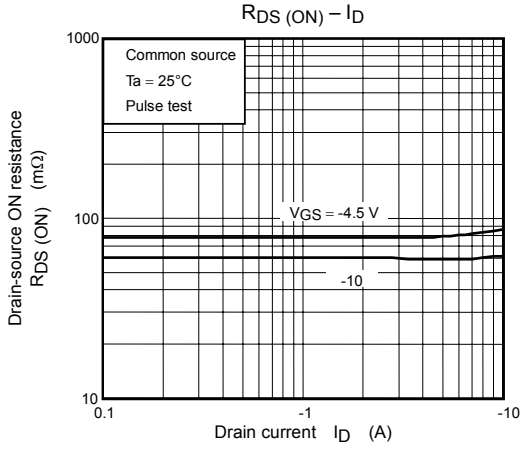
$V_{DS} - V_{GS}$



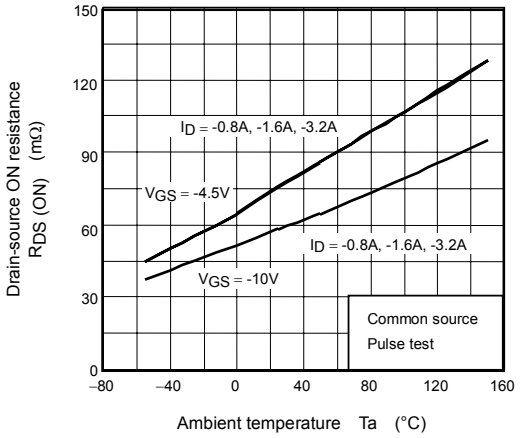
$|Y_{fs}| - I_D$



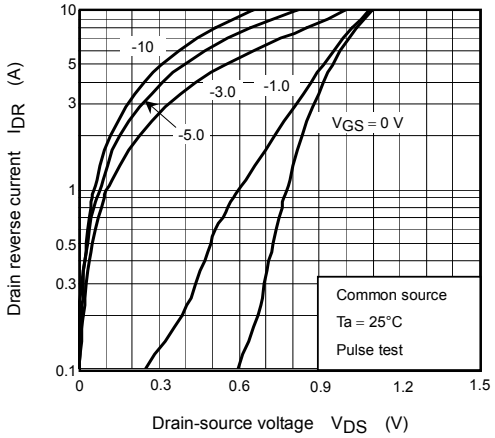
$R_{DS\ (ON)} - I_D$



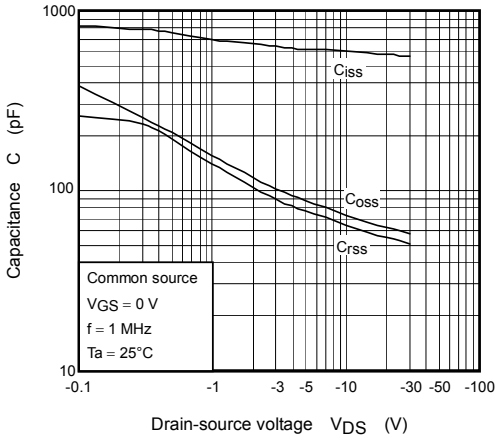
$R_{DS\ (ON)}$ – Ta



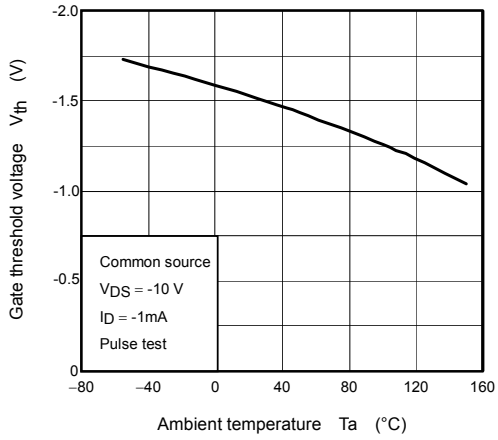
I_{DR} – V_{DS}



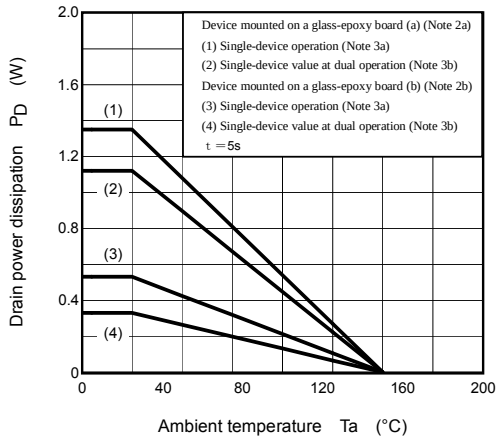
Capacitance – V_{DS}



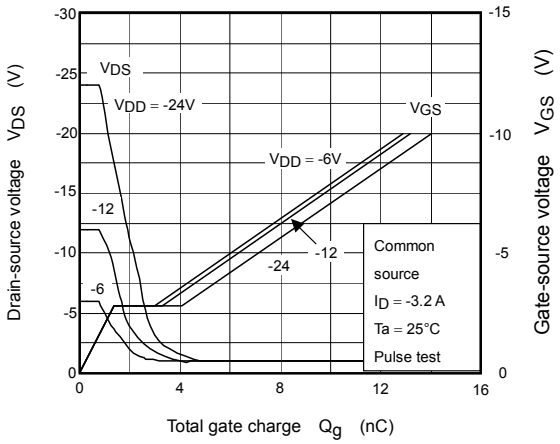
V_{th} – Ta



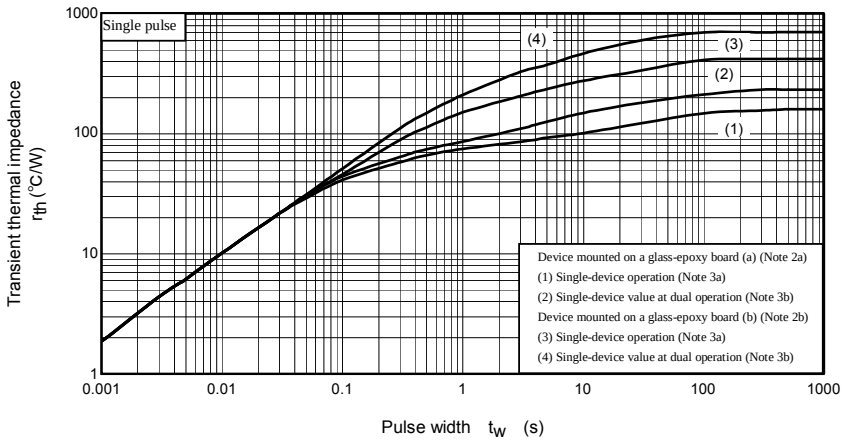
P_D – Ta



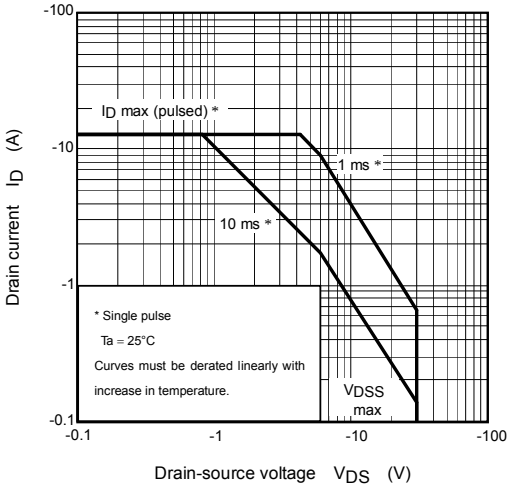
Dynamic input/output characteristics



$r_{th} - t_w$



Safe operating area



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