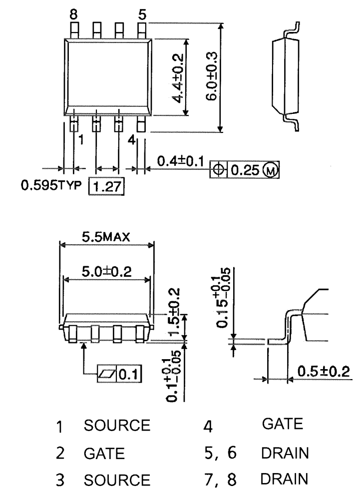
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSIII)

TPC8207

Lithium Ion Battery Applications
Notebook PC Applications
Portable Equipment Applications

Unit: mm



JEDEC	―
JEITA	―
TOSHIBA	2-6J1E

Weight: 0.08 g (typ.)

- Small footprint due to small and thin package
- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 16 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 11 S (typ.)
- Low leakage current: I_{DSS} = 10 μA (max) (V_{DS} = 20 V)
- Enhancement-mode: V_{th} = 0.5~1.2 V (V_{DS} = 10 V, I_D = 200 μA)

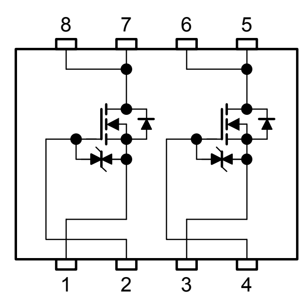
Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	20	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	20	V
Gate-source voltage		V_{GSS}	±12	V
Drain current	DC (Note 1)	I_D	6	A
	Pulse (Note 1)	I_{DP}	24	
Drain power dissipation (t = 10 s) (Note 2a)	Single-device operation (Note 3a)	$P_{D\ (1)}$	1.5	W
	Single-device value at dual operation (Note 3b)	$P_{D\ (2)}$	1.1	
Drain power dissipation (t = 10 s) (Note 2b)	Single-device operation (Note 3a)	$P_{D\ (1)}$	0.75	W
	Single-device value at dual operation (Note 3b)	$P_{D\ (2)}$	0.45	
Single pulse avalanche energy (Note 4)		E_{AS}	46.8	mJ
Avalanche current		I_{AR}	6	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		E_{AR}	0.1	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

Note 1, Note 2, Note 3, Note 4 and Note 5: See the next page.

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

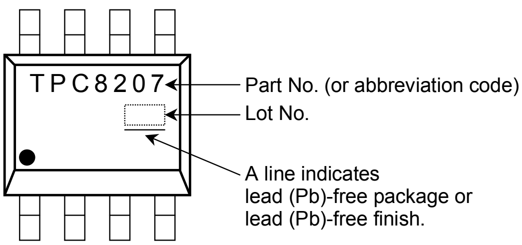
Circuit Configuration



Thermal Characteristics

Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	83.3	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	114	
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	167	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	278	

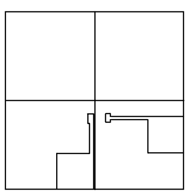
Marking (Note 6)



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

Note 2:

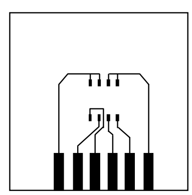
a) Device mounted on a glass-epoxy board (a)



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:

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

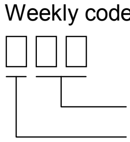
b) The power dissipation and thermal resistance values are shown for a single device (During dual operation, power is evenly applied to both devices.).

Note 4: V_{DD} = 16 V, T_{ch} = 25°C (initial), L = 1.0 mH, R_G = 25 Ω, I_{AR} = 6 A

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

Note 6: • on lower right of the marking indicates Pin 1.

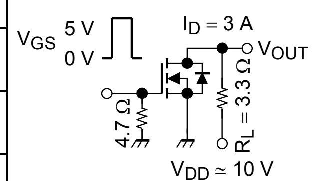
※ Weekly code: (Three digits)



Week of manufacture
(01 for the first week of a year, : sequential number up to 52 or 53)

Year of manufacture
(The last digit of a year)

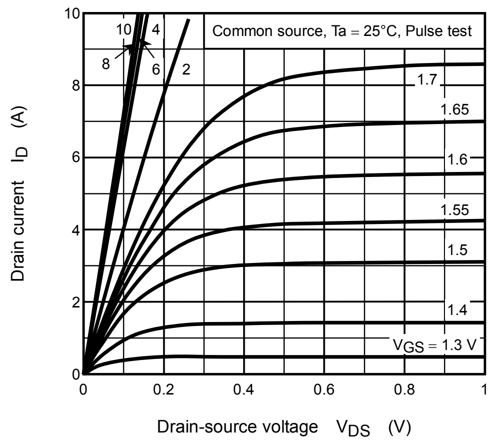
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±10 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut-OFF current		I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	20	—	—	V
		$V_{(BR)\ DSX}$	I_D = 10 mA, V_{GS} = −12 V	8	—	—	
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 200 μA	0.5	—	1.2	V
Drain-source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 2.0 V, I_D = 4.2 A	—	22	45	mΩ
			V_{GS} = 2.5 V, I_D = 4.2 A	—	19	30	
			V_{GS} = 4.0 V, I_D = 4.8 A	—	16	20	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 3.0 A	5.5	11	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	2010	—	pF
Reverse transfer capacitance		C_{rss}		—	210	—	
Output capacitance		C_{oss}		—	240	—	
Switching time	Rise time	t_r	 Duty ≦ 1%, t_w = 10 μs	—	6	—	ns
	Turn-ON time	t_{on}		—	14	—	
	Fall time	t_f		—	22	—	
	Turn-OFF time	t_{off}		—	94	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≃ 16 V, V_{GS} = 5 V, I_D = 6 A	—	22	—	nC
Gate-source charge 1		Q_{gs1}		—	3.2	—	
Gate-drain ("miller") charge		Q_{gd}		—	4.7	—	

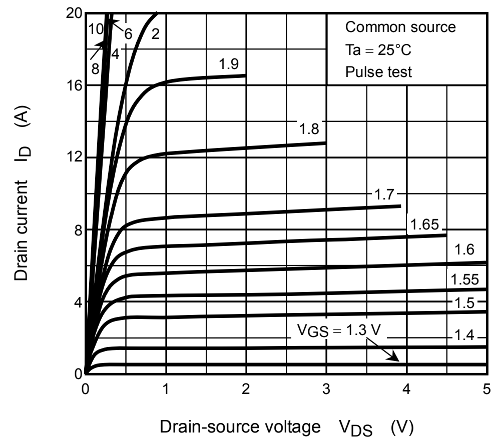
Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	24	A
Forward voltage (diode)		V_{DSF}	I_{DR} = 6 A, V_{GS} = 0 V	—	—	−1.2	V

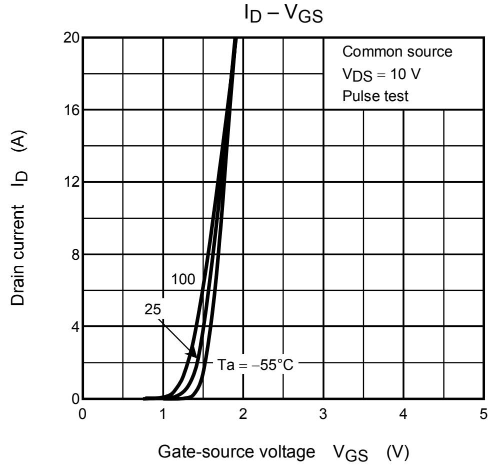
I_D – V_{DS}



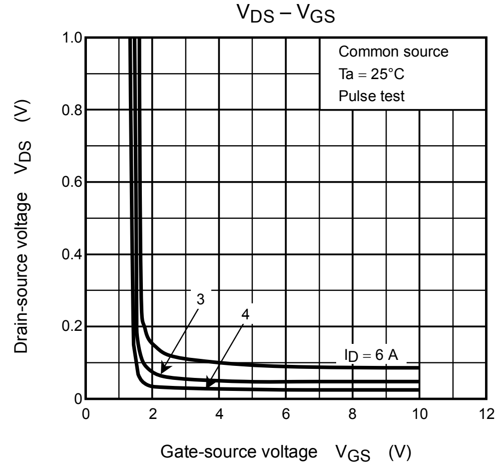
I_D – V_{DS}



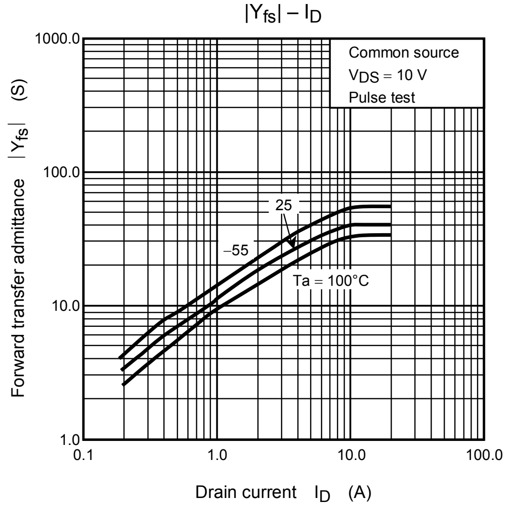
I_D – V_{GS}



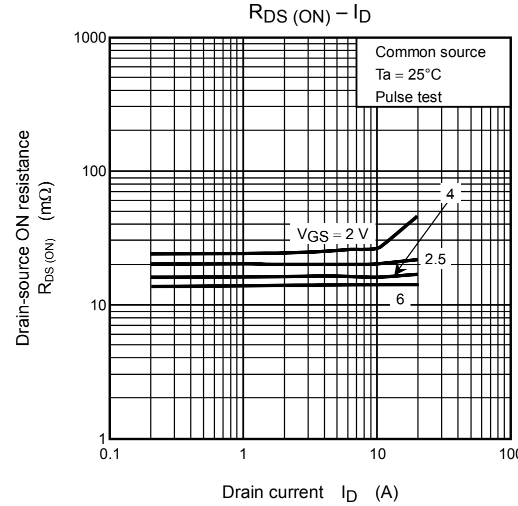
V_{DS} – V_{GS}

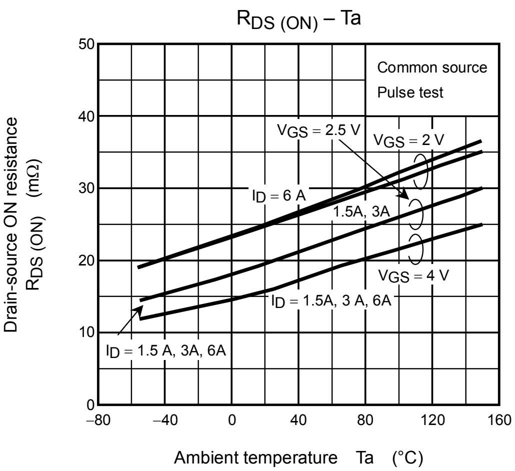


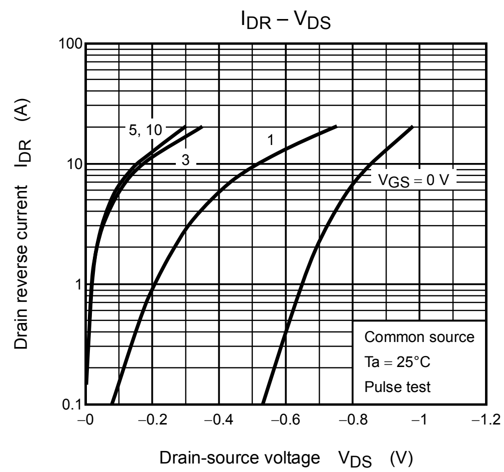
$|Y_{fs}|$ – I_D

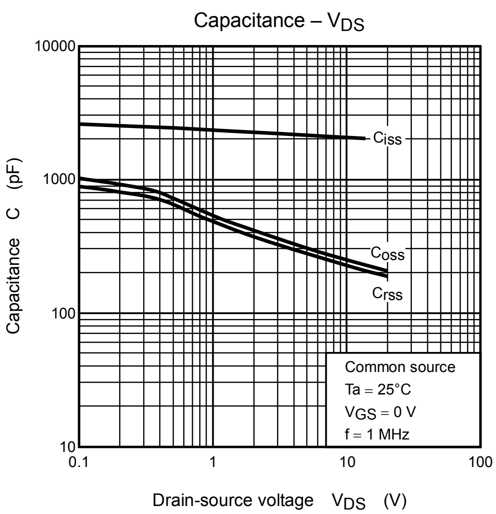


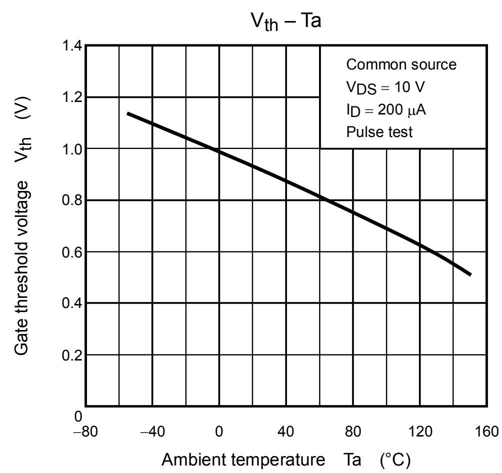
$R_{DS\ (ON)}$ – I_D

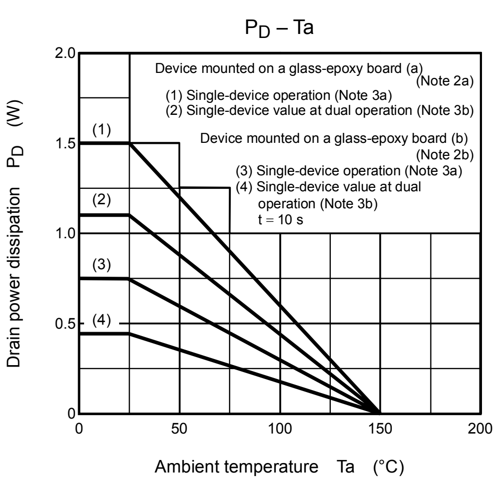


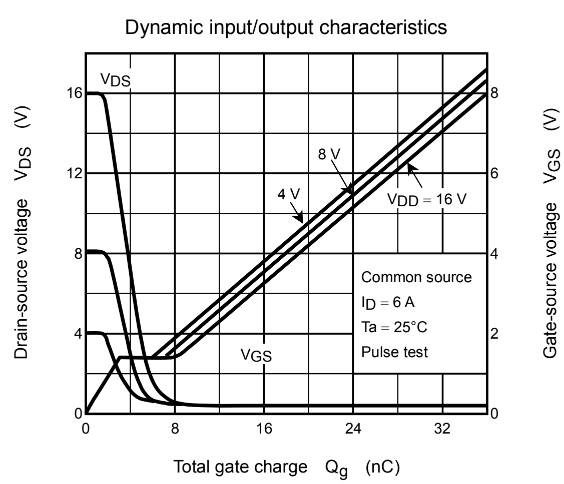

RDS (ON) – Ta
Common source
Pulse test
VGS = 2.5 V
VGS = 2 V
ID = 6 A
1.5A, 3A
VGS = 4 V
ID = 1.5A, 3 A, 6A
ID = 1.5 A, 3A, 6A
Drain-source ON resistance RDS (ON) (mΩ)
Ambient temperature Ta (°C)

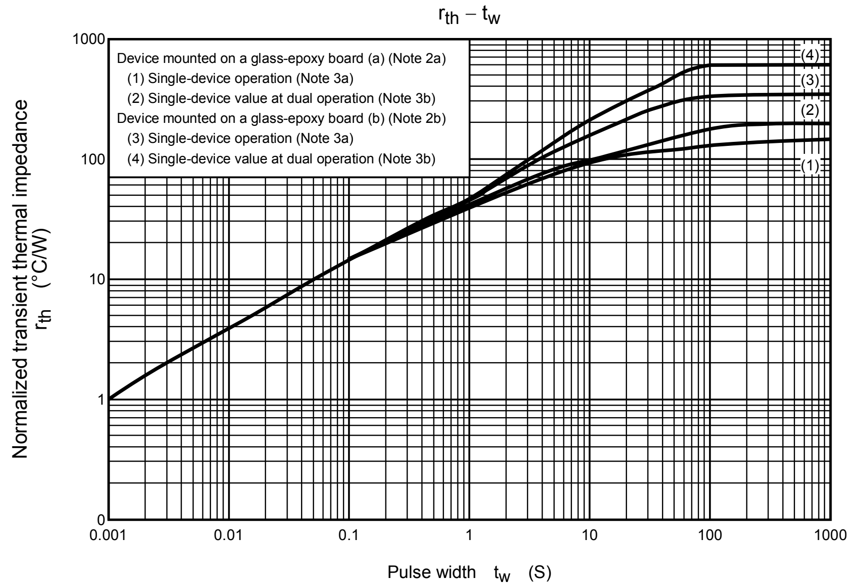

IDR – VDS
5, 10
3
1
VGS = 0 V
Common source
Ta = 25°C
Pulse test
Drain reverse current IDR (A)
Drain-source voltage VDS (V)

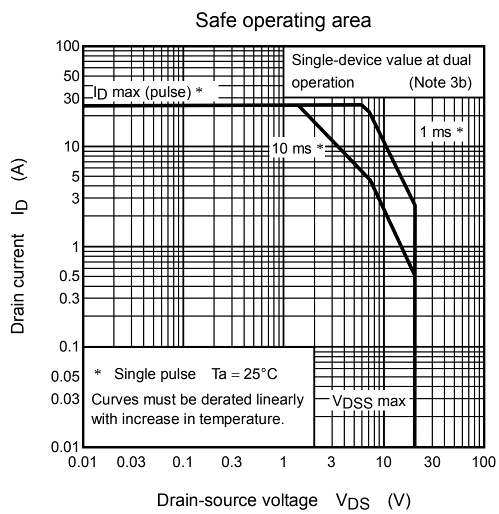

Capacitance – VDS
Ciss
Coss
Crss
Common source
Ta = 25°C
VGS = 0 V
f = 1 MHz
Capacitance C (pF)
Drain-source voltage VDS (V)


Vth – Ta
Common source
VDS = 10 V
ID = 200 μA
Pulse test
Gate threshold voltage Vth (V)
Ambient temperature Ta (°C)


PD – Ta
Device mounted on a glass-epoxy board (a) (Note 2a)
(1) Single-device operation (Note 3a)
(2) Single-device value at dual operation (Note 3b)
Device mounted on a glass-epoxy board (b) (Note 2b)
(3) Single-device operation (Note 3a)
(4) Single-device value at dual operation (Note 3b)
t = 10 s
(1)
(2)
(3)
(4)
Drain power dissipation PD (W)
Ambient temperature Ta (°C)


Dynamic input/output characteristics
VDS
8 V
4 V
VDD = 16 V
VGS
Common source
ID = 6 A
Ta = 25°C
Pulse test
Drain-source voltage VDS (V)
Gate-source voltage VGS (V)
Total gate charge Qg (nC)


rth – tw
Device mounted on a glass-epoxy board (a) (Note 2a)
(1) Single-device operation (Note 3a)
(2) Single-device value at dual operation (Note 3b)
Device mounted on a glass-epoxy board (b) (Note 2b)
(3) Single-device operation (Note 3a)
(4) Single-device value at dual operation (Note 3b)
(4)
(3)
(2)
(1)
Normalized transient thermal impedance rth (°C/W)
1000
100
10
1
0
0.001
0.01
0.1
1
10
100
1000
Pulse width tw (S)


Safe operating area
Single-device value at dual operation (Note 3b)
ID max (pulse) *
10 ms *
1 ms *
* Single pulse Ta = 25°C
Curves must be derated linearly with increase in temperature.
VDSS max
Drain current ID (A)
100
50
30
10
5
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.01
0.03
0.1
0.3
1
3
10
30
100
Drain-source voltage VDS (V)

RESTRICTIONS ON PRODUCT USE