

MSD60N16

N-Channel 60-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

- $R_{DS(ON)} = 50m\Omega @ V_{GS} = 10V$
- Low Reverse Transfer Capacitance
- High Switching Speed
- 100% EAS Guaranteed
- Green Device Available

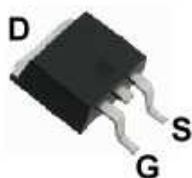
Typical Applications

- Motor Drive
- Power Tools
- LED Lighting

Package type : TO-252

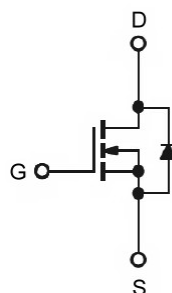
Packing & Order Information

2,500/Reel

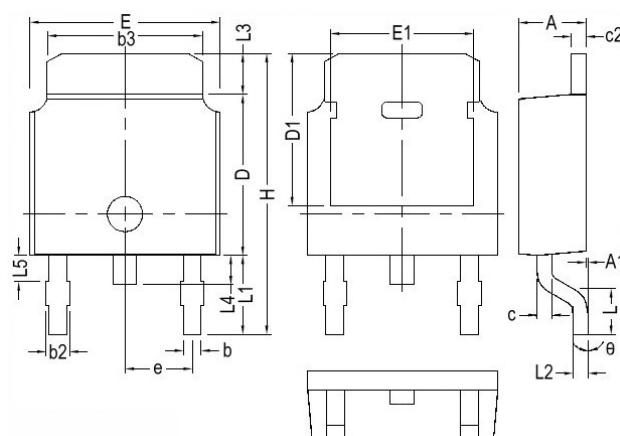


RoHS Compliant

Graphic Symbol

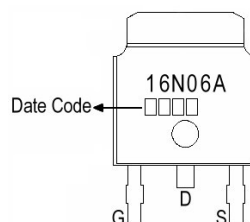


Package Dimension



REF.	Millimeter			REF.	Millimeter		
	Min.	Nom.	Max.		Min.	Nom.	Max.
A	2.20	2.30	2.38	E1	4.40	-	-
A1	0	-	0.127	e	2.286 BSC		
b	0.64	0.76	0.88	H	9.40	10.00	10.40
b2	0.77	0.84	1.14	L	1.40	1.52	1.77
b3	5.21	5.34	5.46	L1	2.743 Ref.		
c	0.45	0.50	0.60	L2	0.508 BSC		
c2	0.45	0.50	0.58	L3	0.89	-	1.27
D	6.00	6.10	6.223	L4	0.64	-	1.01
D1	5.21	-	-	L5	-	-	-
E	6.40	6.60	6.731	theta	0°	-	10°

Marking



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MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Continuous Drain Current ¹ ($T_C=25^\circ\text{C}$)	16	A
	Continuous Drain Current ¹ ($T_C=100^\circ\text{C}$)	10	A
I_{DM}	Pulsed Drain Current ^{1,2}	64	A
I_{AS}	Single Pulse Avalanche Current, $L=0.1\text{mH}^3$	15	A
E_{AS}	Single Pulse Avalanche Energy, $L=0.1\text{mH}^3$	11	mJ
P_D	Power Dissipation ⁴ ($T_C=25^\circ\text{C}$)	27	W
	Power Dissipation ⁴ ($T_A=25^\circ\text{C}$)	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 ¹	62.5	$^\circ\text{C/W}$
$R_{\theta JC}$	Maximum Junction-to-Case ¹	4.6	$^\circ\text{C/W}$

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	1.8	2.5	V
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}$, $I_D=250\mu\text{A}$	60	-	-	V
g_{fs}	Forward Transconductance	$V_{DS}=10\text{V}$, $I_D=4\text{A}$	-	6.5	-	S
I_{GSS}	Gate-Source Leakage Current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$	-	-	± 100	nA
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=60\text{V}$, $V_{GS}=0\text{V}$, $T_J=25^\circ\text{C}$	-	-	1	μA
		$V_{DS}=48\text{V}$, $V_{GS}=0\text{V}$, $T_J=125^\circ\text{C}$	-	-	10	
$R_{DS(on)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10\text{V}$, $I_D=8\text{A}$	-	37	50	m Ω
		$V_{GS}=4.5\text{V}$, $I_D=4\text{A}$	-	42	60	
E_{AS}	Single Pulse Avalanche Energy ⁵	$V_{DD}=25\text{V}$, $L=0.1\text{mH}$, $I_{AS}=8\text{A}$	3.2	-	-	mJ
V_{SD}	Diode Forward Voltage ²	$I_S=8\text{A}$, $V_{GS}=0\text{V}$, $T_J=25^\circ\text{C}$	-	-	1.0	V
I_S	Continuous Source Current ^{1,6}	$V_G=V_D=0\text{V}$, Force Current	-	-	16	A
I_{SM}	Pulsed Source Current ^{2,6}		-	-	64	

Notes

1. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.
2. The data tested by pulsed, pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
3. The EAS data shows maximum rating. The test condition is $V_{DD}=25\text{V}$, $V_{GS}=10\text{V}$, $L=0.1\text{mH}$, $I_{AS}=15\text{A}$.
4. The power dissipation is limited by 150°C junction temperature.
5. The Min. value is 100% EAS tested guarantee.
6. The data is theoretically the same as I_D and I_{DM} , in real applications, should be limited by total power dissipation.

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Dynamic						
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_g	Total Gate Charge ²	$V_{DS}=30V$	--	14	--	nC
Q_{gs}	Gate-Source Charge	$I_D=4A$	--	2.9	--	
Q_{gd}	Gate-Drain ("Miller") Charge	$V_{GS}=10V$	--	2.3	--	
$t_{d(on)}$	Turn-On Delay Time ²	$V_{DS}=30V$	--	3.9	--	ns
t_r	Rise Time	$I_D=1A$	--	13	--	
$t_{d(off)}$	Turn-Off Delay Time	$V_{GS}=10V$	--	23	--	
t_f	Fall Time	$R_G=3.3\Omega$	--	6.7	--	
C_{ISS}	Input Capacitance	$V_{DS}=15V$	--	815	--	pF
C_{OSS}	Output Capacitance	$V_{GS}=0V$	--	379	--	
C_{RSS}	Reverse Transfer Capacitance	$f=1.0MHz$	--	110	--	
R_g	Gate Resistance	$V_{GS}=V_{DS}=0V, f=1.0MHz$	--	1.7	--	Ω

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• Typical Electrical Characteristics

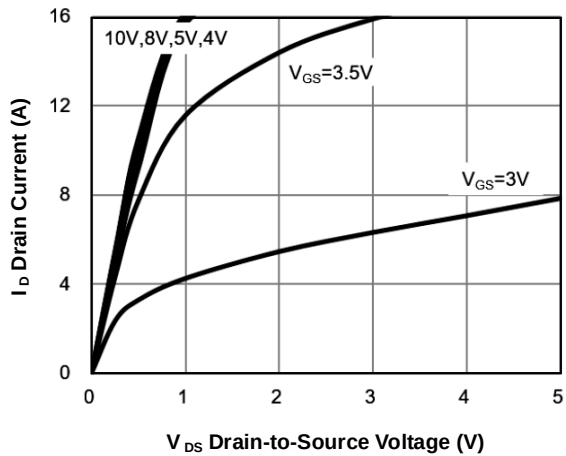


FIG.1-Typical Output Characteristics

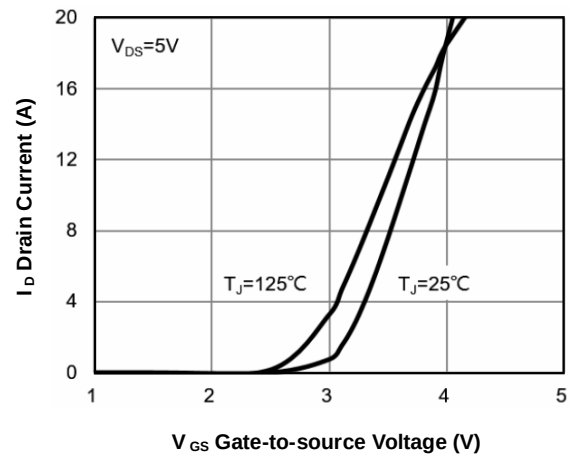


FIG.2-Transfer Characteristics

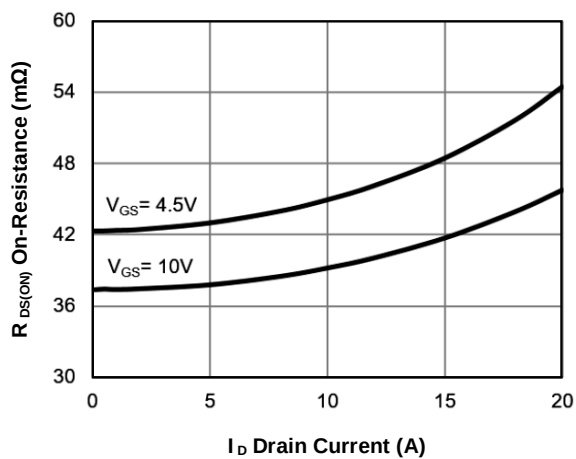


FIG.3-On-Resistance vs. Drain Current

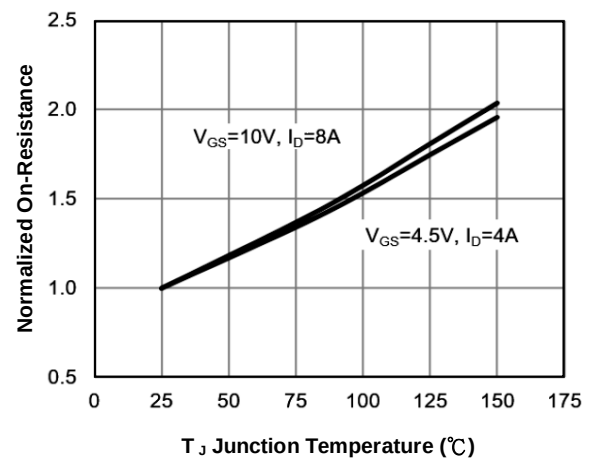


FIG.4-Normalized $R_{DS(on)}$ vs. T_J

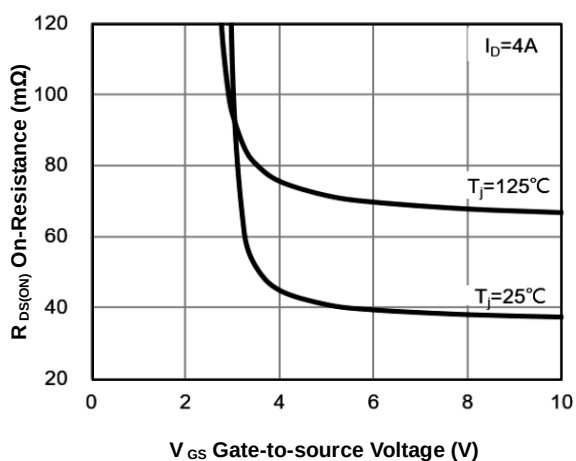


FIG.5-On-Resistance vs. G-S Voltage

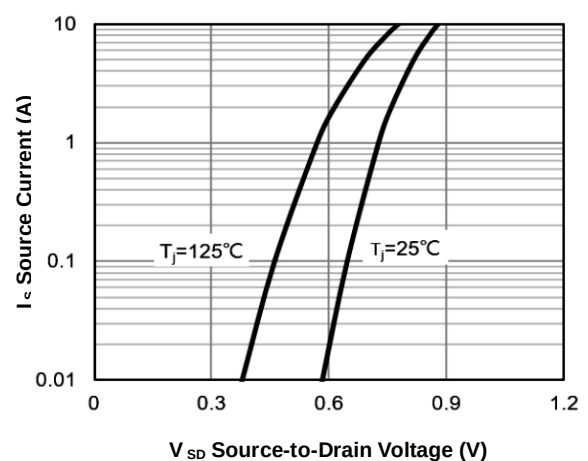
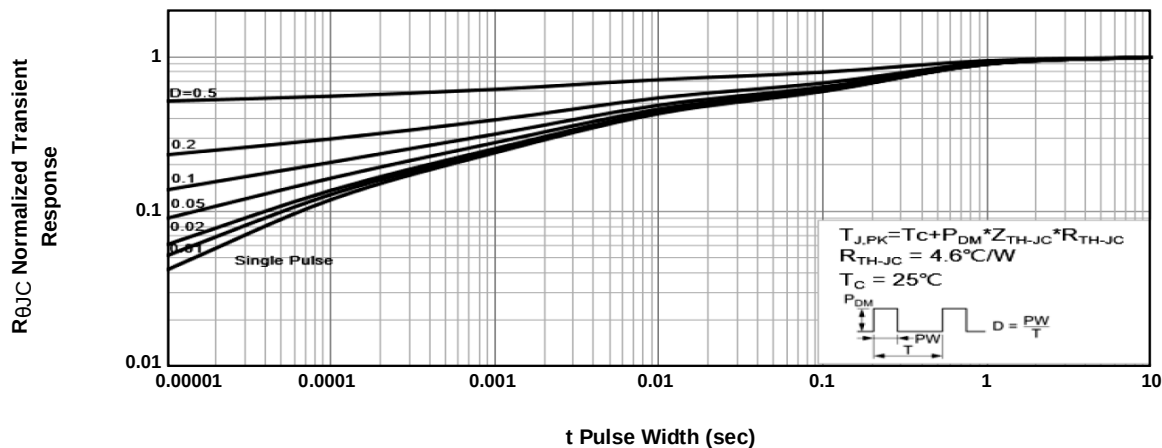
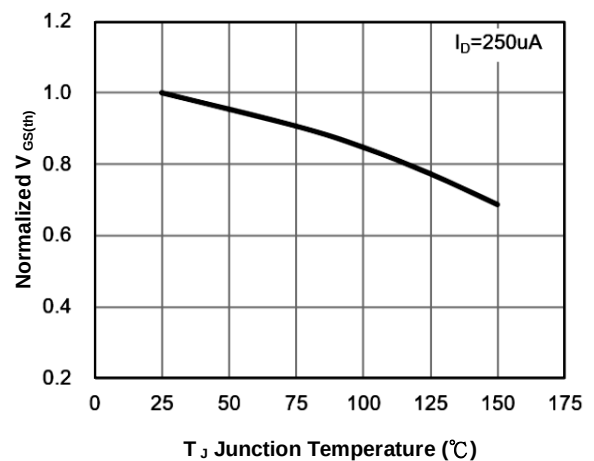
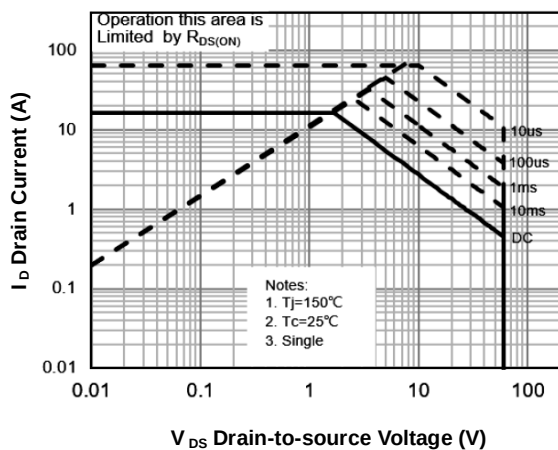
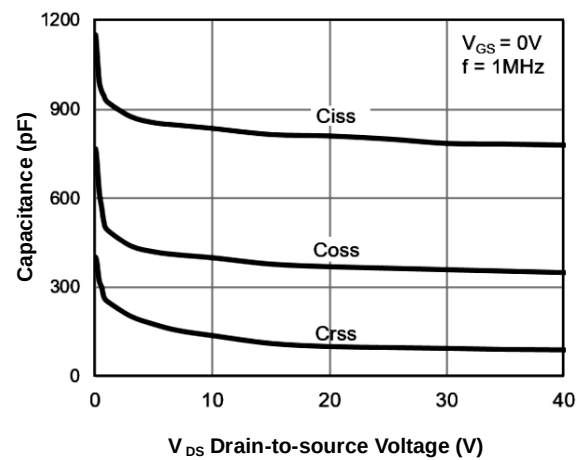
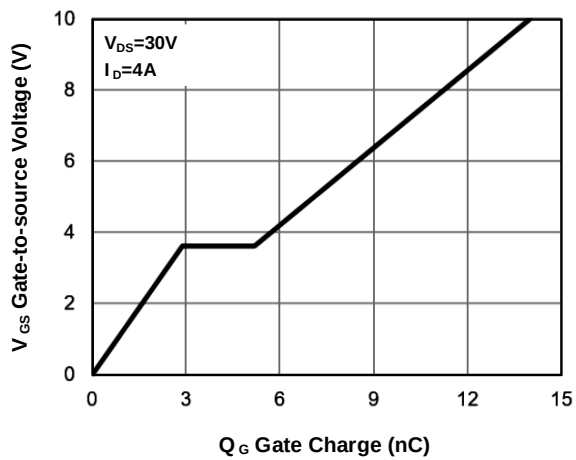


FIG.6-Forward Characteristics of Reverse



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