

# SOT-23 Plastic-Encapsulate MOSFETS

TF2312

## TF2312 N-Channel 20-V(D-S) MOSFET

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	$I_D$
20V	0.031Ω@4.5V	5.0 A
	0.037Ω@2.5V	
	0.047Ω@1.8V	

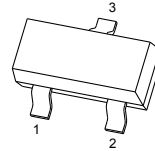
### General FEATURE

- TrenchFET Power MOSFET
- Lead free product is acquired
- Surface mount package

### APPLICATION

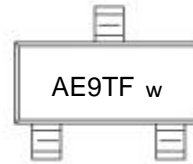
- Load Switch for Portable Devices
- DC/DC Converter

### SOT-23



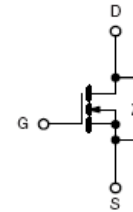
- 1.GATE
- 2.SOURCE
- 3.DRAIN

### MARKING



\*w: week code

### Equivalent Circuit



### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

Parameter		Symbol	5 sec	Steady State	Unit
Drain-Source Voltage		$V_{DS}$	20		V
Gate-Source Voltage		$V_{GS}$	±8		
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) <sup>a</sup>	$T_A = 25^\circ\text{C}$	$I_D$	5.0	3.9	A
Pulsed Drain Current <sup>b</sup>		$I_{DM}$	15		
Avalanche Current <sup>b</sup>	L = 0.1 mH	$I_{AS}$	13		
Single Avalanche Energy		$E_{AS}$	8.45		mJ
Continuous Source Current (Diode Conduction) <sup>a</sup>		$I_S$	1.0	0.63	A
Power Dissipation <sup>a</sup>	$T_A = 25^\circ\text{C}$	$P_D$	1.25	0.75	W
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to 150		$^\circ\text{C}$

### THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	t ≤ 5 sec	$R_{thJA}$	80	100	$^\circ\text{C/W}$
	Steady State		120	166	
Maximum Junction-to-Foot	Steady State	$R_{thJF}$	50	60	

#### Notes

- Surface Mounted on 1" x 1" FR4 Board.
- Pulse width limited by maximum junction temperature

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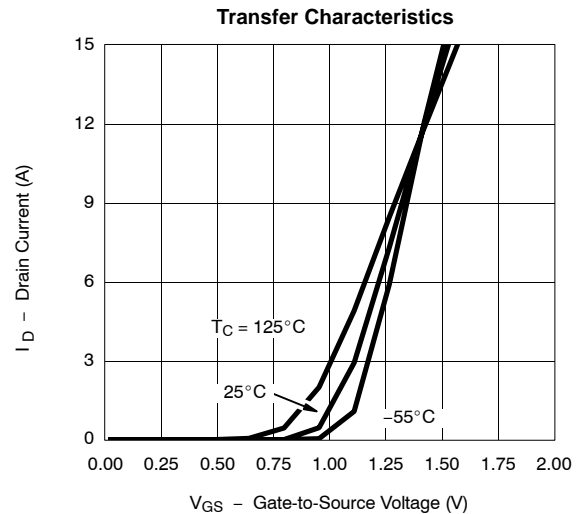
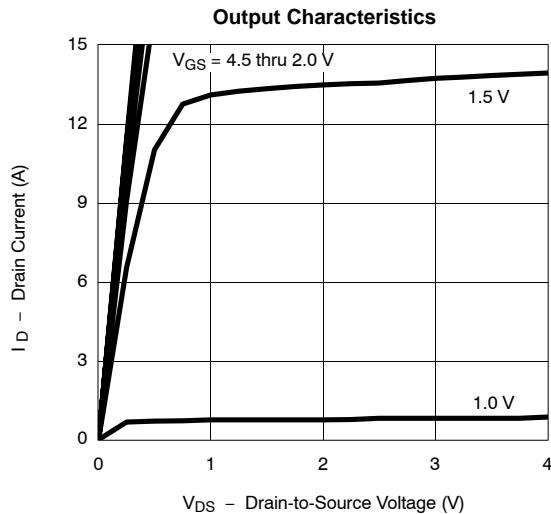
SPECIFICATIONS (T <sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Conditions	Limits			Unit
			Min	Typ	Max	
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	20			V
Gate-Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	0.45		0.85	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±8 V			±100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 70 °C			75	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ 10 V, V <sub>GS</sub> = 4.5 V	15			A
Drain-Source On-Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 5.0 A		0.025	0.031	Ω
		V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 4.6 A		0.030	0.037	
		V <sub>GS</sub> = 1.8 V, I <sub>D</sub> = 4.1 A		0.036	0.047	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 5.0 A		30		S
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> = 1.0 A, V <sub>GS</sub> = 0 V		0.8	1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 5.0 A		7.5	12	nC
Gate-Source Charge	Q <sub>gs</sub>			1.4		
Gate-Drain Charge	Q <sub>gd</sub>			1.2		
Gate Resistance	R <sub>g</sub>	f = 1.0 MHz	1.1	2.2	3.3	Ω
<b>Switching</b>						
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 10 V, R <sub>L</sub> = 10 Ω I <sub>D</sub> ≅ 1.0 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 6 Ω		9	15	ns
Rise Time	t <sub>r</sub>			30	45	
Turn-Off Delay Time	t <sub>d(off)</sub>			35	55	
Fall-Time	t <sub>f</sub>			10	15	
Source-Drain Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 1.0 A, di/dt = 100 A/μs		13	25	nC
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			4.5	7	

Notes

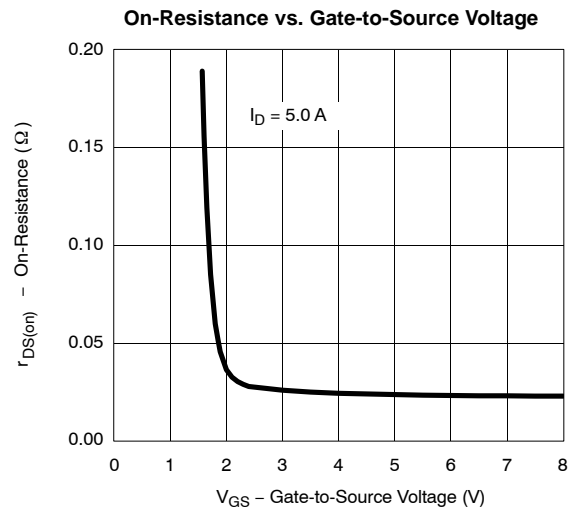
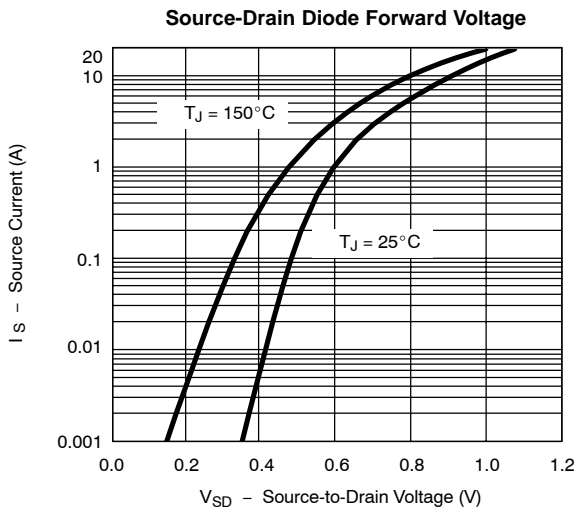
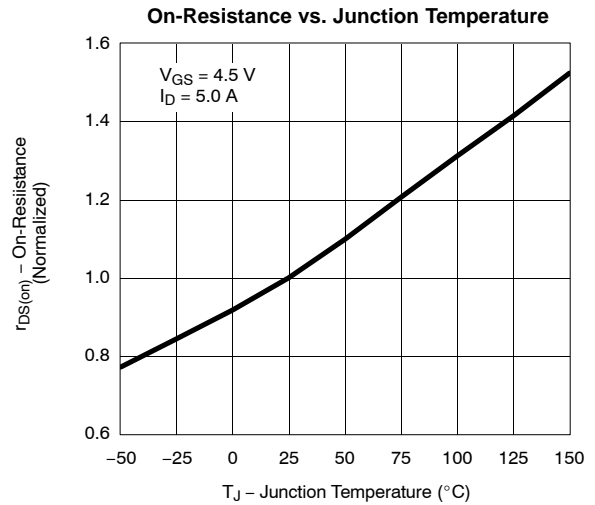
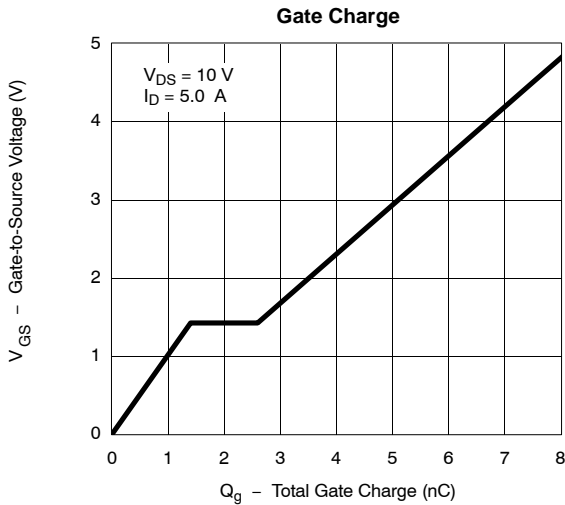
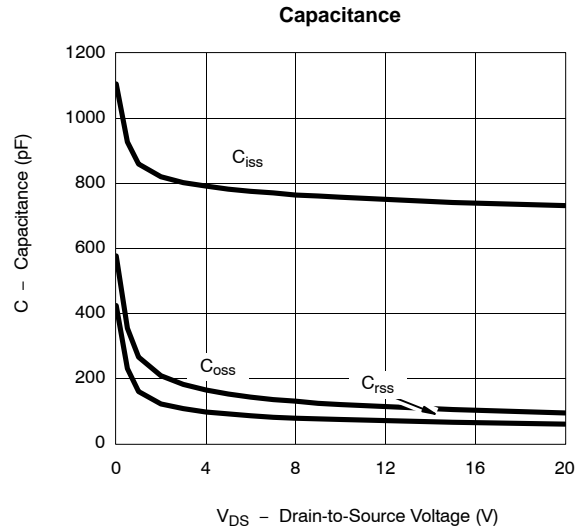
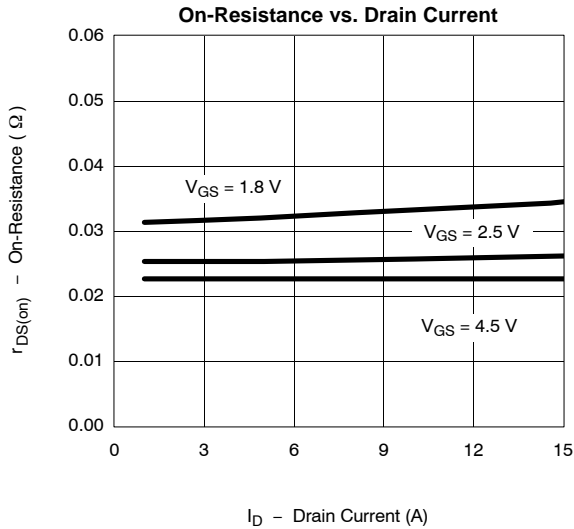
- a. Pulse test: PW ≤ 300 μs duty cycle ≤ 2%.
- b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

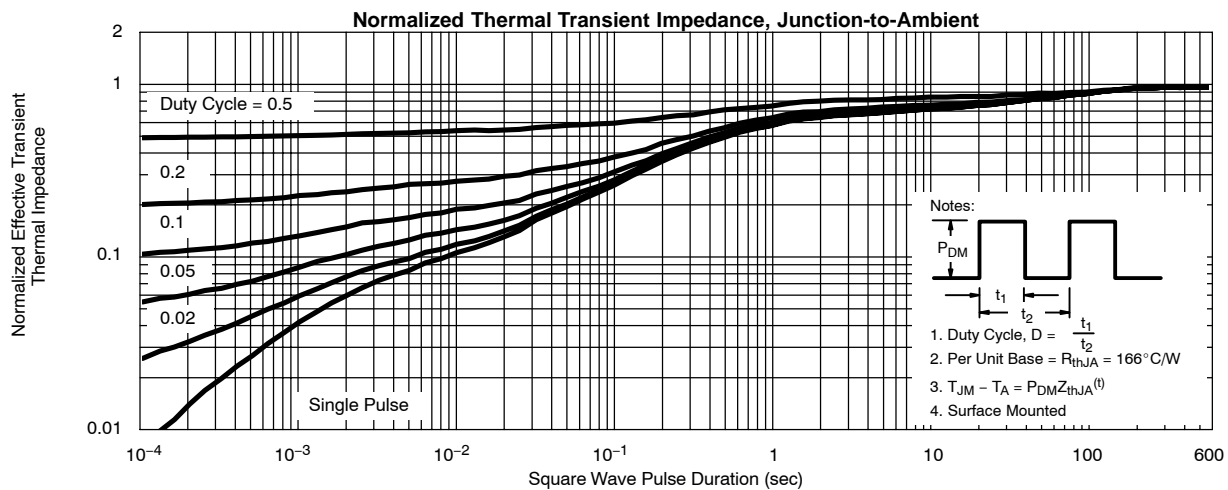
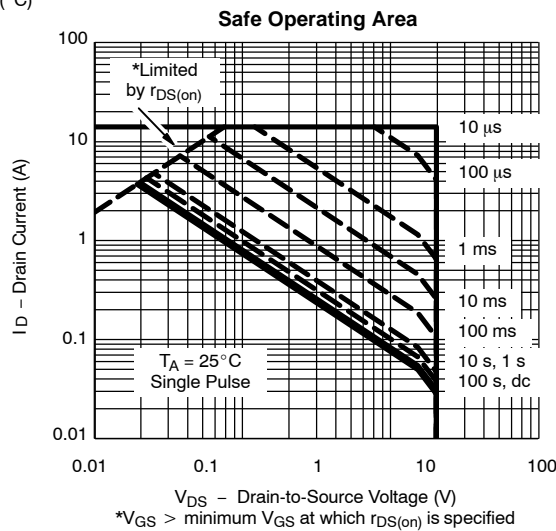
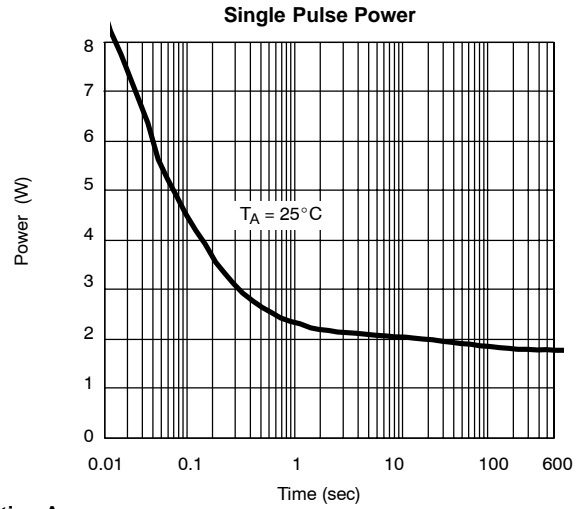
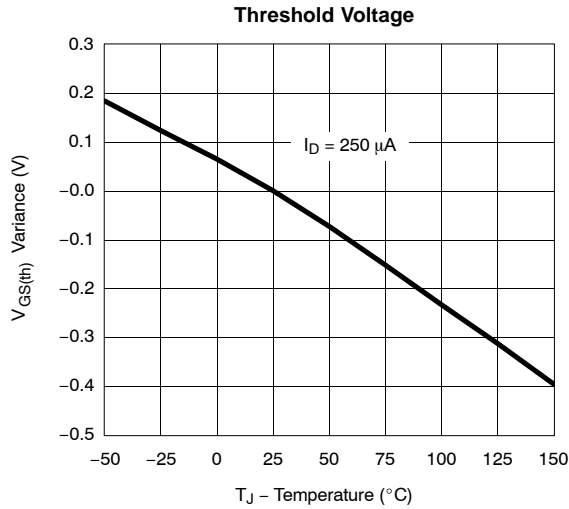
## TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)



**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**



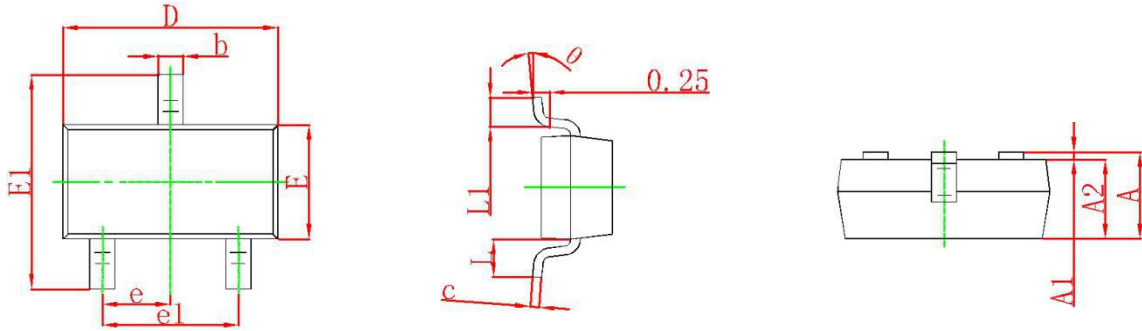
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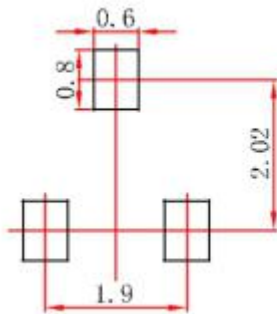
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## SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

## SOT-23 Suggested Pad Layout



Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.