MOSFETs Silicon P-Channel MOS (U-MOSⅥ)

TPCP8111

1. Applications

- Motor Drivers
- Mobile Equipment

2. Features

(1) Small, thin package

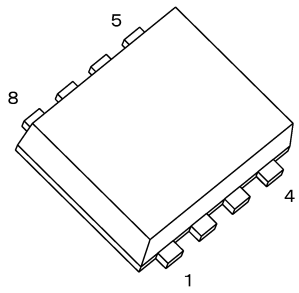
(2) Small gate charge: Q_{SW} = 5.2 nC (typ.)

(3) Low drain-source on-resistance: $R_{DS(ON)}$ = 90 mΩ (typ.) (V_{GS} = -10 V)

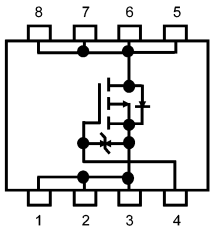
(4) Low leakage current: I_{DSS} = -10 μA (max) (V_{DS} = -60 V)

(5) Enhancement mode: V_{th} = -2 to -3 V (V_{DS} = -10 V, I_D = -1 mA)

3. Packaging and Internal Circuit



PS-8



1, 2, 3: Source
4: Gate
5, 6, 7, 8: Drain

4. Absolute Maximum Ratings (Note) (T_a = 25 °C unless otherwise specified)

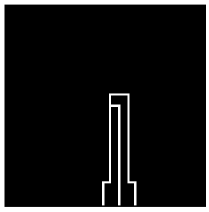
Characteristics			Symbol	Rating	Unit
Drain-source voltage			V_{DSS}	-60	V
Gate-source voltage			V_{GSS}	-20/+10	
Drain current (DC)		(Note 1)	I_D	-3	A
Drain current (pulsed)		(Note 1)	I_{DP}	-12	
Power dissipation	(t = 5 s)	(Note 2)	P_D	1.96	W
Power dissipation	(t = 5 s)	(Note 3)	P_D	0.94	
Single-pulse avalanche energy		(Note 4)	E_{AS}	31.1	mJ
Avalanche current			I_{AR}	-3	A
Channel temperature		(Note 5)	T_{ch}	175	°C
Storage temperature			T_{stg}	-55 to 150	

Note: 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).

5. Thermal Characteristics

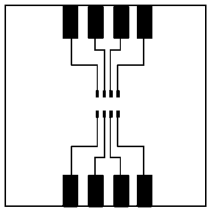
Characteristics			Symbol	Max	Unit
Channel-to-ambient thermal resistance	(t = 5 s)	(Note 2)	$R_{th(ch-a)}$	76.5	°C/W
Channel-to-ambient thermal resistance	(t = 5 s)	(Note 3)	$R_{th(ch-a)}$	159.5	

Note 1: Ensure that the channel temperature does not exceed 175 °C.
Note 2: Device mounted on a glass-epoxy board (a), Figure 5.1
Note 3: Device mounted on a glass-epoxy board (b), Figure 5.2
Note 4: V_{DD} = -25 V, T_{ch} = 25 °C (initial), L = 4.696 mH, R_G = 25 Ω, I_{AR} = -3 A
Note 5: Merely channel temperature is guaranteed 175 °C.
Storage temperature range is guaranteed as usual (-55 to 150 °C).



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

Fig. 5.1 Device Mounted on a Glass-Epoxy Board (a)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

Fig. 5.2 Device Mounted on a Glass-Epoxy Board (b)

Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

6. Electrical Characteristics

6.1. Static Characteristics (T_a = 25 °C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	V_{GS} = -16/+10 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut-off current	I_{DSS}	V_{DS} = -60 V, V_{GS} = 0 V	—	—	-10	
Drain-source breakdown voltage	$V_{(BR)DSS}$	I_D = -10 mA, V_{GS} = 0 V	-60	—	—	V
Drain-source breakdown voltage (Note 6)	$V_{(BR)DSX}$	I_D = -10 mA, V_{GS} = 10 V	-50	—	—	
Gate threshold voltage	V_{th}	V_{DS} = -10 V, I_D = -1 mA	-2	-2.5	-3	
Drain-source on-resistance	$R_{DS(ON)}$	V_{GS} = -6 V, I_D = -1.5 A	—	99	158.4	mΩ
		V_{GS} = -10 V, I_D = -1.5 A	—	90	117	

Note 6: If a reverse bias is applied between gate and source, this device enters $V_{(BR)DSX}$ mode. Note that the drain-source breakdown voltage is lowered in this mode.

6.2. Dynamic Characteristics (T_a = 25 °C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	C_{iss}	V_{DS} = -10 V, V_{GS} = 0 V, f = 1 MHz	—	760	—	pF
Reverse transfer capacitance	C_{rss}		—	60	—	
Output capacitance	C_{oss}		—	90	—	
Switching time (rise time)	t_r	See Figure 6.2.1.	—	8	—	ns
Switching time (turn-on time)	t_{on}		—	25	—	
Switching time (fall time)	t_f		—	24	—	
Switching time (turn-off time)	t_{off}		—	126	—	

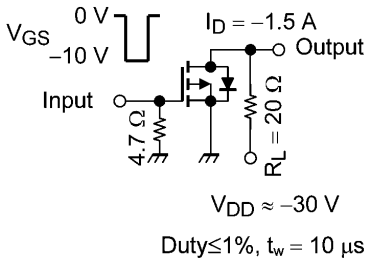


Fig. 6.2.1 Switching Time Test Circuit

6.3. Gate Charge Characteristics (T_a = 25 °C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Q_g	V_{DD} ≈ -48 V, V_{GS} = -10 V, I_D = -3 A	—	17.0	—	nC
Gate-source charge 1	Q_{gs1}		—	2.3	—	
Gate-drain charge	Q_{gd}		—	4.5	—	
Gate switch charge	Q_{SW}		—	5.2	—	

6.4. Source-Drain Characteristics (T_a = 25 °C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Reverse drain current (pulsed) (Note 7)	I_{DRP}	—	—	—	-12	A
Diode forward voltage	V_{DSF}	I_{DR} = -3 A, V_{GS} = 0 V	—	—	1.2	V

Note 7: Ensure that the channel temperature does not exceed 175 °C.

7. Marking

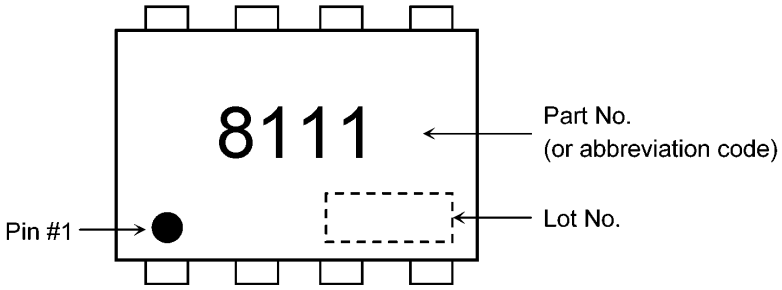


Fig. 7.1 Marking

8. Characteristics Curves (Note)

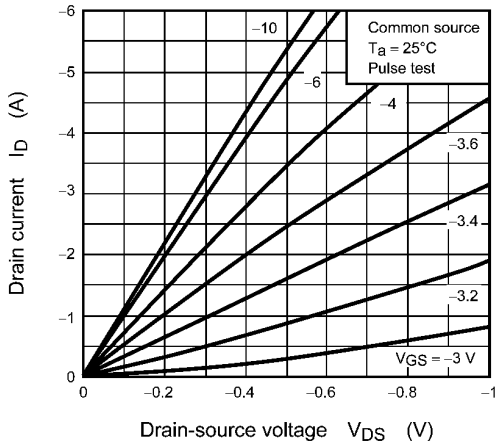


Fig. 8.1 I_D - V_{DS}

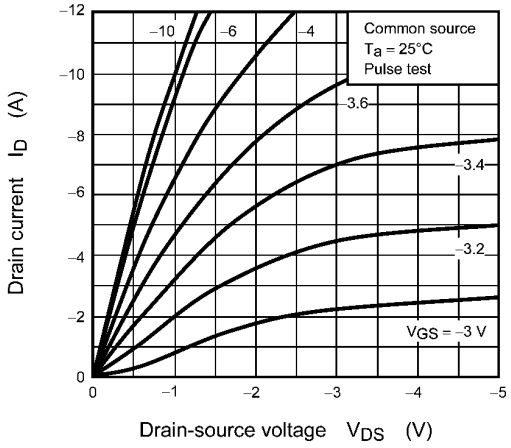


Fig. 8.2 I_D - V_{DS}

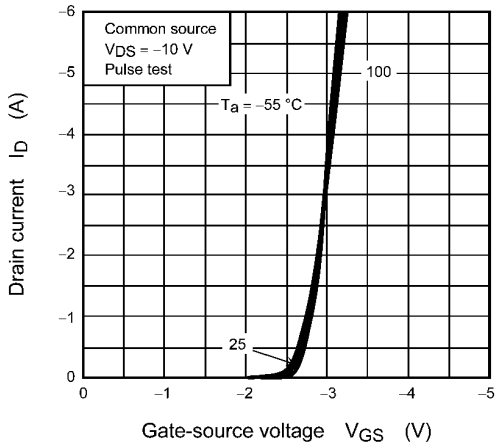


Fig. 8.3 I_D - V_{GS}

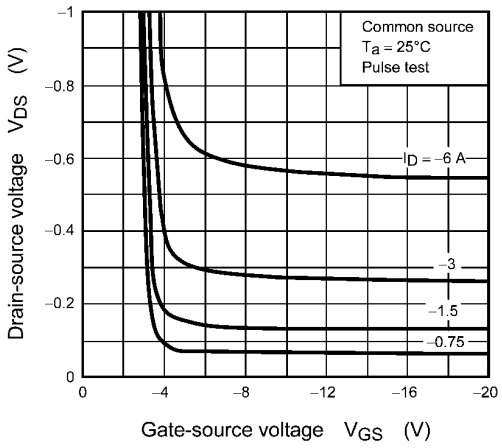


Fig. 8.4 V_{DS} - V_{GS}

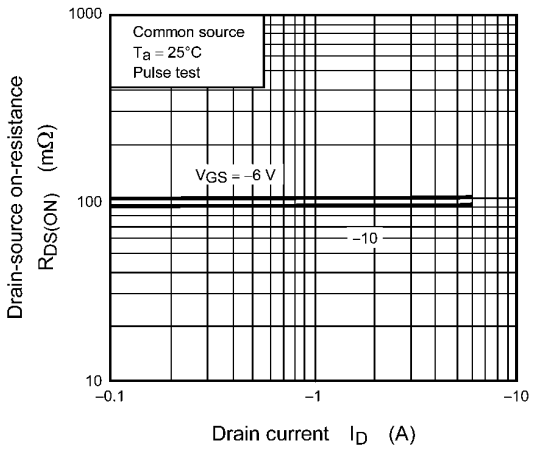


Fig. 8.5 $R_{DS(ON)}$ - I_D

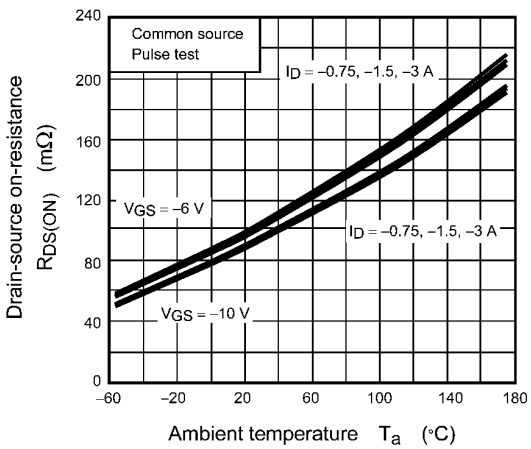


Fig. 8.6 $R_{DS(ON)}$ - T_a (Note 8)

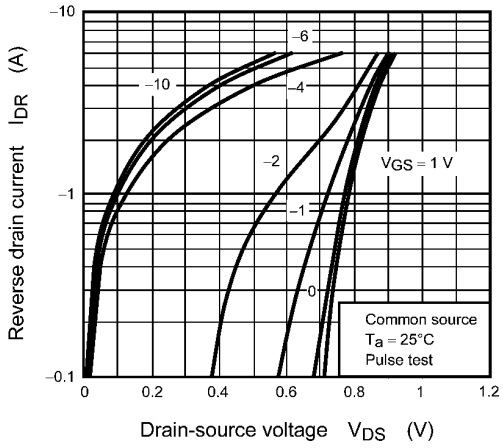


Fig. 8.7 I_{DR} - V_{DS}

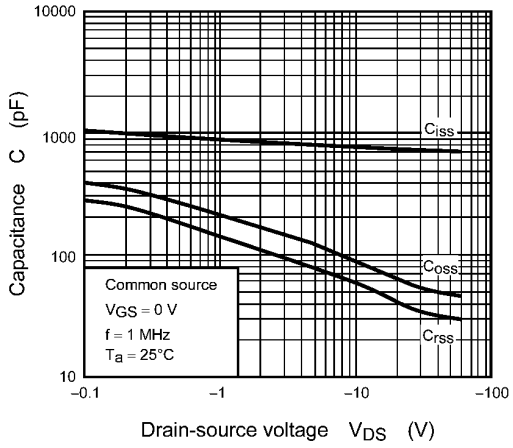


Fig. 8.8 Capacitance - V_{DS}

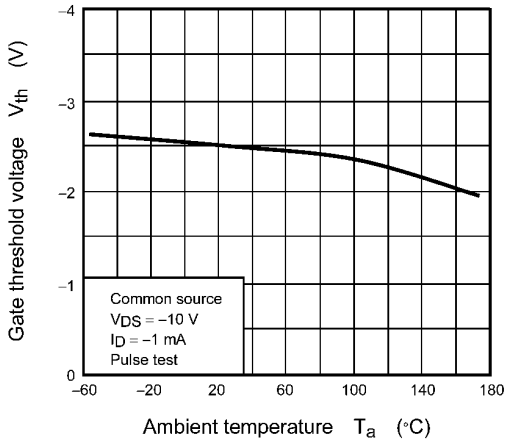


Fig. 8.9 V_{th} - T_a (Note 8)

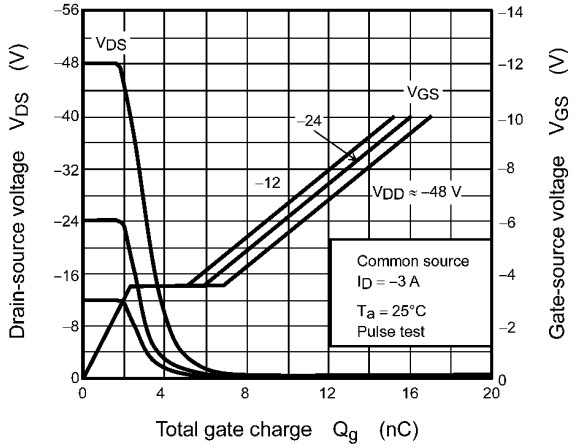


Fig. 8.10 Dynamic Input/Output Characteristics

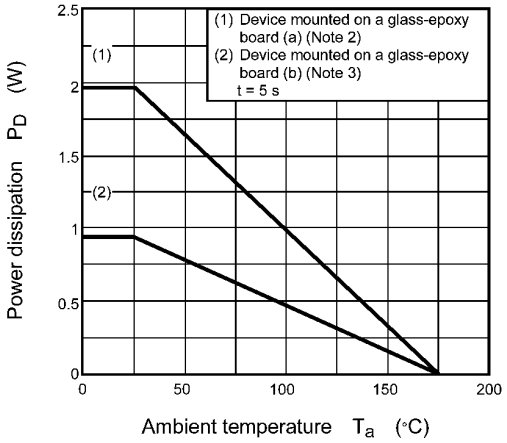


Fig. 8.11 P_D - T_a (Guaranteed Maximum) (Note 8)

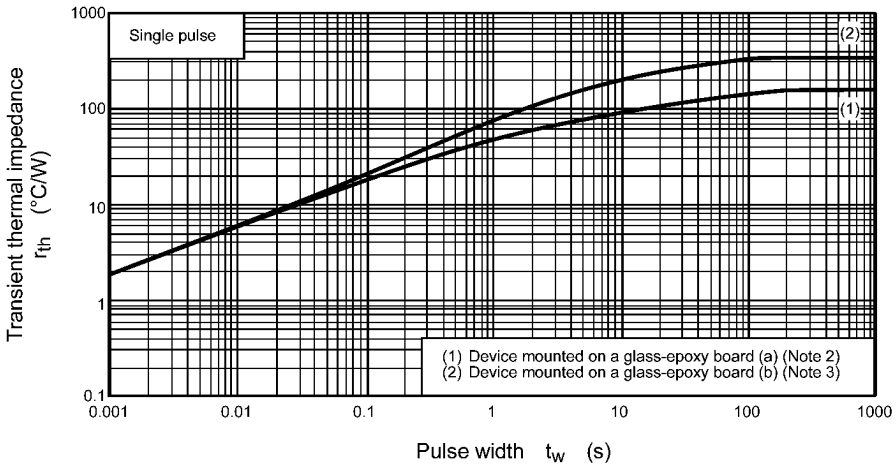


Fig. 8.12 r_{th} - t_w
(Guaranteed Maximum)

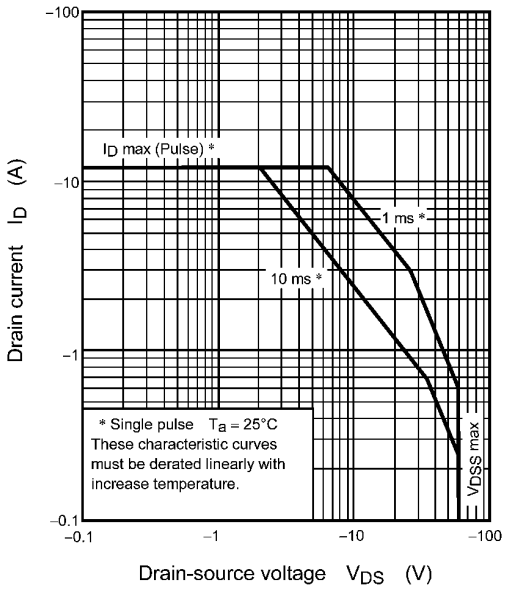


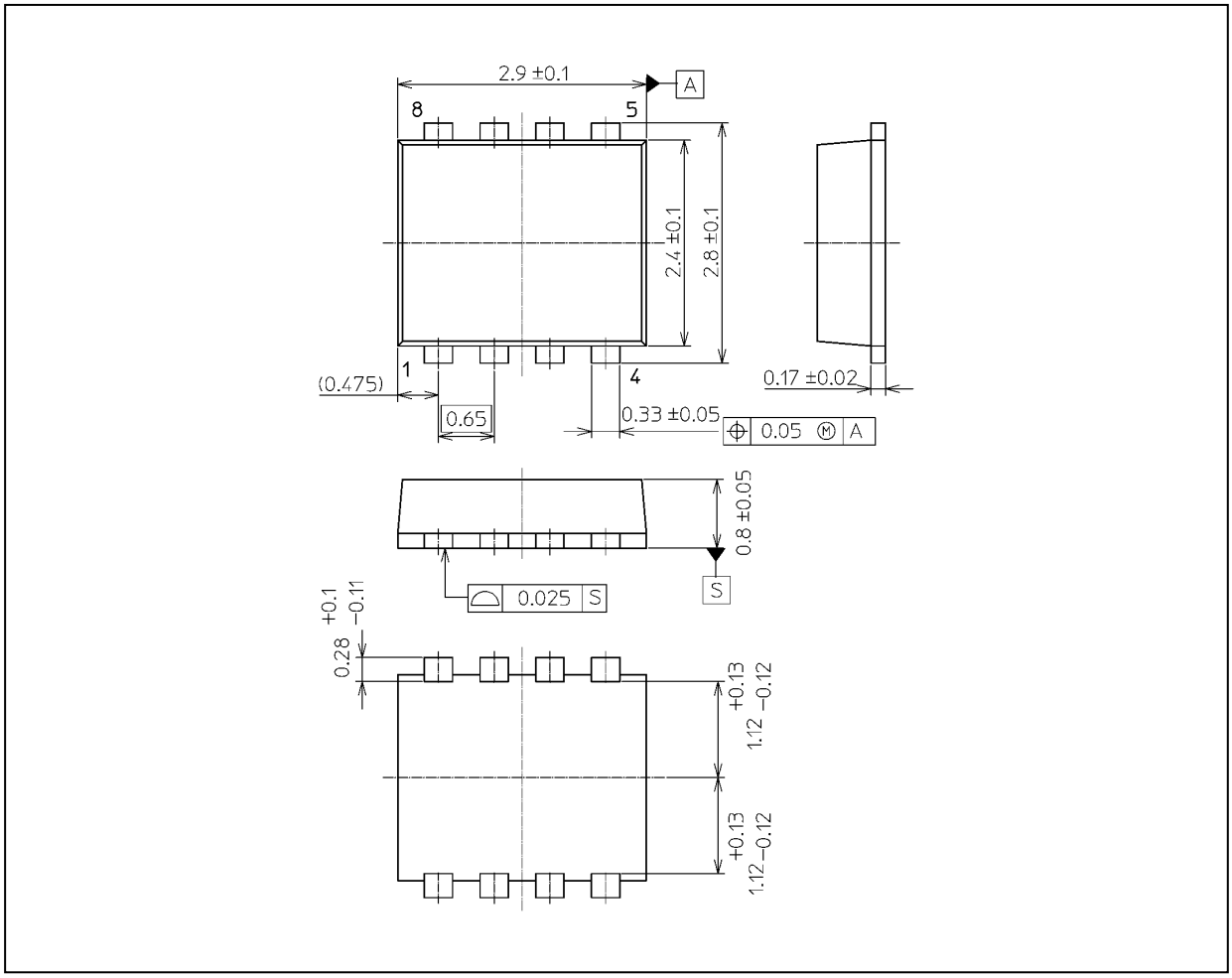
Fig. 8.13 Safe Operating Area
(Guaranteed Maximum)

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Note 8: Although several performance curves are shown up to a T_a of 175 °C, the device is not guaranteed at storage temperatures up to 175 °C. The storage temperature (T_{stg}) range is rated at -55 °C to 150 °C.

Package Dimensions

Unit: mm



Weight: 0.017 g (typ.)

Package Name(s)
TOSHIBA: 2-3V1S
Nickname: PS-8

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