

MOSFETs Silicon N-channel MOS (U-MOSVII-H)

TPN3300ANH

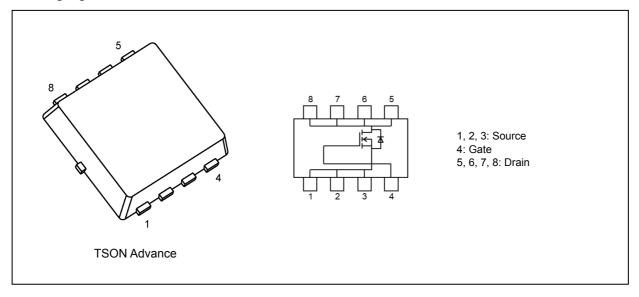
1. Applications

- · DC-DC Converters
- · Switching Voltage Regulators
- · Motor Drivers

2. Features

- (1) Small, thin package
- (2) High-speed switching
- (3) Small gate charge: $Q_{SW} = 4.5 \text{ nC (typ.)}$
- (4) Low drain-source on-resistance: $R_{DS(ON)} = 28 \text{ m}\Omega$ (typ.) ($V_{GS} = 10 \text{ V}$)
- (5) Low leakage current: I_{DSS} = 10 μA (max) (V_{DS} = 100 V)
- (6) Enhancement mode: $V_{th} = 2.0$ to 4.0 V ($V_{DS} = 10$ V, $I_D = 0.1$ mA)

3. Packaging and Internal Circuit



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

Characteristi	cs		Symbol	Rating	Unit
Drain-source voltage			V_{DSS}	100	V
Gate-source voltage	·		V_{GSS}	±20	
Drain current (DC)	(Silicon limit)	(Note 1), (Note 2)	Ι _D	21	Α
Drain current (DC)	(T _c = 25 °C)	(Note 1)	I_D	9.4	
Drain current (pulsed)	(t = 1 ms)	(Note 1)	I _{DP}	38	
Power dissipation	(T _c = 25 °C)		P_D	27	W
Power dissipation	(t = 10 s)	(Note 3)	P_D	1.9	W
Power dissipation	(t = 10 s)	(Note 4)	P_D	0.7	W
Single-pulse avalanche energy		(Note 5)	E _{AS}	23	mJ
Avalanche current			I _{AR}	9.4	Α
Channel temperature			T _{ch}	150	°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-case thermal resistance	(T _c = 25 °C)		R _{th(ch-c)}	4.62	°C/W
Channel-to-ambient thermal resistance	(t = 10 s)	(Note 3)	R _{th(ch-a)}	65.7	°C/W
Channel-to-ambient thermal resistance	(t = 10 s)	(Note 4)	R _{th(ch-a)}	178	

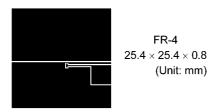
Note 1: Ensure that the channel temperature does not exceed 150 °C.

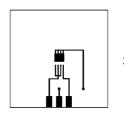
Note 2: Limited by silicon chip capability.

Note 3: Device mounted on a glass-epoxy board (a), Figure 5.1

Note 4: Device mounted on a glass-epoxy board (b), Figure 5.2

Note 5: V_{DD} = 60 V, T_{ch} = 25 °C (initial), L = 0.29 mH, I_{AR} = 9.4 A





FR-4 $25.4 \times 25.4 \times 0.8$ (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_a = 25 °C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Gate leakage current	I _{GSS}	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	_	_	±0.1	μА
Drain cut-off current	I _{DSS}	V _{DS} = 100 V, V _{GS} = 0 V	_	_	10	
Drain-source breakdown voltage	V _{(BR)DSS}	I _D = 10 mA, V _{GS} = 0 V	100	_	_	V
Drain-source breakdown voltage	V _{(BR)DSX}	I _D = 10 mA, V _{GS} = -20 V	65	_	_	
Gate threshold voltage	V_{th}	V _{DS} = 10 V, I _D = 0.1 mA	2.0	_	4.0	
Drain-source on-resistance	R _{DS(ON)}	V _{GS} = 10 V, I _D = 4.7 A	_	28	33	mΩ

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

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Input capacitance	C _{iss}	V _{DS} = 50 V, V _{GS} = 0 V, f = 1 MHz	_	680	880	pF
Reverse transfer capacitance	C_{rss}		_	8.8	50	
Output capacitance	C _{oss}		_	130	_	
Gate resistance	r _g	_	_	0.6	1.1	Ω
Switching time (rise time)	t _r	See Fig. 6.2.1	_	4.4	_	ns
Switching time (turn-on time)	t _{on}		_	12	_	
Switching time (fall time)	t _f		_	3.8	_	
Switching time (turn-off time)	t _{off}		-	15		

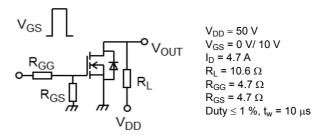


Fig. 6.2.1 Switching Time Test Circuit

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

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Qg	$V_{DD} \approx 50 \text{ V}, V_{GS} = 10 \text{ V}, I_{D} = 9.4 \text{ A}$	_	11		nC
Gate-source charge 1	Q _{gs1}			3.6		
Gate-drain charge	Q_{gd}		_	3.0		
Gate switch charge	Q_{SW}			4.5		

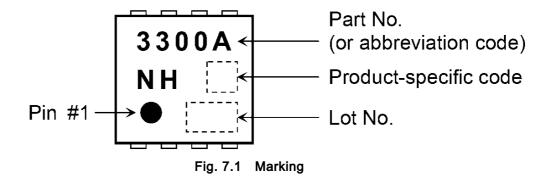
6.4. Source-Drain Characteristics (T_a = 25 °C unless otherwise specified)

Characteristics		Symbol	Test Condition	Min	Тур.	Max	Unit
Reverse drain current (pulsed) (Note 6)	I_{DRP}	_	_	_	38	Α
Diode forward voltage		V_{DSF}	I _{DR} = 9.4 A, V _{GS} = 0 V	_	_	-1.2	V

Note 6: Ensure that the channel temperature does not exceed 150 °C.



7. Marking





8. Characteristics Curves (Note)

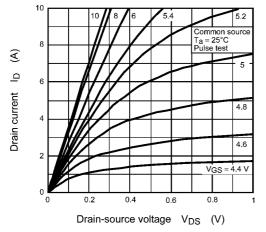
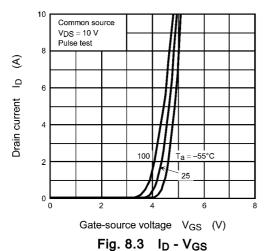
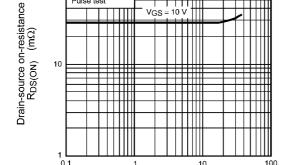


Fig. 8.1 I_D - V_{DS}





Common source

Ta = 25°C

Drain current I_D (A) Fig. 8.5 RDs(ON) - I_D

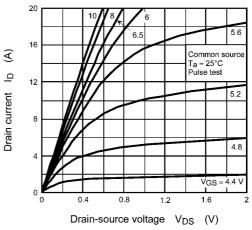


Fig. 8.2 I_D - V_{DS}

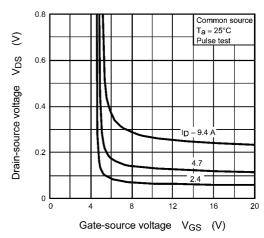


Fig. 8.4 V_{DS} - V_{GS}

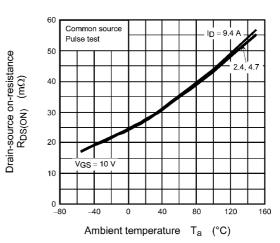
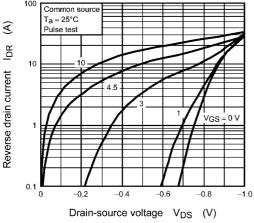
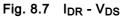


Fig. 8.6 R_{DS(ON)} - T_a







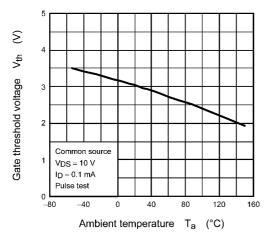


Fig. 8.9 V_{th} - T_a

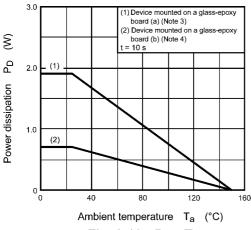


Fig. 8.11 $P_D - T_a$ (Guaranteed Maximum)

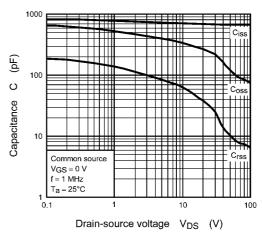


Fig. 8.8 Capacitance - V_{DS}

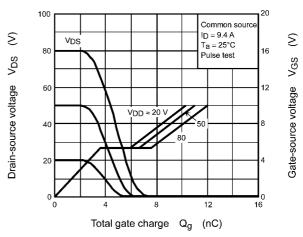


Fig. 8.10 Dynamic Input/Output Characteristics

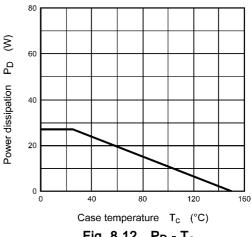


Fig. 8.12 P_D - T_c (Guaranteed Maximum)



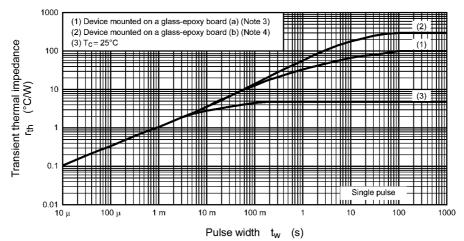


Fig. 8.13 r_{th} - t_w (Guaranteed Maximum)

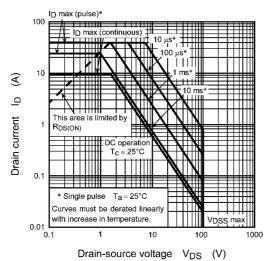


Fig. 8.14 Safe Operating Area (Guaranteed Maximum)

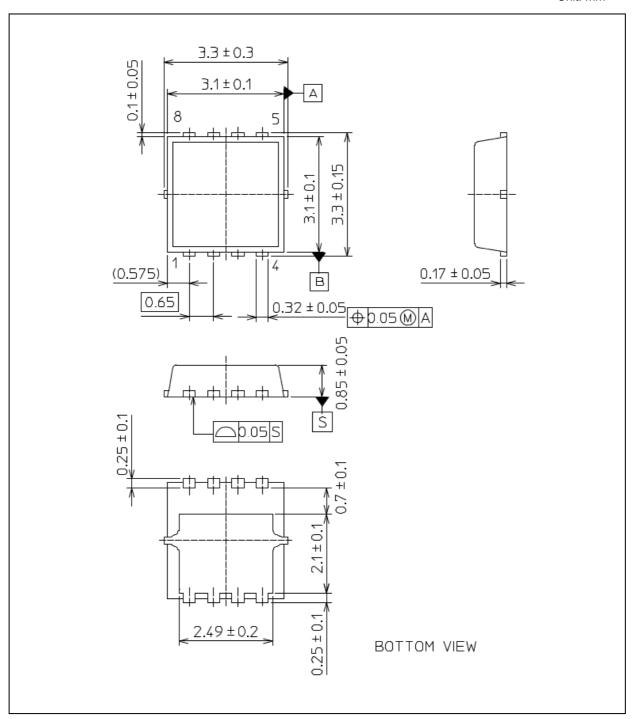
Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

2025-10-28



Package Dimensions

Unit: mm



Weight: 0.02 g (typ.)

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

Rev.4.0



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