

# MSQ30N10D

## Dual N-Channel 30-V (D-S) MOSFET

### Description

The device is the highest performance trench N-ch MOSFETs with extreme high cell density, which provide excellent  $R_{DS(ON)}$  and gate charge for most of the synchronous buck converter applications.

The device meets the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

### Features

- $R_{DS(ON)} = 14m\Omega @ V_{GS} = 10V$
- Super Low Gate Charge
- Excellent  $CdV/dt$  effect decline
- 100% EAS Guaranteed
- Green Device Available

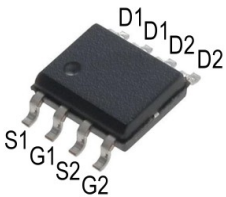
### Typical Applications

- MB / VGA / Vcore
- POL Applications
- SMPS 2<sup>nd</sup> SR

Package type : SOP-8

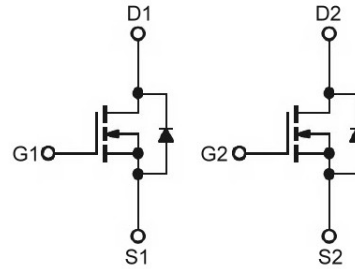
### Packing & Order Information

3,000/Reel

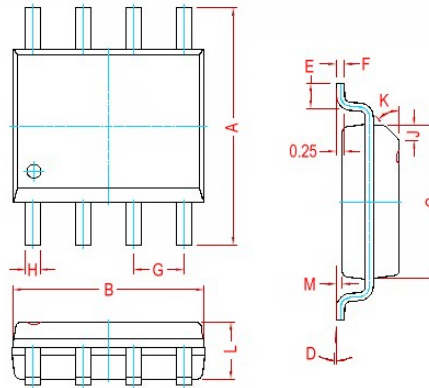


RoHS Compliant

### Graphic Symbol

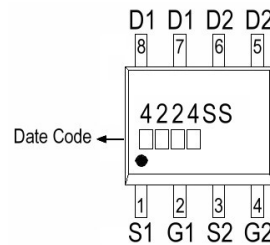


### Package Dimension



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	5.80	6.20	M	0.10	0.25
B	4.80	5.00	H	0.35	0.51
C	3.80	4.00	L	1.35	1.75
D	0°	8°	J	0.40 Ref.	
E	0.40	0.90	K	45° Ref.	
F	0.19	0.26	G	1.27 Typ.	

### Marking



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#### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

##### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$V_{DS}$	Drain-Source Voltage	30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current <sup>1</sup> ( $T_A = 25^\circ\text{C}$ )	10	A
	Continuous Drain Current <sup>1</sup> ( $T_A = 70^\circ\text{C}$ )	8	A
$I_{DM}$	Pulsed Drain Current <sup>1,2</sup>	30	A
$I_{AS}$	Single Pulse Avalanche Current, $L = 0.1\text{mH}^3$	21	A
$E_{AS}$	Single Pulse Avalanche Energy, $L = 0.1\text{mH}^3$	22	mJ
$P_D$	Power Dissipation <sup>4</sup> ( $T_A = 25^\circ\text{C}$ )	2	W
$T_J/T_{STG}$	Operating Junction and Storage Temperature	-55 to +150	$^\circ\text{C}$

##### Thermal Resistance Ratings

Symbol	Parameter	Maximum	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient <sup>1</sup>	62.5	$^\circ\text{C/W}$

##### Electrical Characteristics ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.0	-	3.0	V
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$	30	-	-	V
$g_{fs}$	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 10\text{A}$	-	6	-	S
$I_{GSS}$	Gate-Source Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V}, T_J = 25^\circ\text{C}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 24\text{V}, V_{GS} = 0\text{V}, T_J = 70^\circ\text{C}$	-	-	25	$\mu\text{A}$
$R_{DS(on)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS} = 10\text{V}, I_D = 10\text{A}$	-	9	14	$\text{m}\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 7\text{A}$	-	12	20	$\text{m}\Omega$
$E_{AS}$	Single Pulse Avalanche Energy <sup>5</sup>	$V_{DD} = 25\text{V}, L = 0.1\text{mH}, I_{AS} = 10\text{A}$	5	-	-	mJ
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$I_S = 10\text{A}, V_{GS} = 0\text{V}, T_J = 25^\circ\text{C}$	-	-	1.2	V
$I_S$	Continuous Source Current <sup>1,6</sup>	$V_G = V_D = 0\text{V}, \text{Force Current}$	-	-	10	A
$I_{SM}$	Pulsed Source Current <sup>2,6</sup>		-	-	30	

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Dynamic						
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q <sub>g</sub>	Total Gate Charge <sup>2</sup>	V <sub>DS</sub> = 15V	--	12.6	--	nC
Q <sub>gs</sub>	Gate-Source Charge	I <sub>D</sub> = 10A	--	4.2	--	
Q <sub>gd</sub>	Gate-Drain Charge	V <sub>GS</sub> = 4.5V	--	5.1	--	
t <sub>d(on)</sub>	Turn-On Delay Time <sup>2</sup>	V <sub>DS</sub> = 15V	--	6.2	--	ns
t <sub>r</sub>	Rise Time	I <sub>D</sub> = 10A	--	59	--	
t <sub>d(off)</sub>	Turn-Off Delay Time	V <sub>GS</sub> = 10V	--	27.6	--	
t <sub>f</sub>	Fall Time	R <sub>G</sub> = 3.3Ω	--	8.4	--	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 15V	--	1317	--	pF
C <sub>oss</sub>	Output Capacitance	V <sub>GS</sub> = 0V	--	163	--	
C <sub>rss</sub>	Reverse Transfer Capacitance	f = 1.0MHz	--	131	--	
R <sub>g</sub>	Gate Resistance	V <sub>GS</sub> = V <sub>DS</sub> = 0V, f = 1.0MHz	--	2.2	--	Ω

#### Notes

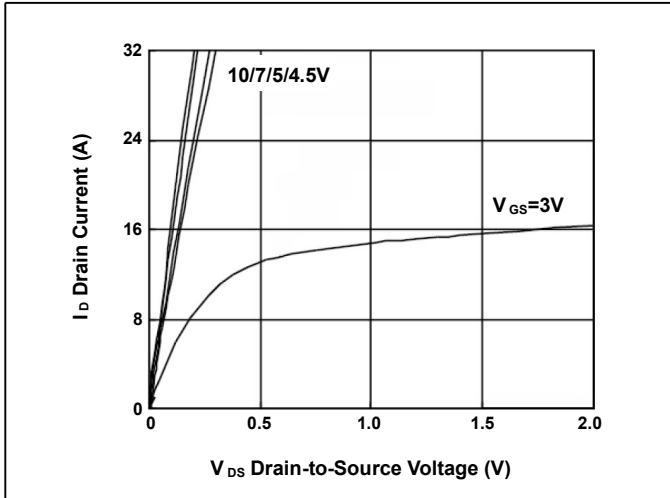
1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
3. The EAS data shows maximum rating. The test condition is V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=21A.
4. The power dissipation is limited by 150°C junction temperature.
5. The Min. value is 100% EAS tested guarantee.

The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

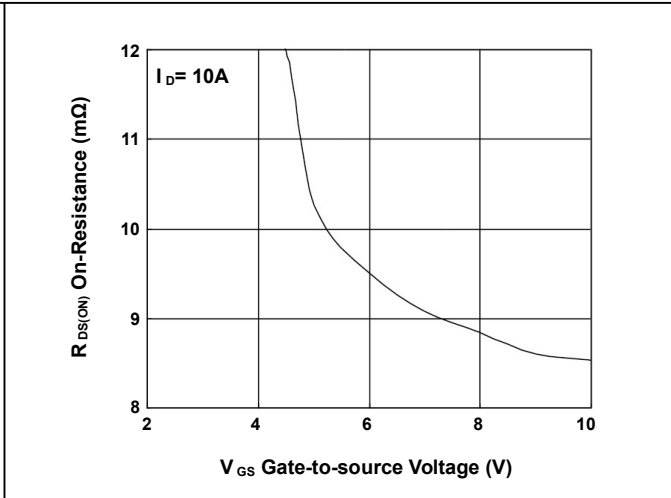
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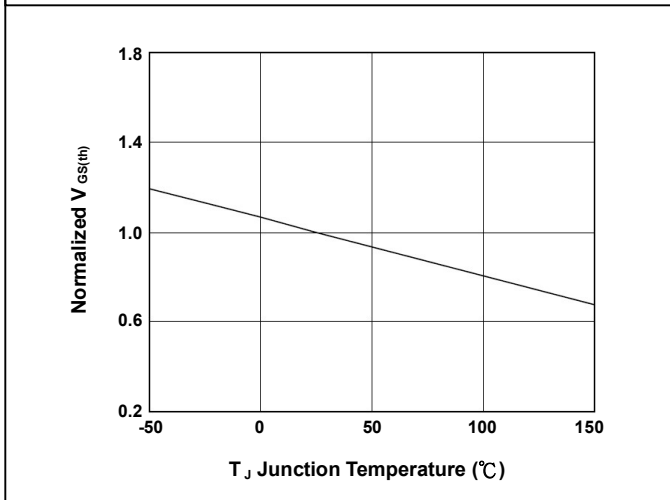
- Typical Electrical Characteristics



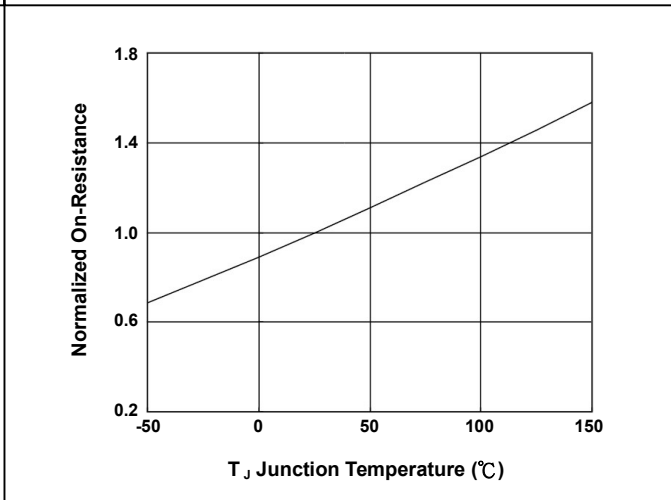
**FIG.1-Typical Output Characteristics**



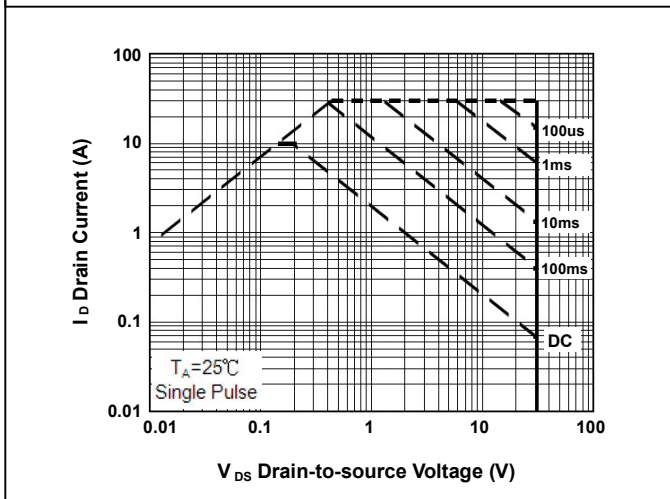
**FIG.2-On-Resistance vs. G-S Voltage**



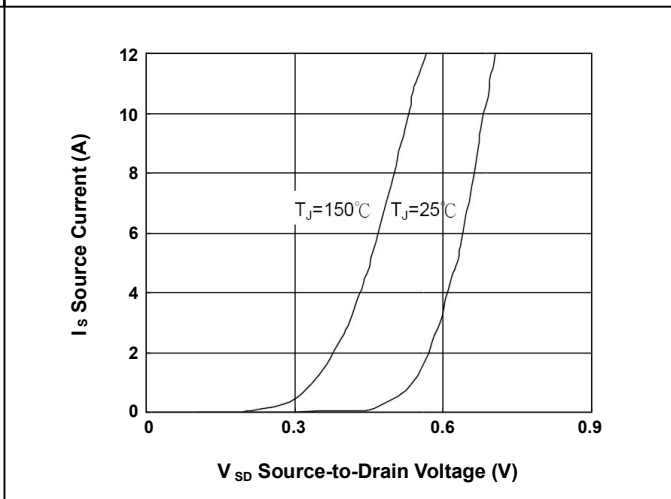
**FIG.3-Normalized  $V_{GS(th)}$  vs.  $T_J$**



**FIG.4-Normalized  $R_{DS(on)}$  vs.  $T_J$**



**FIG.5-Safe Operating Area**



**FIG.6-Forward Characteristics of Reverse**

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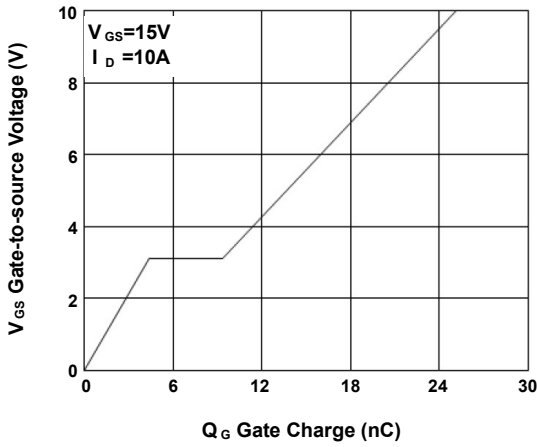


FIG.7-Gate Charge Characteristics

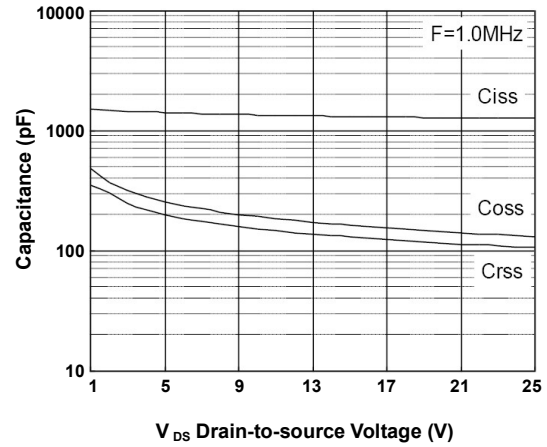


FIG.8-Capacitance Characteristics

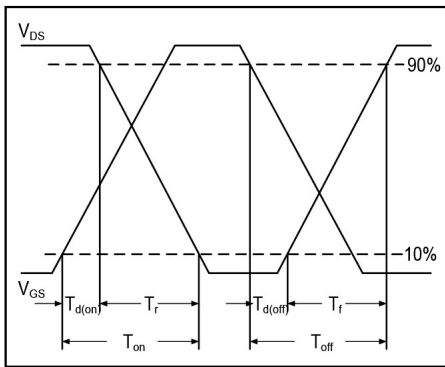


FIG.9-Switching Time Waveform

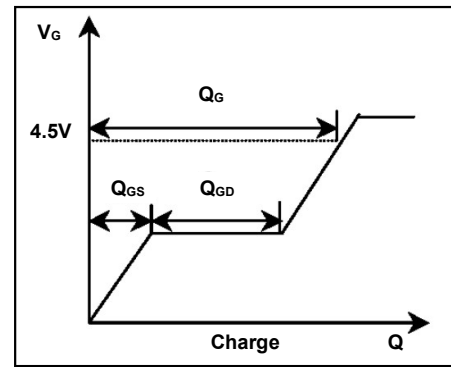


FIG.10-Gate Charge Waveform

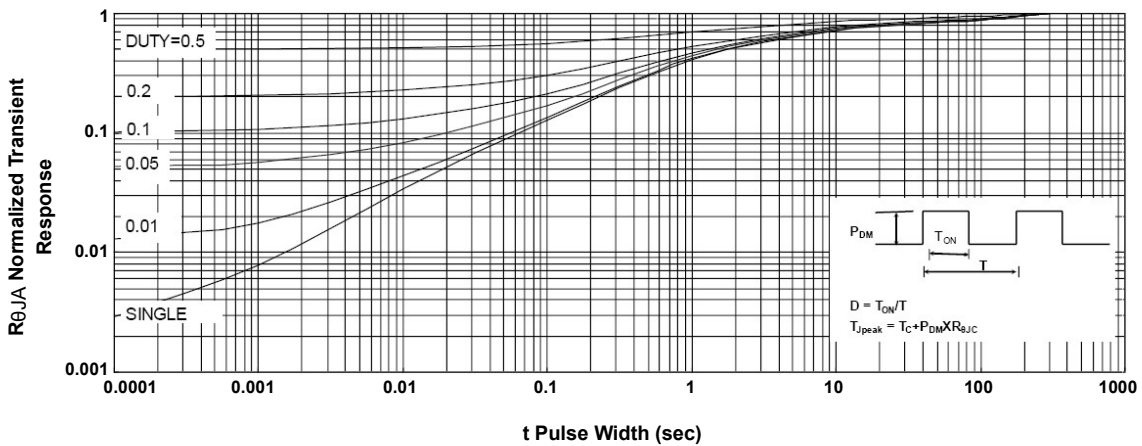


FIG.11-Normalized Maximum Transient Thermal Impedance

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