

MOSFETs Silicon N-Channel MOS (U-MOSVII)

# **TPCC8076**

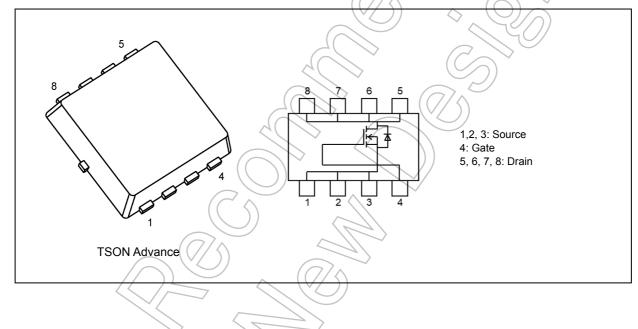
#### 1. Applications

- Lithium-Ion Secondary Batteries
- · Notebook PCs
- · Mobile Equipments

#### 2. Features

- (1) Small footprint due to a small and thin package
- (2) Low drain-source on-resistance:  $R_{DS(ON)} = 3.7 \text{ m}\Omega$  (typ.) ( $V_{GS} = 10 \text{ V}$ )
- (3) Low leakage current:  $I_{DSS}$  = 10  $\mu A$  (max) ( $V_{DS}$  = 33 V)
- (4) Enhancement mode:  $V_{th} = 1.3$  to 2.3 V ( $V_{DS} = 10$  V,  $I_D = 0.3$  mA)

# 3. Packaging and Internal Circuit



Start of commercial production



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

Characteri	stics		Symbol	Rating	Unit
Drain-source voltage			$V_{DSS}$	33	V
Gate-source voltage			$V_{GSS}$	±20	
Drain current (DC)		(Note 1)	I <sub>D</sub>	27	Α
Drain current (pulsed)		(Note 1)	I <sub>DP</sub>	81	
Power dissipation	(T <sub>c</sub> = 25 °C)		P <sub>D</sub>	39	W
Power dissipation	(t = 10 s)	(Note 2)	P <sub>D</sub>	1.9	
Power dissipation	(t = 10 s)	(Note 3)	Pp	0.7	W
Single-pulse avalanche energy		(Note 4)	EAS	)) 82	mJ
Avalanche current			I <sub>AR</sub>	27	Α
Channel temperature			T <sub>ch</sub>	150	°C
Storage temperature		6	T <sub>stg</sub>	-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

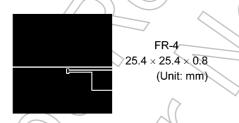
	Characteristics			Symbol	Max	Unit
Channel-to-case thermal resistance		(T <sub>c</sub> = 25 °C)		R <sub>th(ch-c)</sub>	3.2	°C/W
Channel-to-ambient thermal resistance		(t = 10 s)	(Note 2)	R <sub>th(ch-a)</sub>	65.7	°C/W
Channel-to-ambient thermal resistance		(t = 10 s)	(Note 3)	R <sub>th(ch-a)</sub>	178	°C/W

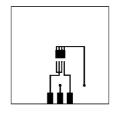
Note 1: Ensure that the channel temperature does not exceed 150°C.

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:  $V_{DD}$  = 24 V,  $T_{ch}$  = 25°C (initial), L = 0.1 mH,  $R_G$  = 1  $\Omega$ ,  $I_{AR}$  = 27 A





 $FR-4 \\ 25.4 \times 25.4 \times 0.8 \\ \text{(Unit: mm)}$ 

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

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<sub>a</sub> = 25°C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Gate leakage current	I <sub>GSS</sub>	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	_	_	±10	μА
Drain cut-off current	I <sub>DSS</sub>	V <sub>DS</sub> = 33 V, V <sub>GS</sub> = 0 V		_	10	
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	33			V
	V <sub>(BR)DSX</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = -20 V	18	)		
Gate threshold voltage	$V_{th}$	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.3 mA	1.3	<i>7</i> _	2.3	
Drain-source on-resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 13.5 A	/ <del>A</del>	4.9	6.2	mΩ
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 13.5 A		3.7	4.6	

# 6.2. Dynamic Characteristics (T<sub>a</sub> = 25°C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Input capacitance	C <sub>iss</sub>	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	- /	2500	_	pF
Reverse transfer capacitance	C <sub>rss</sub>	((// \) \ \	_((	120	( –	
Output capacitance	C <sub>oss</sub>		7	430	) —	
Switching time (rise time)	t <sub>r</sub>	See Figure 6.2.1.		2.9	_	ns
Switching time (turn-on time)	t <sub>on</sub>			10	_	
Switching time (fall time)	t <sub>f</sub>		//-//	9.5	_	
Switching time (turn-off time)	t <sub>off</sub>		$\widetilde{\wedge}$	48	_	

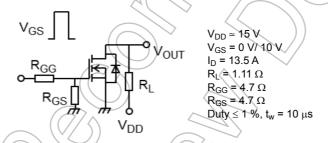


Fig. 6.2.1 Switching Time Test Circuit

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

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Qg	$V_{DD} \approx 24 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 27 \text{ A}$	_	34	_	nC
Gate-source charge 1	Q <sub>gs1</sub>		1	7.4	_	
Gate-drain charge	$Q_{gd}$		_	4	_	

# 6.4. Source-Drain Characteristics (T<sub>a</sub> = 25°C unless otherwise specified)

Characteristics		Symbol	Test Condition	Min	Тур.	Max	Unit
Reverse drain current (pulsed)	(Note 5)	I <sub>DRP</sub>	_	_	_	81	Α
Diode forward voltage		$V_{DSF}$	I <sub>DR</sub> = 27 A, V <sub>GS</sub> = 0 V	_	_	-1.2	V

Note 5: Ensure that the channel temperature does not exceed 150°C.



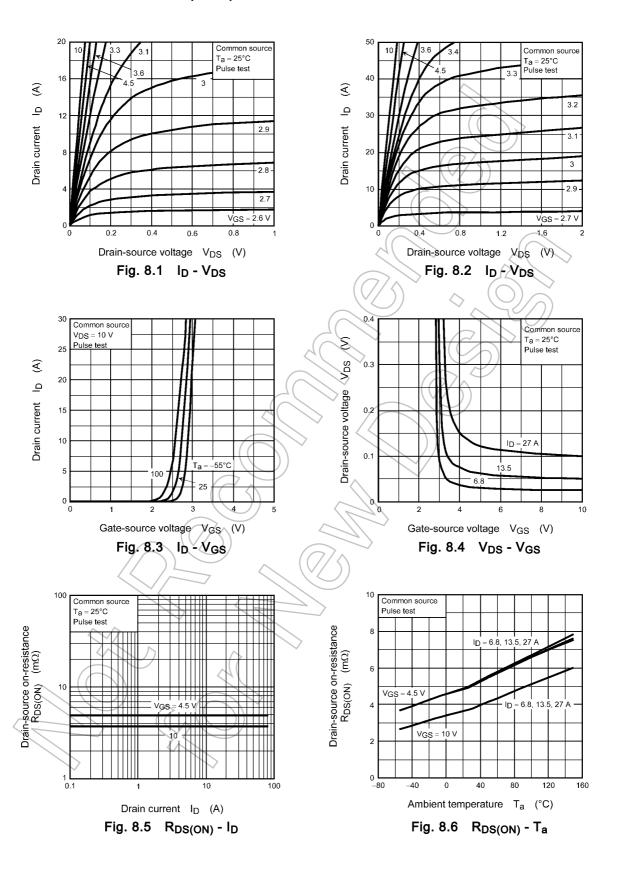
# 7. Marking



Rev.5.0



#### 8. Characteristics Curves (Note)





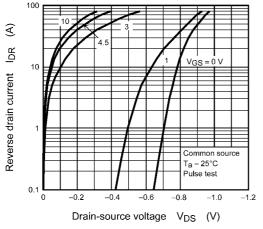


Fig. 8.7 IDR - VDS

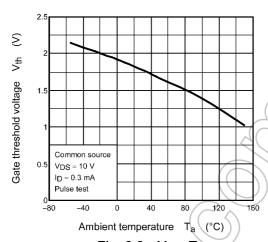


Fig. 8.9 V<sub>th</sub> - T<sub>a</sub>

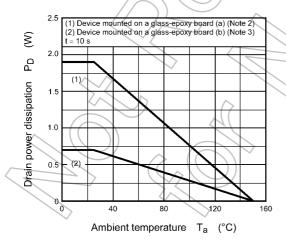


Fig. 8.11 P<sub>D</sub> - T<sub>a</sub> (Guaranteed Maximum)

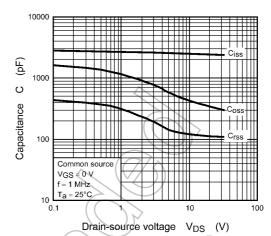


Fig. 8.8 Capacitance - V<sub>DS</sub>

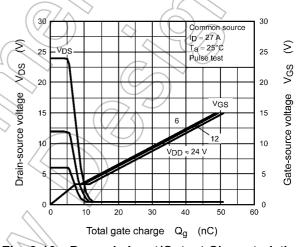


Fig. 8.10 Dynamic Input/Output Characteristics

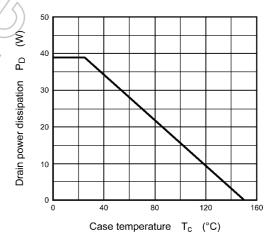
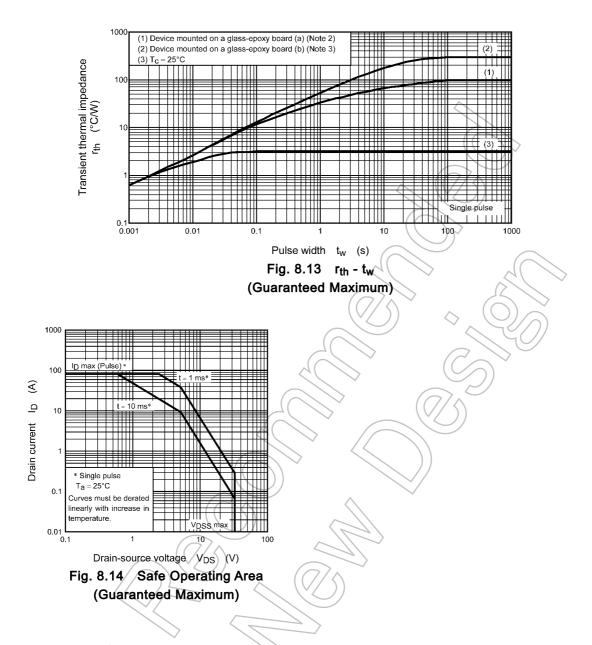


Fig. 8.12 P<sub>D</sub> - T<sub>c</sub> (Guaranteed Maximum)



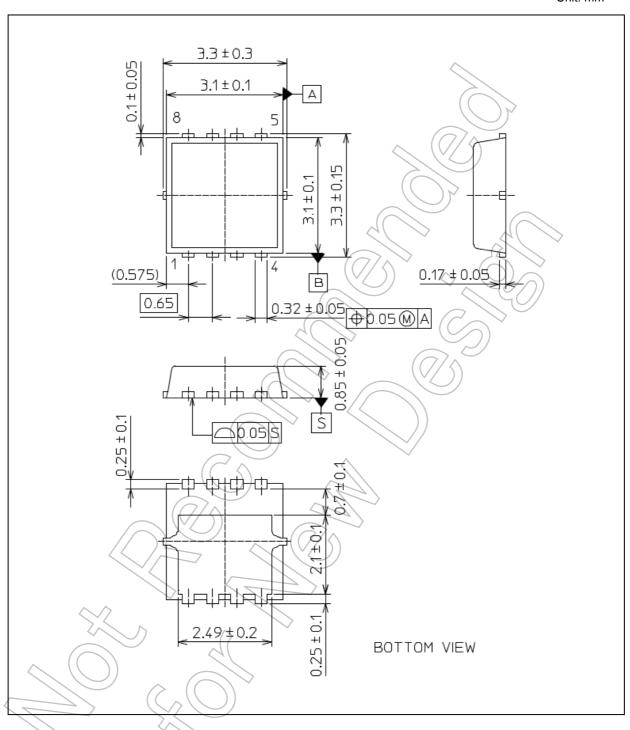


Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



# **Package Dimensions**

Unit: mm



Weight: 0.02 g (typ.)

Package Name(s)
TOSHIBA: 2-3X1S
Nickname: TSON Advance



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