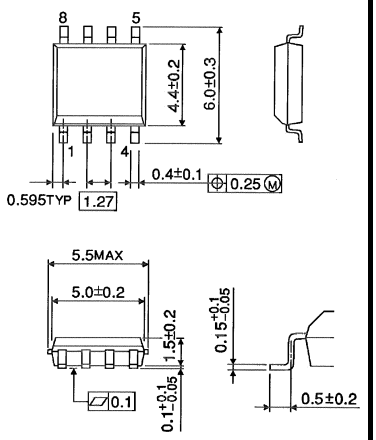
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOS IV)

TPC8042

Lithium-Ion Battery Applications
Portable Equipment Applications
Notebook PC Applications

- Small footprint due to a small and thin package
- Low drain-source ON-resistance: $R_{DS\ (ON)}$ = 2.7 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 42 S (typ.)
- Low leakage current: I_{DSS} = 10 μA (max) (V_{DS} = 30 V)
- Enhancement mode: V_{th} = 1.3 to 2.5 V (V_{DS} = 10 V, I_D = 1 mA)

Unit: mm



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

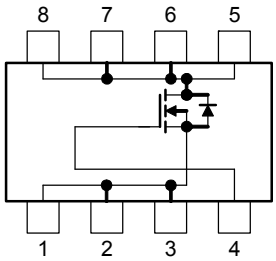
JEDEC	—
JEITA	—
TOSHIBA	2-6J1B

Weight: 0.08 g (typ.)

Absolute 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	18	A
	Pulse (Note 1)	I_{DP}	72	
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}	84	mJ
Avalanche current		I_{AR}	18	A
Repetitive avalanche energy (Note 2a) (Note 4)		E_{AR}	0.044	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.

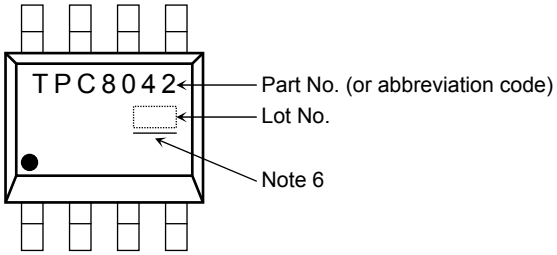
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within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

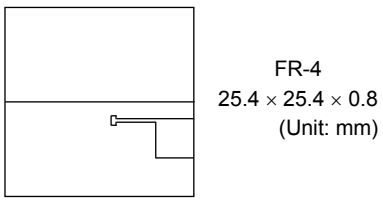
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th\ (ch\text{-}a)}$	65.8	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th\ (ch\text{-}a)}$	125	°C/W

Marking (Note 5)

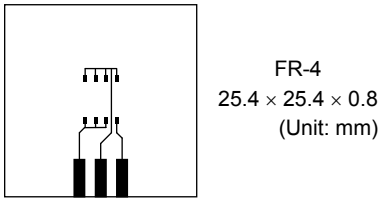


Note 1: Ensure that the channel temperature does not exceed 150°C.

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



(a)



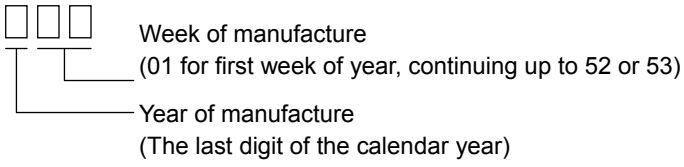
(b)

Note 3: V_{DD} = 24 V, T_{ch} = 25°C (initial), L = 0.2 mH, I_{AR} = 18 A

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

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

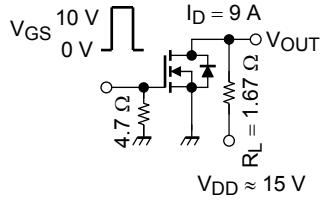
* Weekly code: (Three digits)



Note 6: A line under a Lot No. identifies the indication of product Labels.
Not underlined: [[Pb]]/INCLUDES > MCV
Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

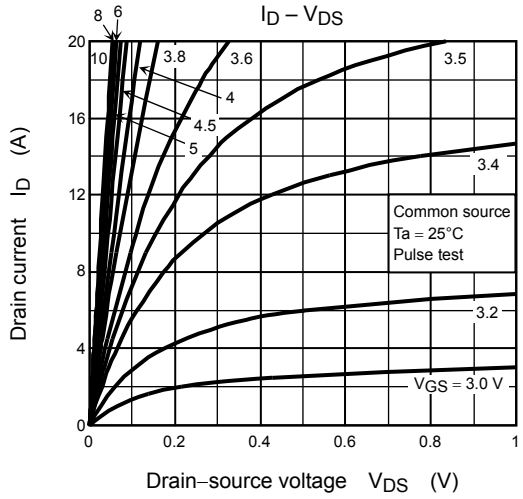
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

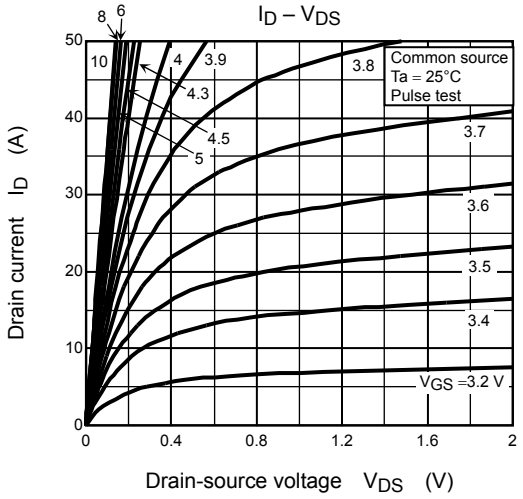
Electrical Characteristics (Ta = 25°C)

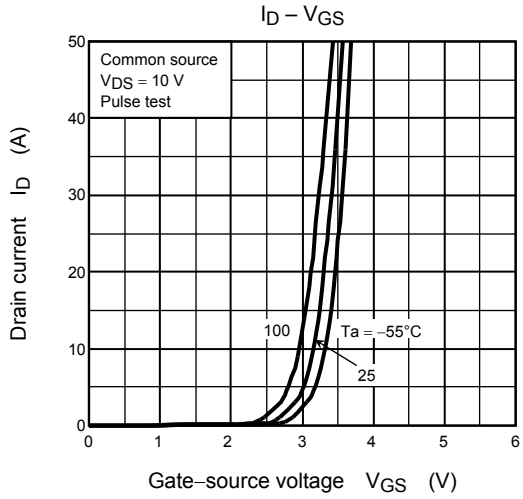
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V	—	—	±100	nA
Drain cut-OFF current		I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	30	—	—	V
		$V_{(BR)\ DSX}$	I_D = 10 mA, V_{GS} = −20 V	10	—	—	
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	1.3	—	2.5	V
Drain-source ON-resistance		$R_{DS\ (ON)}$	V_{GS} = 4.5 V, I_D = 9 A	—	4.2	6.5	mΩ
			V_{GS} = 10 V, I_D = 9 A	—	2.7	3.4	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 9 A	21	42	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	2900	—	pF
Reverse transfer capacitance		C_{rss}		—	460	—	
Output capacitance		C_{oss}		—	800	—	
Switching time	Rise time	t_r		—	18	—	ns
	Turn-on time	t_{on}		—	32	—	
	Fall time	t_f		—	25	—	
	Turn-off time	t_{off}	Duty ≤ 1%, t_w = 10 μs	—	81	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≈ 24 V, V_{GS} = 10 V, I_D = 18 A	—	56	—	nC
Gate-source charge 1		Q_{gs1}		—	9	—	
Gate-drain (“miller”) charge		Q_{gd}		—	17	—	

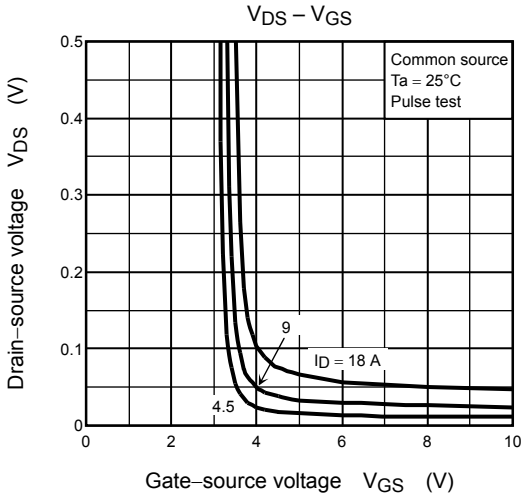
Source-Drain Ratings and Characteristics (Ta = 25°C)

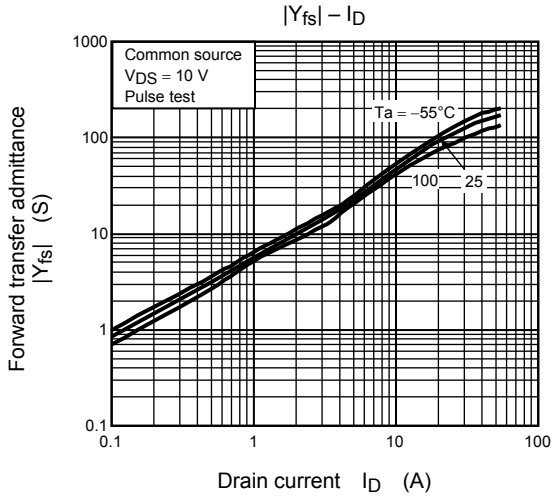
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	72	A
Forward voltage (diode)		V_{DSF}	I_{DR} = 18 A, V_{GS} = 0 V	—	—	−1.2	V

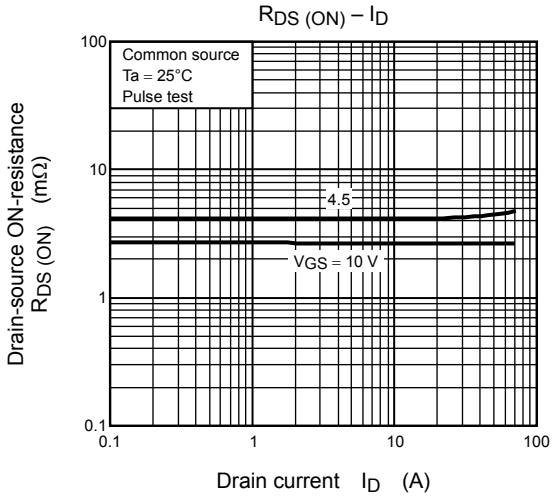

$I_D - V_{DS}$
Common source
Ta = 25°C
Pulse test
8
6
10
3.8
3.6
3.5
4
4.5
5
3.4
3.2
V_{GS} = 3.0 V
Drain current I_D (A)
Drain–source voltage V_{DS} (V)


$I_D - V_{DS}$
Common source
Ta = 25°C
Pulse test
8
6
10
4
3.9
4.3
3.8
4.5
5
3.7
3.6
3.5
3.4
V_{GS} =3.2 V
Drain current I_D (A)
Drain-source voltage V_{DS} (V)

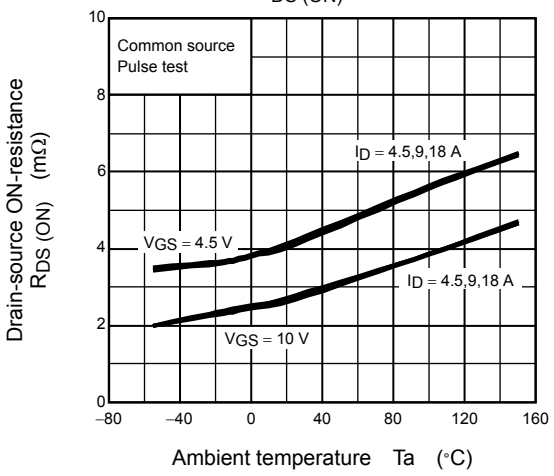

$I_D - V_{GS}$
Common source
V_{DS} = 10 V
Pulse test
100
Ta = −55°C
25
Drain current I_D (A)
Gate–source voltage V_{GS} (V)


$V_{DS} - V_{GS}$
Common source
Ta = 25°C
Pulse test
9
I_D = 18 A
4.5
Drain–source voltage V_{DS} (V)
Gate–source voltage V_{GS} (V)

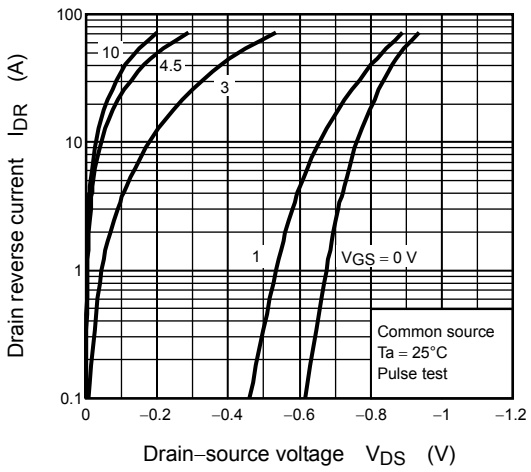

$|Y_{fs}| - I_D$
Common source
V_{DS} = 10 V
Pulse test
Ta = −55°C
100
25
Forward transfer admittance $|Y_{fs}|$ (S)
Drain current I_D (A)


$R_{DS\ (ON)} - I_D$
Common source
Ta = 25°C
Pulse test
4.5
V_{GS} = 10 V
Drain-source ON-resistance $R_{DS\ (ON)}$ (mΩ)
Drain current I_D (A)

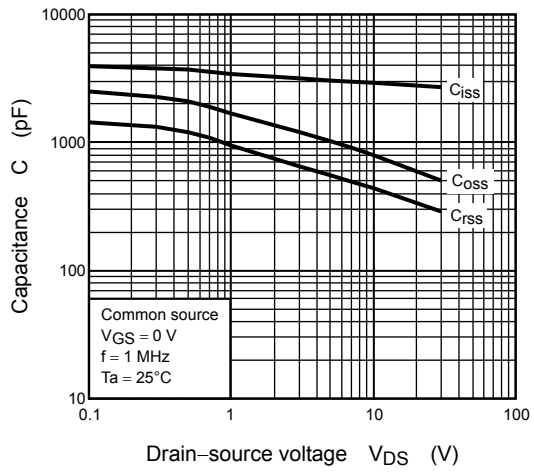
$R_{DS\ (ON)}$ – Ta



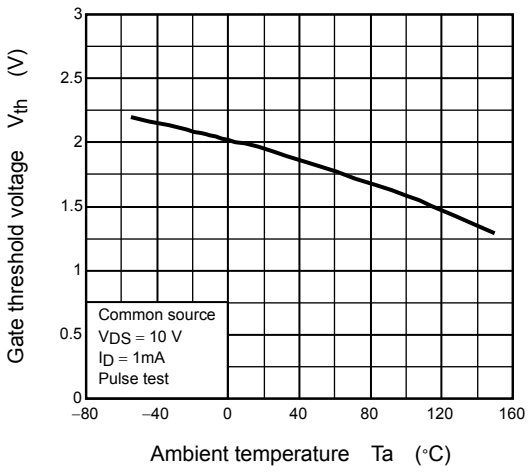
I_{DR} – V_{DS}



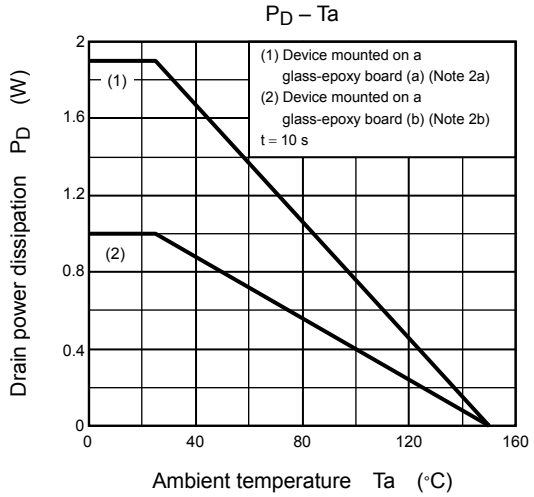
Capacitance – V_{DS}



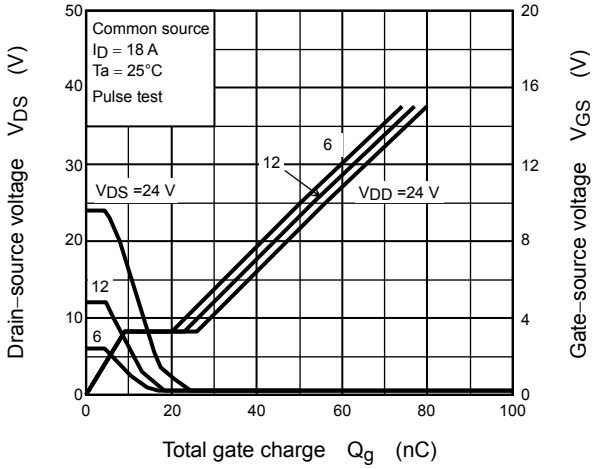
V_{th} – Ta

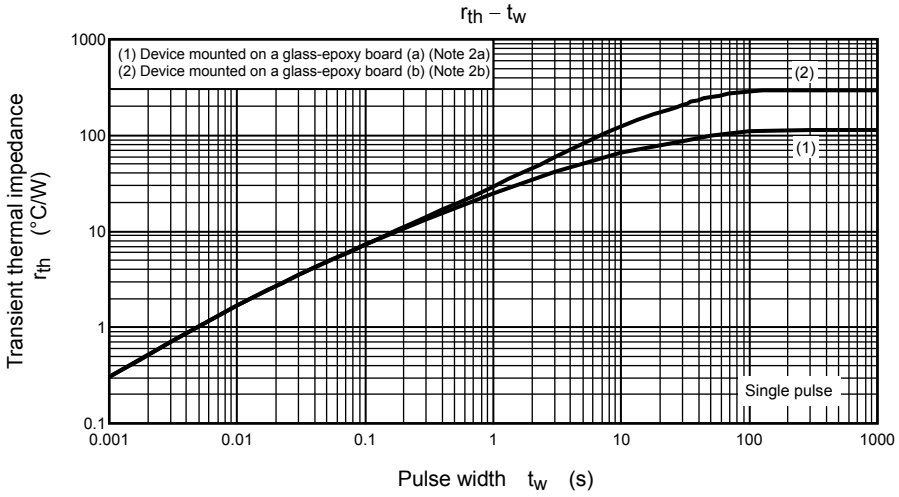


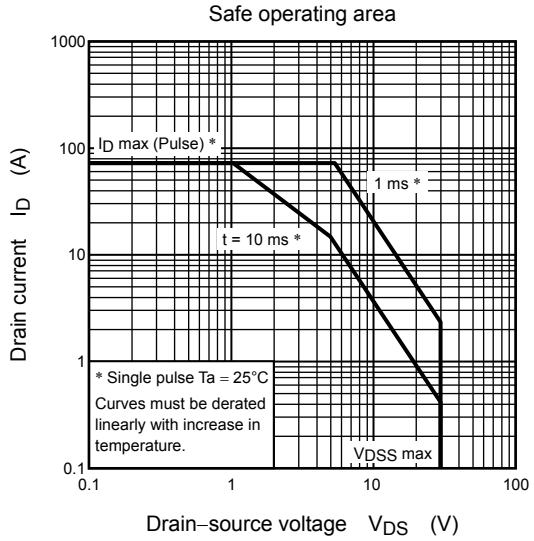
P_D – Ta



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)
(2)
(1)
Single pulse
Transient thermal impedance r_{th} (°C/W)
1000
100
10
1
0.1
0.001
0.01
0.1
1
10
100
1000
Pulse width t_w (s)


Safe operating area
I_D max (Pulse) *
1 ms *
t = 10 ms *
* Single pulse Ta = 25°C
Curves must be derated linearly with increase in temperature.
V_{DSS} max
Drain current I_D (A)
1000
100
10
1
0.1
0.1
1
10
100
Drain−source voltage V_{DS} (V)

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