

MSN04R010S

40V N-Channel Trench MOSFET

General Description

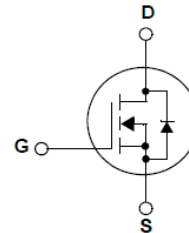
This Power MOSFET is produced using Maple semi's advanced Technology, which provides high performance in on-state Resistance, fast switching performance and excellent quality. This Power MOSFET is suitable device for Synchronous Rectification for Server and general purpose applications.

Features

- $V_{DS}=40V$
- $I_D=100A$ @ $V_{GS}=10V$
- $R_{DS(ON)} < 1.0m\Omega$ @ $V_{GS}=10V$
- Fast switching
- 100% avalanche tested
- 100% R_g tested



PDFN5*6



Absolute Maximum Ratings

 $T_C = 25^\circ C$ unless otherwise noted

Symbol	Parameter	MSN04R010S	Units
V_{DSS}	Drain-Source Voltage	40	V
I_D	Drain Current - Continuous ($T_C = 25^\circ C$) - Continuous ($T_C = 100^\circ C$)	100	A
		39	A
I_{DM}	Drain Current - Pulsed (Note 1)	400	A
V_{GSS}	Gate-Source Voltage	± 20	V
EAS	Single Pulsed Avalanche Energy (Note 2)	450	mJ
P_D	Power Dissipation ($T_C = 25^\circ C$) - Derate above $25^\circ C$	96.2	W
		0.77	W/ $^\circ C$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ C$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ C$

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	1.3	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	50	$^\circ C/W$

Ordering Information

Part Number	Temp. Range	Package	Packing	RoHS Status
MSN04R010S	-55 ~ +150 $^\circ C$	PDFN5*6	Tape&Reel	Halogen Free

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40	--	--	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C	--	0.05	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	μA
		$V_{DS} = 32\text{ V}, T_C = 125^\circ\text{C}$	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0	--	2.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}$	--	0.8	1.0	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 50\text{ A}$	--	185	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	6892.7	--	pF
C_{oss}	Output Capacitance		--	147.2	--	pF
C_{rss}	Reverse Transfer Capacitance		--	2058.7	--	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{ V}, I_D = 50\text{ A},$ $V_{DS} = 20\text{ V}, R_G = 3.0\text{ }\Omega$	--	21.8	--	ns
t_r	Turn-On Rise Time		--	18.8	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	96.3	--	ns
t_f	Turn-Off Fall Time		--	44.1	--	ns
Q_g	Total Gate Charge	$V_{DS} = 20\text{ V}, I_D = 50\text{ A},$ $V_{GS} = 10\text{ V}$	--	103.5	--	nC
Q_{gs}	Gate-Source Charge		--	18.5	--	nC
Q_{gd}	Gate-Drain Charge		--	13.7	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 50\text{ A}$	--	0.8	1.2	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 50\text{ A},$	--	57.7	--	ns
Q_{rr}	Reverse Recovery Charge	$di_F / dt = 100\text{ A}/\mu\text{s}$ (Note 3)	--	105.4	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $I_{AS} = 30.0\text{ A}, L = 1\text{ mH}, V_{GS} = 10\text{ V}$, Starting $T_J = 25^\circ\text{C}$
3. Pulse Test : Pulse width $\leq 300\text{ }\mu\text{s}$, Duty cycle $\leq 2\%$
4. Essentially independent of operating temperature

Typical Characteristics

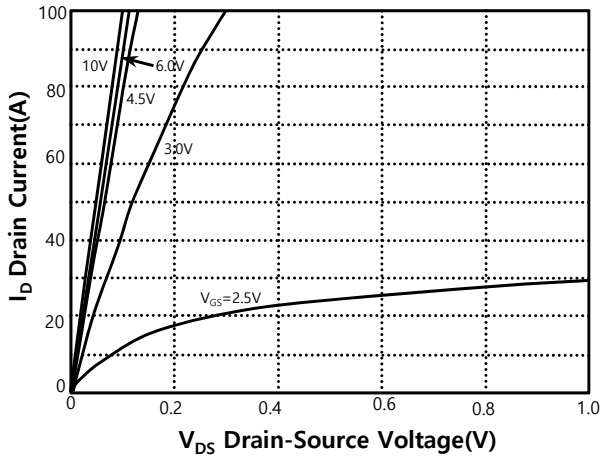


Figure 1. On-Region Characteristics

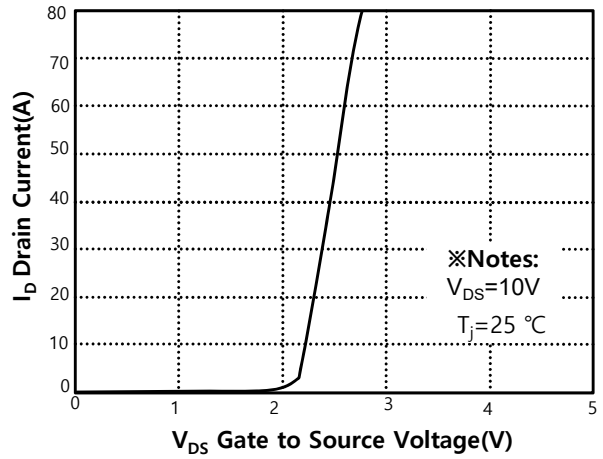


Figure 2. Transfer Characteristics

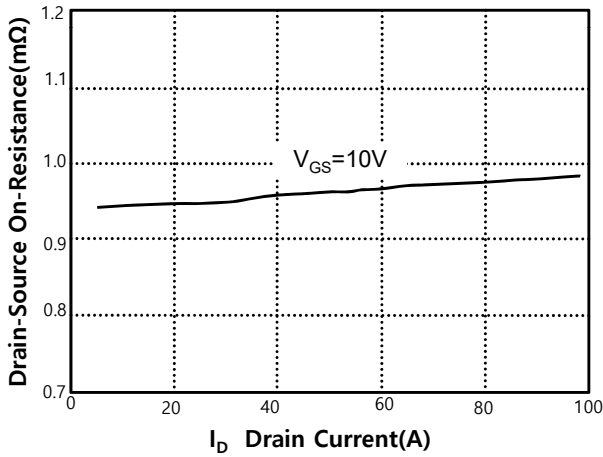


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

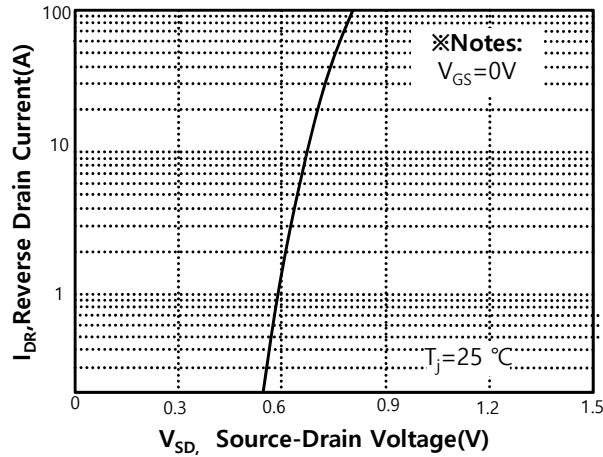


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

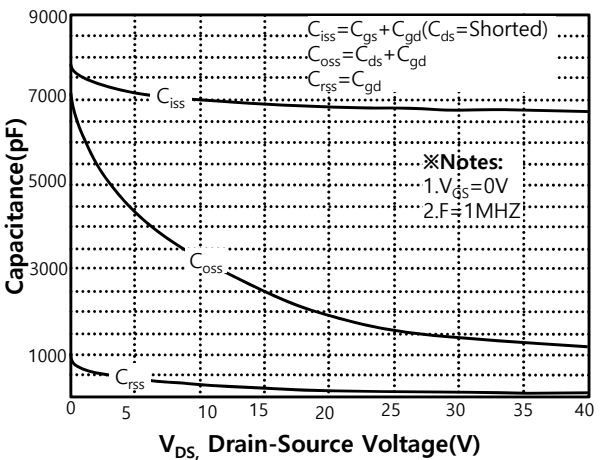


Figure 5. Capacitance Characteristics

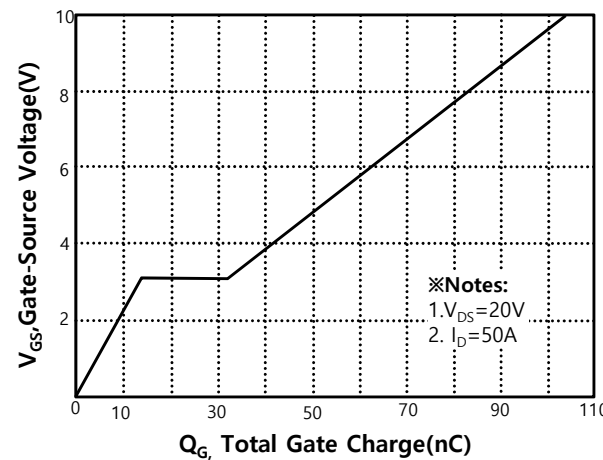


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

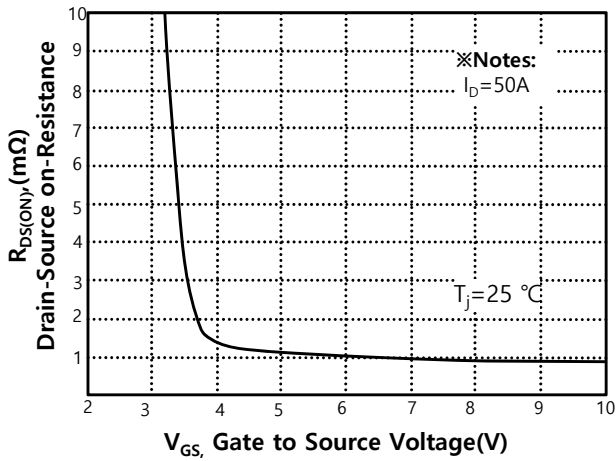


Figure 7. On-Resistance Variation with Gate to Source Voltage

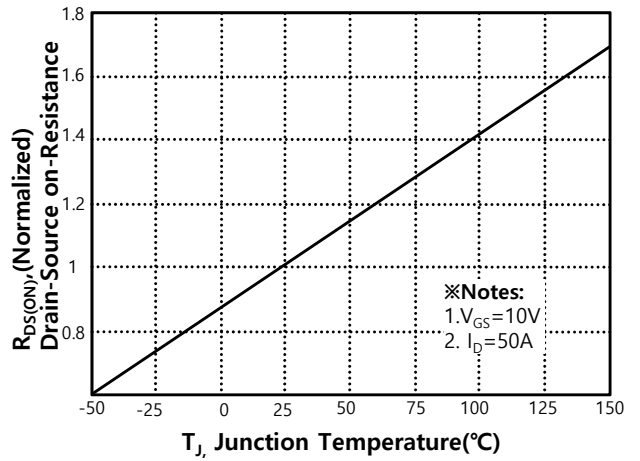


Figure 8. On-Resistance Variation vs Temperature

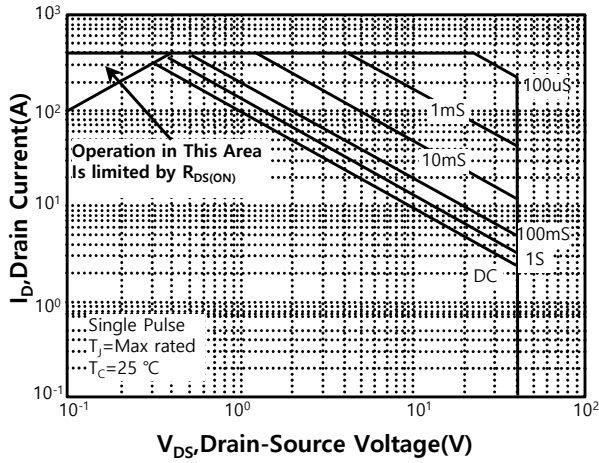


Figure 9. Maximum Safe Operating Area

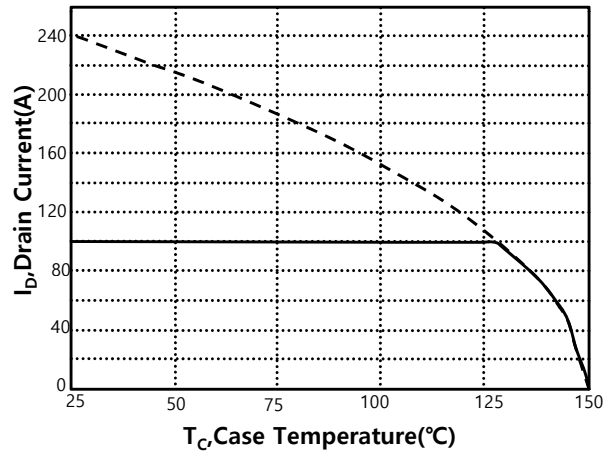
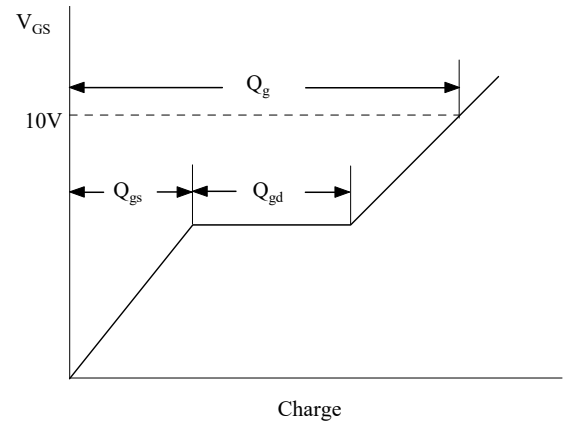
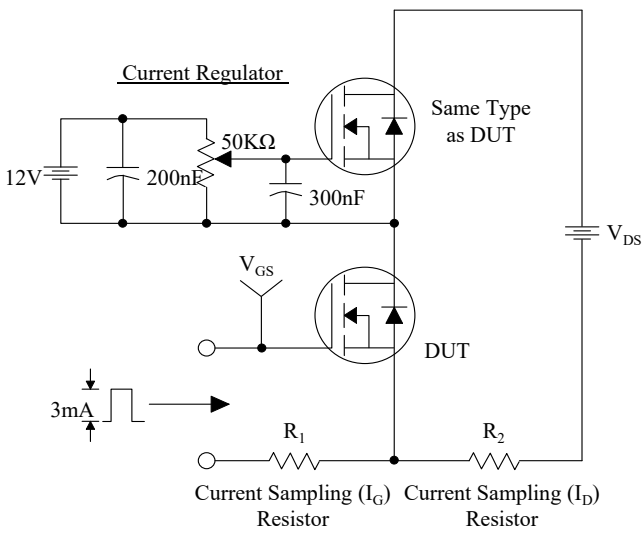
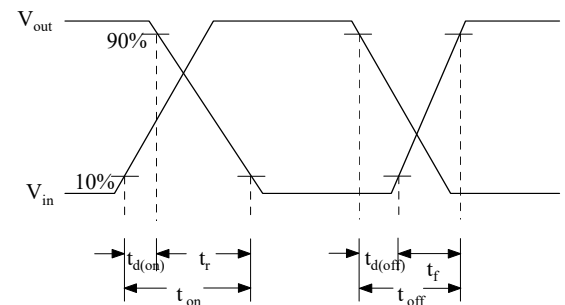
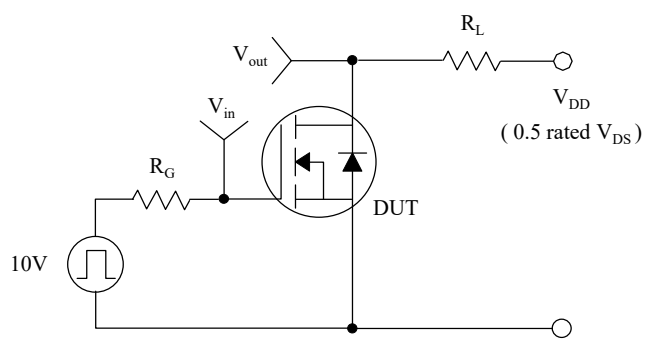


Figure 10. Maximum Drain Current vs Case Temperature

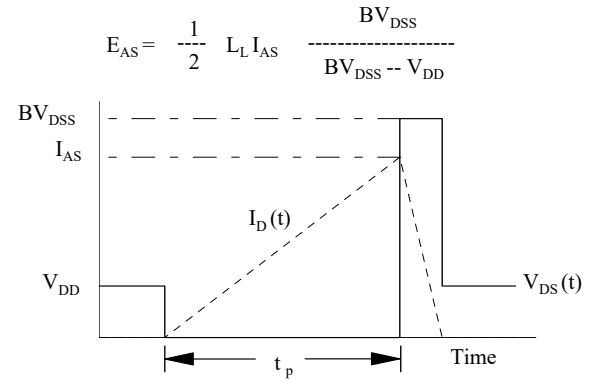
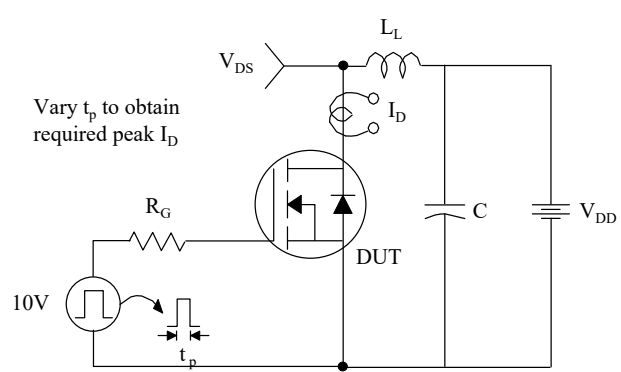
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms

