

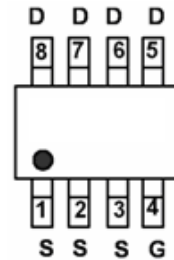
40V(D-S) N-Channel Enhancement Mode Power MOS FET

General Features

- $V_{DS}=40V, I_D=9A$
 $R_{DS(ON)} < 16m\Omega @ V_{GS}=10V$
 $R_{DS(ON)} < 24m\Omega @ V_{GS}=4.5V$
- High density cell design for ultra low $R_{DS(on)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability



Lead Free

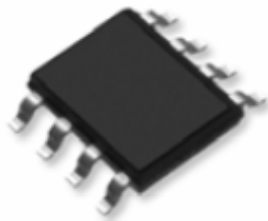


Marking and pin assignment

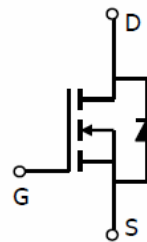
Application

- Load switching
- Hard switched and high frequency circuits
- Uninterruptible power supply

PIN Configuration



SOP-8 top view



Schematic diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MSN0409W	MSN0409W	SOP-8	Ø330mm	12mm	2500 units

Absolute Maximum Ratings ($T_C=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	9	A
Drain Current-Continuous($T_C=100^{\circ}C$)	$I_D(100^{\circ}C)$	6.4	A
Pulsed Drain Current	I_{DM}	40	A
Maximum Power Dissipation	P_D	2	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^{\circ}C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient ^(Note 2)	$R_{\theta JA}$	62.5	$^{\circ}C/W$
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Electrical Characteristics ($T_A=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =40V,V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V,V _{DS} =0V	-	-	±100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	1	1.5	2.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =8A	-	12.9	16	mΩ
		V _{GS} =4.5V, I _D =4A	-	18.9	24	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V,I _D =8A	33	-	-	S
Dynamic Characteristics ^(Note4)						
Input Capacitance	C _{ISS}	V _{DS} =20V,V _{GS} =0V, F=1.0MHz	-	415	-	PF
Output Capacitance	C _{OSS}		-	112	-	PF
Reverse Transfer Capacitance	C _{RSS}		-	11	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =20V, R _L =2.5Ω V _{GS} =10V,R _{GEN} =3Ω	-	4	-	nS
Turn-on Rise Time	t _r		-	3	-	nS
Turn-Off Delay Time	t _{d(off)}		-	15	-	nS
Turn-Off Fall Time	t _f		-	2	-	nS
Total Gate Charge	Q _g	V _{DS} =20V,I _D =8A, V _{GS} =10V	-	12	-	nC
Gate-Source Charge	Q _{gs}		-	3.2	-	nC
Gate-Drain Charge	Q _{gd}		-	3.1	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V _{SD}	V _{GS} =0V,I _S =9A	-	0.8	1.2	V

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics (Curves)

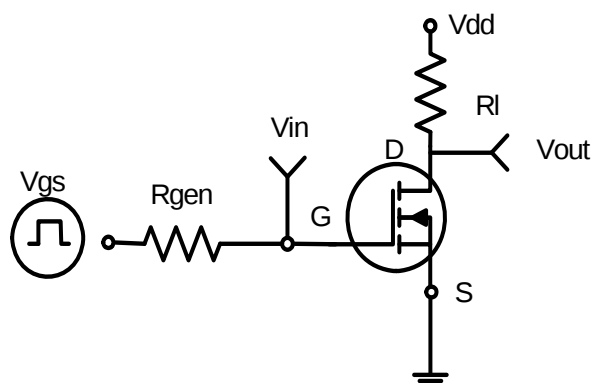


Figure 1: Switching Test Circuit

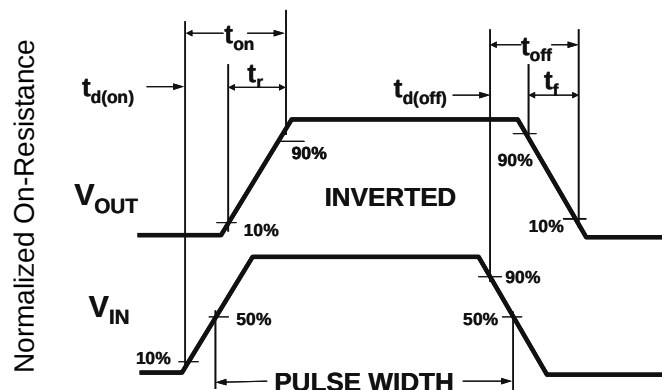


Figure 2: Switching Waveforms

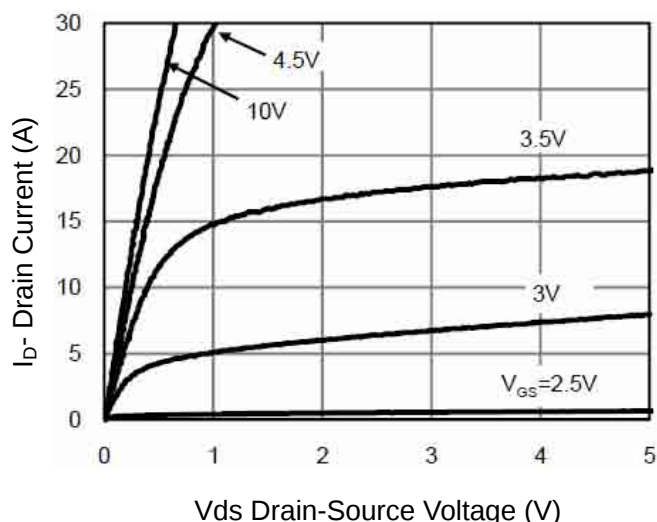


Figure 3 Output Characteristics

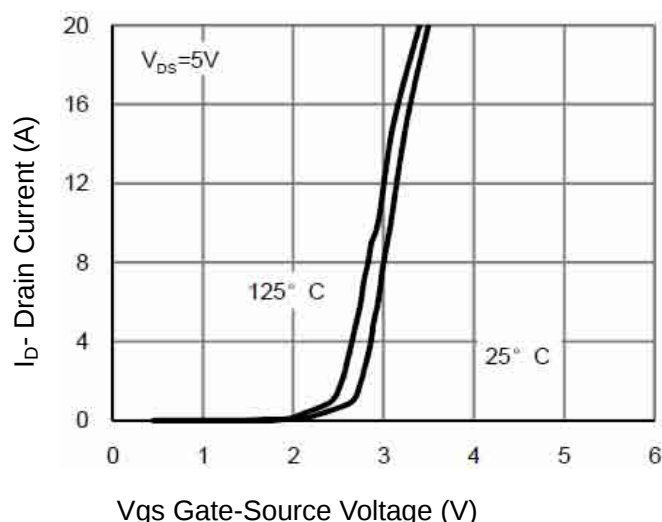


Figure 4 Transfer Characteristics

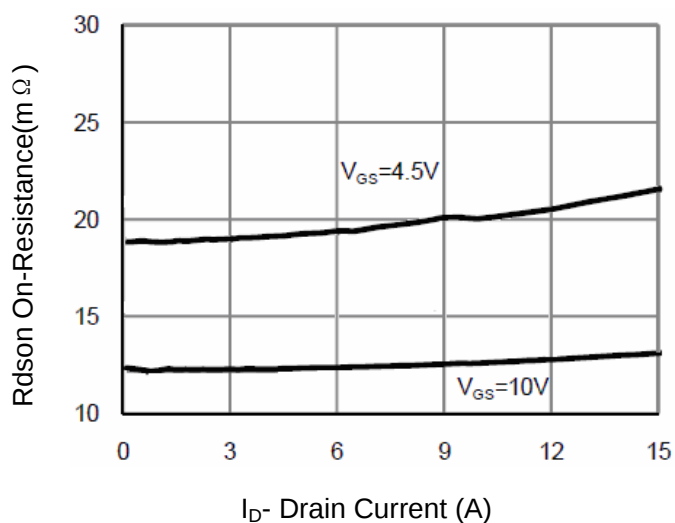


Figure 5 Drain-Source On-Resistance

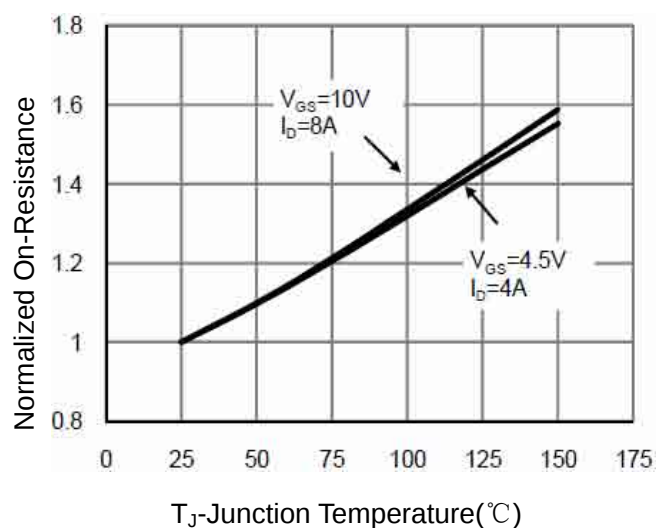
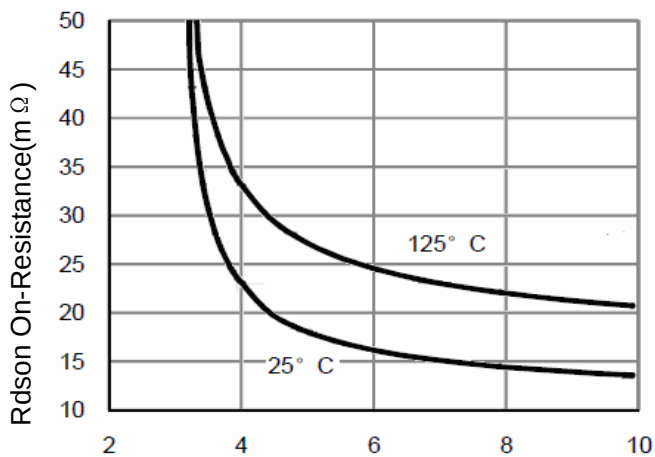
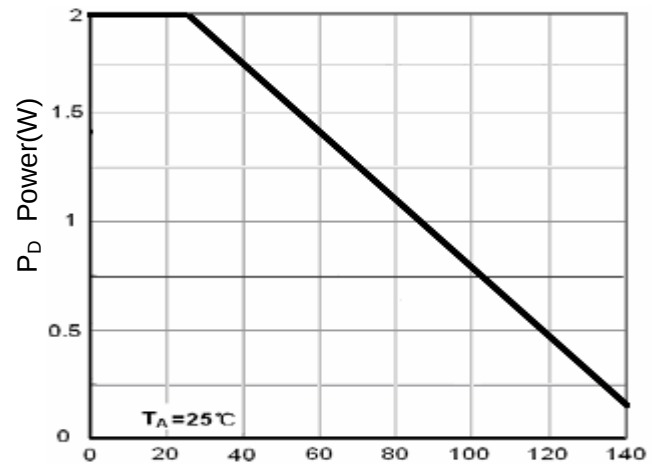


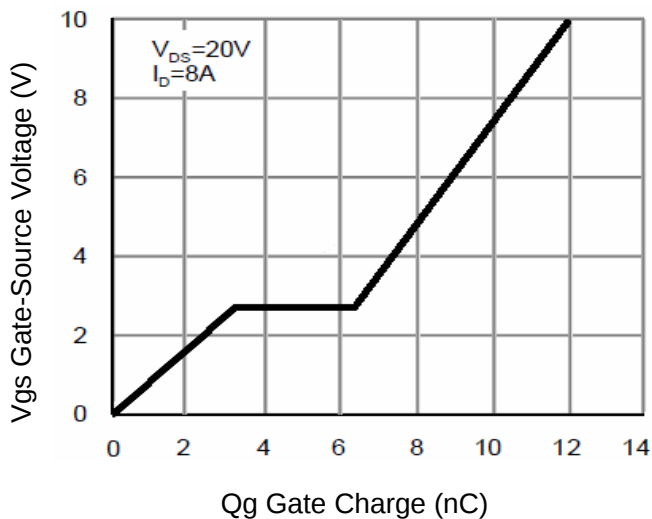
Figure 6 Drain-Source On-Resistance



Vgs Gate-Source Voltage (V)
Figure 7 Rdson vs Vgs



Tj Junction Temperature (°C)
Figure 8 Power Dissipation



Qg Gate Charge (nC)
Figure 9 Gate Charge

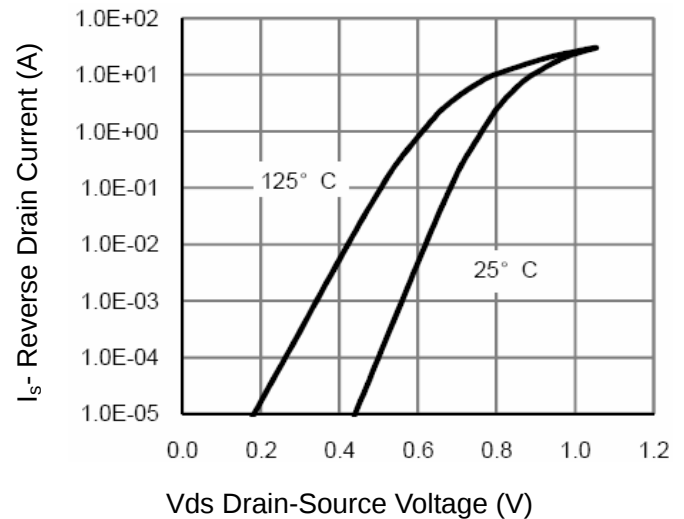
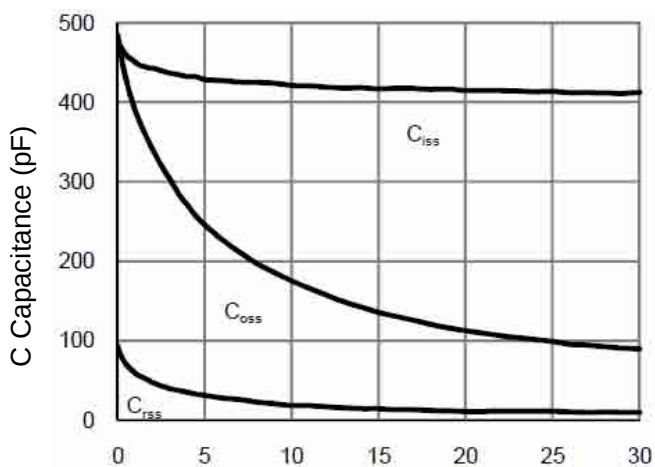
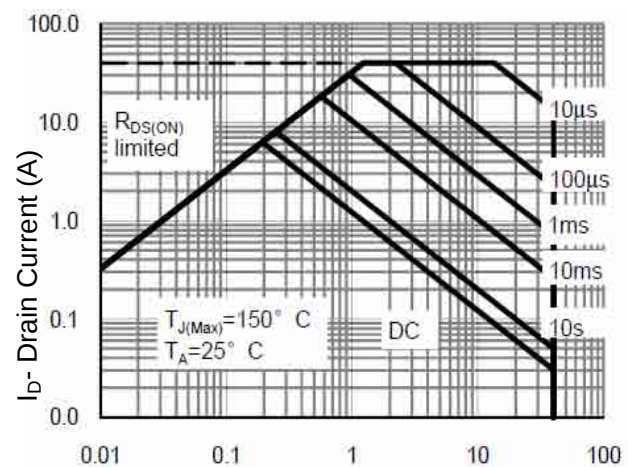


Figure 10 Source- Drain Diode Forward



Vds Drain-Source Voltage (V)
Figure 11 Capacitance vs Vds



Vds Drain-Source Voltage (V)
Figure 12 Safe Operation Area

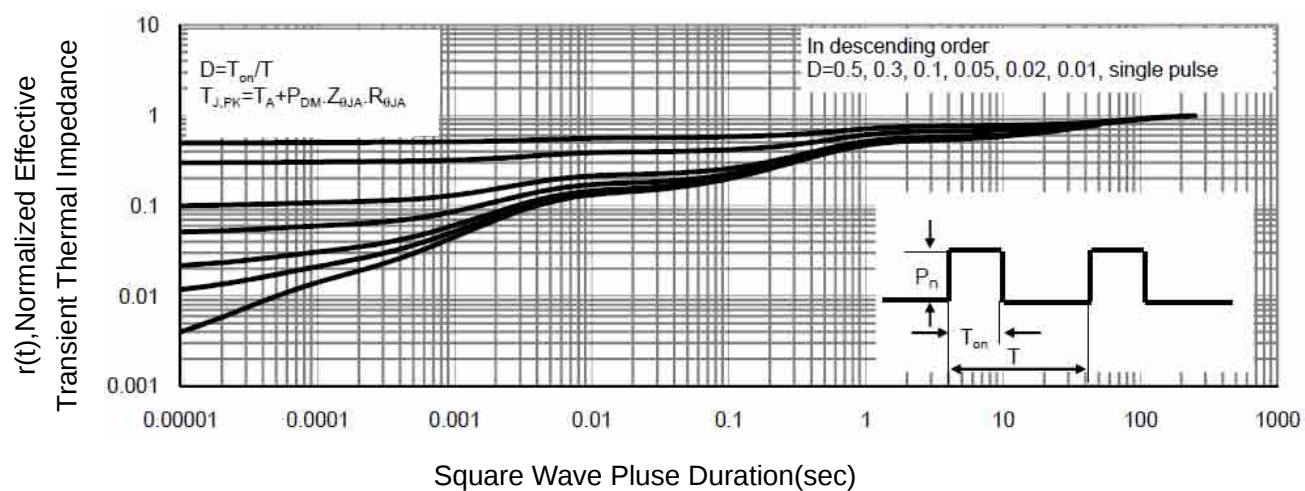
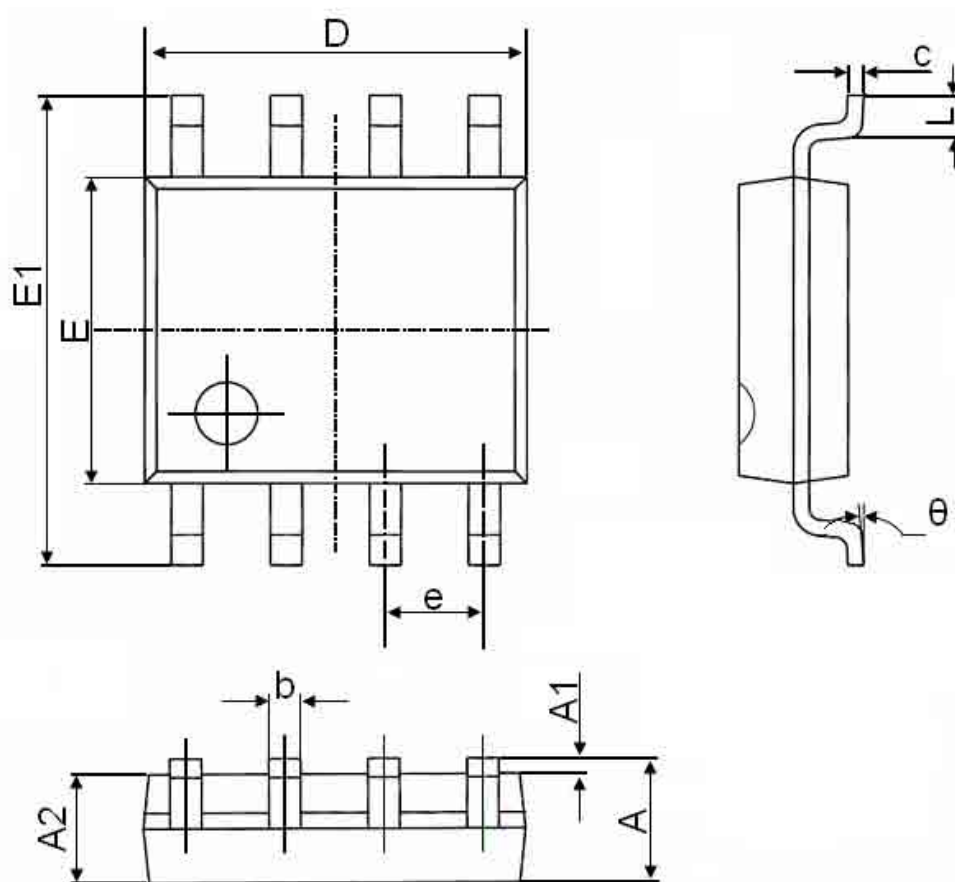


Figure 13 Normalized Maximum Transient Thermal Impedance

SOP-8 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°