



## Description

The MMFTN3404A-AQ uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.



**SOT-23**

## General Features

$V_{DS} = 30V$   $I_D = 5.8A$

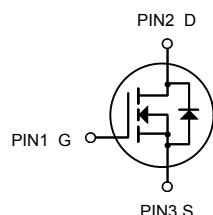
$R_{DS(ON)} < 28m\Omega$  @  $V_{GS}=10V$

## Application

Battery protection

Load switch

Uninterruptible power supply



N-Channel MOSFET

## Ordering Information

Product ID	Pack	Brand	Qty(PCS)
MMFTN3404A-AQ3	SOT-23	HXY MOSFET	3000

## Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Limit	Unit
$V_{DS}$	Drain-Source Voltage	30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current-Continuous	5.8	A
$I_{DM}$	Drain Current-Pulsed	18.4	A
$P_D$	Maximum Power Dissipation	1	W
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 150	°C
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	125	°C/W



**Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$\text{V}_{\text{GS}}=0\text{V}$ , $\text{I}_{\text{D}}=250\mu\text{A}$	30	---	---	V
$\Delta \text{BV}_{\text{DSS}}/\Delta T$	BVDSS Temperature Coefficient	Reference to $25^\circ\text{C}$ , $\text{I}_{\text{D}}=1\text{mA}$	---	0.023	---	$\text{V}/^\circ\text{C}$
$\text{R}_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance <sup>2</sup>	$\text{V}_{\text{GS}}=10\text{V}$ , $\text{I}_{\text{D}}=4\text{A}$	---	22	28	$\text{m}\Omega$
		$\text{V}_{\text{GS}}=4.5\text{V}$ , $\text{I}_{\text{D}}=3\text{A}$	---	26	32	
$\text{V}_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$\text{V}_{\text{GS}}=\text{V}_{\text{DS}}$ , $\text{I}_{\text{D}}=250\mu\text{A}$	1.0	1.5	2.5	V
$\Delta \text{V}_{\text{GS}(\text{th})}$	$\text{V}_{\text{GS}(\text{th})}$ Temperature Coefficient		---	-4.2	---	$\text{mV}/^\circ\text{C}$
$\text{I}_{\text{DSS}}$	Drain-Source Leakage Current	$\text{V}_{\text{DS}}=24\text{V}$ , $\text{V}_{\text{GS}}=0\text{V}$ , $T_J=25^\circ\text{C}$	---	---	1	$\text{uA}$
		$\text{V}_{\text{DS}}=24\text{V}$ , $\text{V}_{\text{GS}}=0\text{V}$ , $T_J=55^\circ\text{C}$	---	---	5	
$\text{I}_{\text{GSS}}$	Gate-Source Leakage Current	$\text{V}_{\text{GS}}=\pm 20\text{V}$ , $\text{V}_{\text{DS}}=0\text{V}$	---	---	$\pm 100$	nA
$\text{g}_{\text{fs}}$	Forward Transconductance	$\text{V}_{\text{DS}}=5\text{V}$ , $\text{I}_{\text{D}}=4\text{A}$	---	7	---	S
$\text{R}_{\text{g}}$	Gate Resistance	$\text{V}_{\text{DS}}=0\text{V}$ , $\text{V}_{\text{GS}}=0\text{V}$ , $f=1\text{MHz}$	---	2.3	4.6	$\Omega$
$\text{Q}_{\text{g}}$	Total Gate Charge (4.5V)	$\text{V}_{\text{DS}}=15\text{V}$ , $\text{V}_{\text{GS}}=4.5\text{V}$ , $\text{I}_{\text{D}}=4\text{A}$	---	5.0	6.9	$\text{nC}$
$\text{Q}_{\text{gs}}$	Gate-Source Charge		---	1.1	2.2	
$\text{Q}_{\text{gd}}$	Gate-Drain Charge		---	2.6	2.8	
$\text{T}_{\text{d}(\text{on})}$	Turn-On Delay Time	$\text{V}_{\text{DD}}=15\text{V}$ , $\text{V}_{\text{GS}}=10\text{V}$ , $\text{R}_{\text{G}}=3.3\Omega$ , $\text{I}_{\text{D}}=4\text{A}$	---	2	4	$\text{ns}$
$\text{T}_{\text{r}}$	Rise Time		---	34.4	62	
$\text{T}_{\text{d}(\text{off})}$	Turn-Off Delay Time		---	13.2	26	
$\text{T}_{\text{f}}$	Fall Time		---	4.8	9.6	
$\text{C}_{\text{iss}}$	Input Capacitance	$\text{V}_{\text{DS}}=15\text{V}$ , $\text{V}_{\text{GS}}=0\text{V}$ , $f=1\text{MHz}$	---	420	582	$\text{pF}$
$\text{C}_{\text{oss}}$	Output Capacitance		---	60	87	
$\text{C}_{\text{rss}}$	Reverse Transfer Capacitance		---	53	71	
$\text{I}_{\text{s}}$	Continuous Source Current <sup>1,4</sup>	$\text{V}_{\text{G}}=\text{V}_{\text{D}}=0\text{V}$ , Force Current	---	---	4.6	A
$\text{I}_{\text{SM}}$	Pulsed Source Current <sup>2,4</sup>		---	---	18.4	A
$\text{V}_{\text{SD}}$	Diode Forward Voltage <sup>2</sup>	$\text{V}_{\text{GS}}=0\text{V}$ , $\text{I}_{\text{s}}=1\text{A}$ , $T_J=25^\circ\text{C}$	---	---	1.2	V
$\text{t}_{\text{rr}}$	Reverse Recovery Time	$\text{I}_{\text{F}}=4\text{A}$ , $d\text{I}/dt=100\text{A}/\mu\text{s}$ , $T_J=25^\circ\text{C}$	---	8.7	---	nS
$\text{Q}_{\text{rr}}$	Reverse Recovery Charge		---	2.3	---	$\text{nC}$

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu\text{s}$  , duty cycle  $\leq 2\%$
- 3.The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
- 4.The data is theoretically the same as  $\text{I}_{\text{D}}$  and  $\text{I}_{\text{DM}}$  , in real applications , should be limited by total power dissipation.



## Typical Characteristics

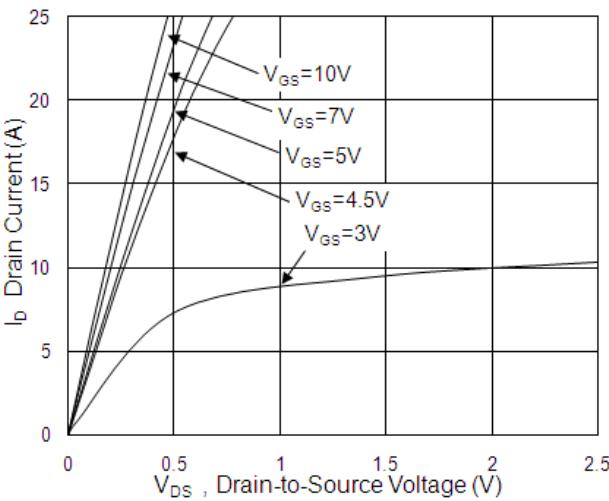


Fig.1 Typical Output Characteristics

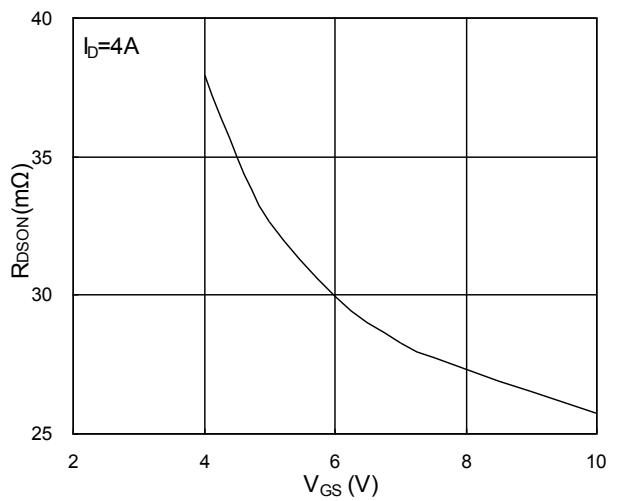


Fig.2 On-Resistance vs. Gate-Source

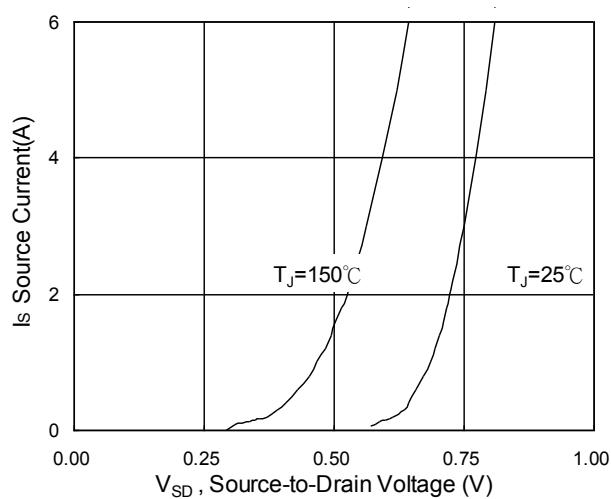


Fig.3 Forward Characteristics Of Reverse

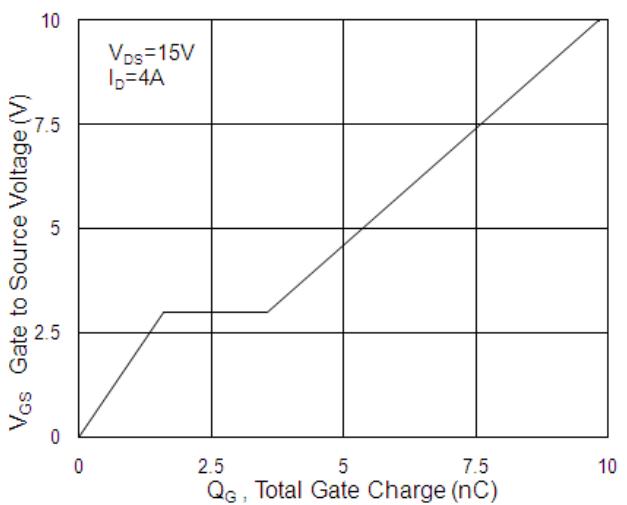


Fig.4 Gate-Charge Characteristics

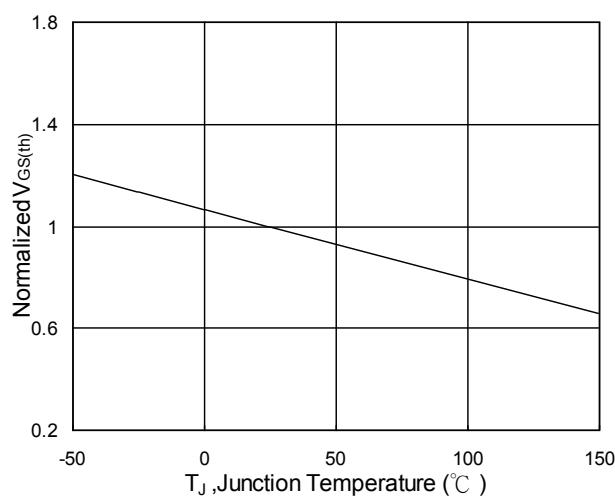


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

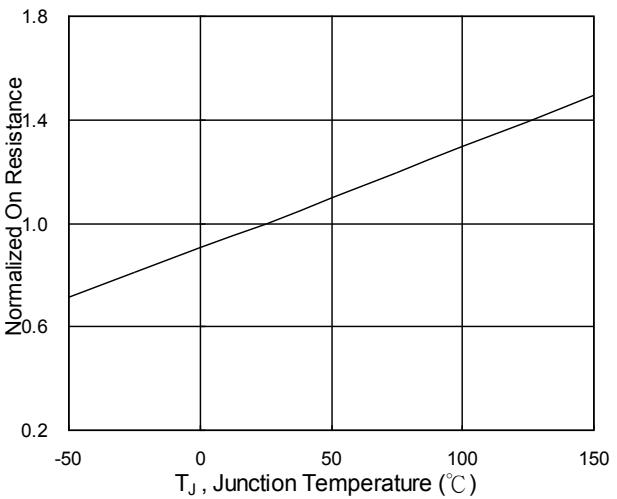


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

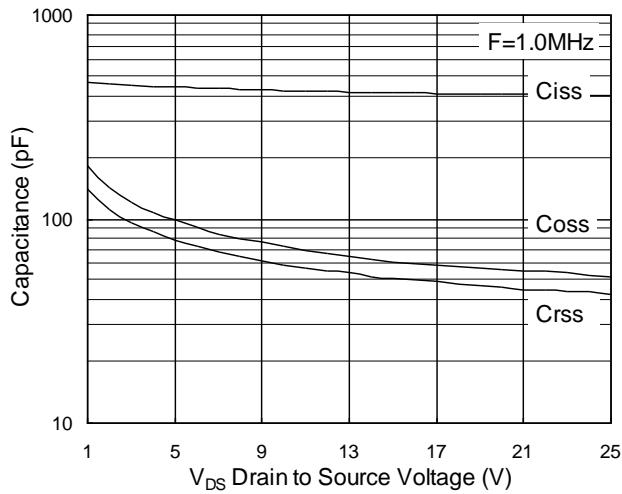


Fig.7 Capacitance

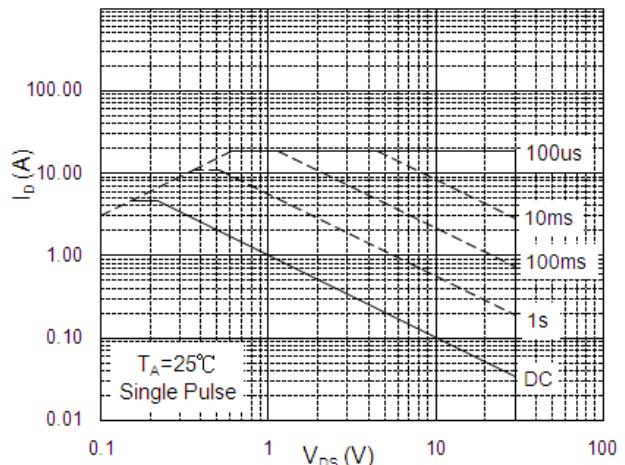


Fig.8 Safe Operating Area

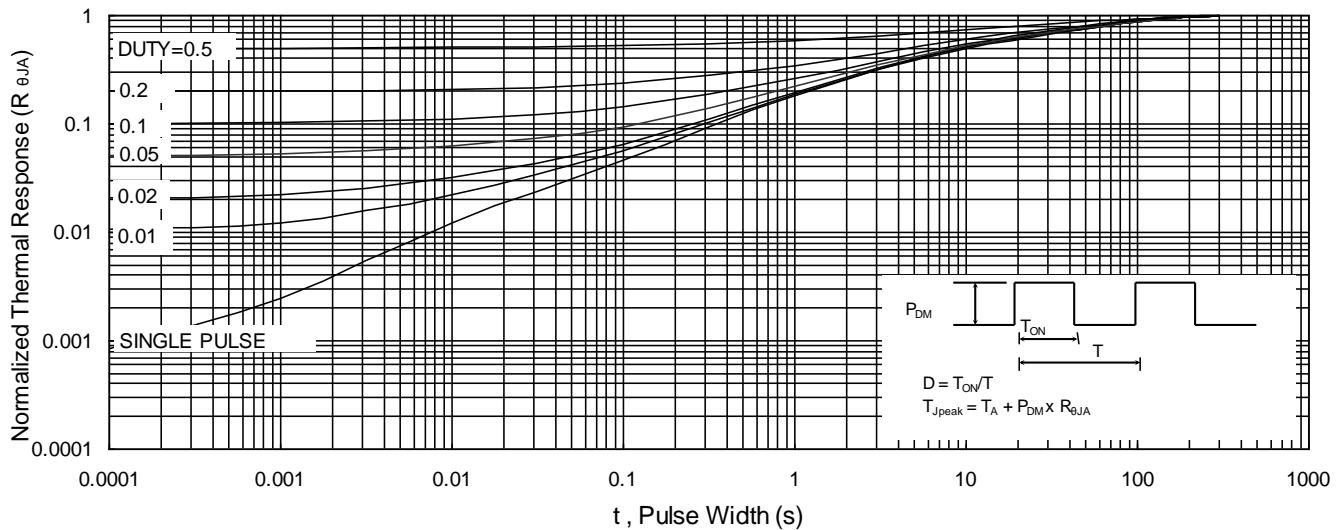


Fig.9 Normalized Maximum Transient Thermal Impedance

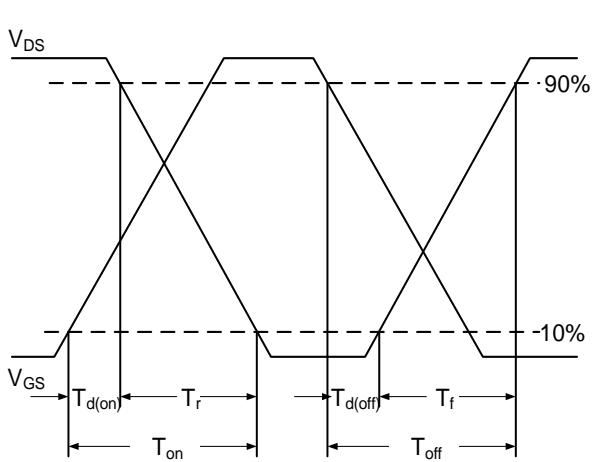


Fig.10 Switching Time Waveform

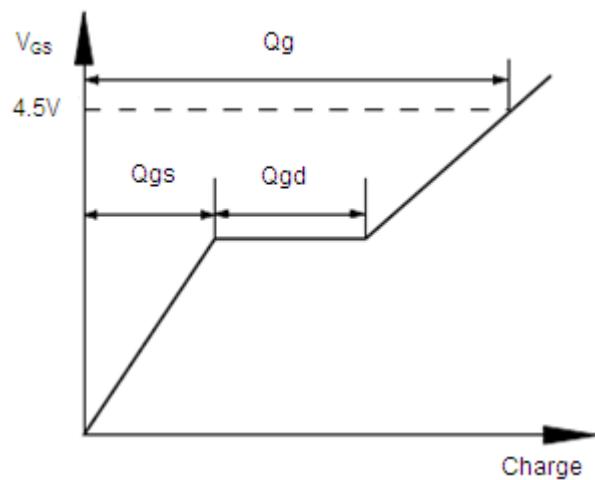
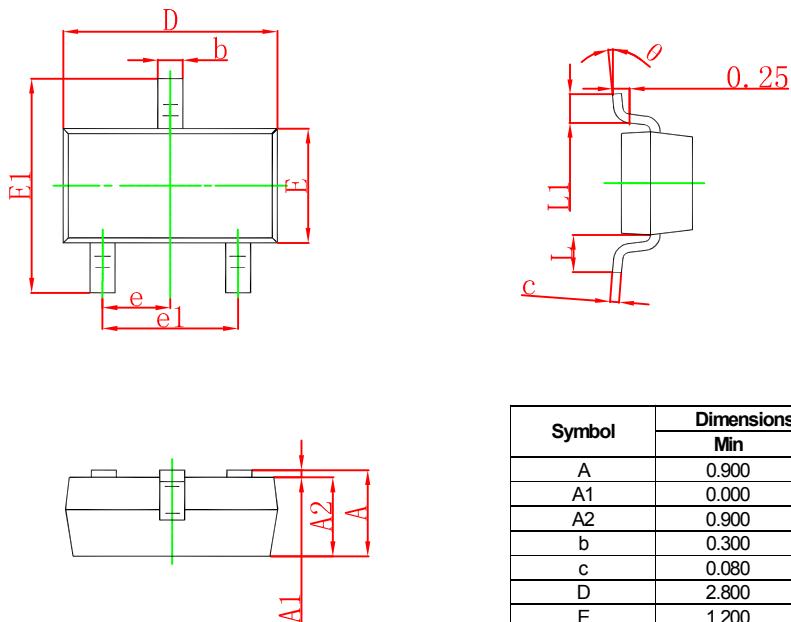


Fig.11 Gate Charge Waveform

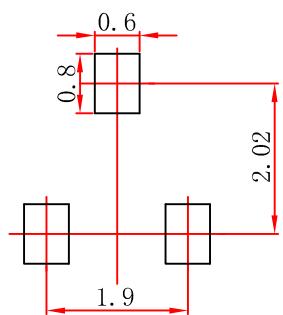


### SOT-23 Package Outline Dimensions



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
$\theta$	0°	8°	0°	8°

### SOT-23 Suggested Pad Layout



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



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