N-Ch 40V Fast Switching MOSFETs

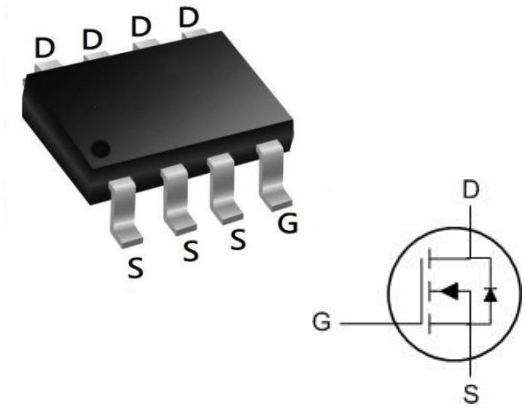
- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

Product Summary

Green

BVDSS	RDSON	ID
40V	12 mΩ	9A

SOP8 Pin Configuration



Description

The XR4009S is the high cell density trenched N-ch MOSFETs, which provides excellent RDSON and gate charge for most of the synchronous buck converter applications.

The XR4009S meets the RoHS and Green Product requirements, 100% EAS guaranteed with full function reliability approved.

Absolute Maximum Ratings (T_A=25 °C, unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	±20	V
I_D	Continuous Drain Current (Tc=100°C)	9	A
I_{DM}	Pulsed Drain Current(Note1)	40	A
P_D	Maximum Power Dissipation(T_c=25°C)	2	W
T_J T_{STG}	Operation Junction and Storage Temperature Range	-55 to 150	℃

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient [1]	---	62.5	℃/W
$R_{\theta JC}$	Thermal Resistance Junction-Case[1]	---	---	℃/W

Electrical Characteristics (T_J=25 ℃, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Static Characterisitics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	40	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V , I_D=4A,	---	12	16	mΩ
		V_{GS}=4.5V , I_D=3A,	---	19	24	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.0	1.5	2.0	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=40V , V_{GS}=0V , T_J=25℃	---	----	1	uA
		V_{DS}=-40V, V_{GS}=0V , T_J=55℃	---	---	---	
I_{GSS}	Gate-Source Leakage Current	V_{GS} =±20V , V_{DS}=0V	---	---	±100	nA
Switching Characteristics						
Q_g	Total Gate Charge	V_{GS}=10V , V_{DS}=20V , I_D=8A	---	22.9	---	nC
Q_{gs}	Gate-Source Charge		---	3.5	---	
Q_{gd}	Gate-Drain Charge		---	5.3	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=20V,R_{GEN}=3Ω, R_L=2.5Ω V_{GS}=10V,	---	5.5	---	ns
T_r	Rise Time		---	14	---	
$T_{d(off)}$	Turn-Off Delay Time		---	24	---	
T_f	Fall Time		---	12	---	
trr	Body Diode Reverse Recovery Time	I_F=5A ,T_J=25°C dI/dt=100A/us	---	20	---	ns
Qrr	Body Diode Recerse Recovery Charge		---	11	---	nC
Dynamic Characterisitics						
C_{iss}	Input Capacitance	V_{DS}=20V , V_{GS}=0V , f=1MHz	---	964	---	pF
C_{oss}	Output Capacitance		---	109	---	
C_{rss}	Reverse Transfer Capacitance		---	96	---	
Rg	Gate Resistance	V_{GS}=0V , V_{DS} Open	---	---	---	Ω

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current(Body Diode)	Tc==25°C	---	---	---	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS}=0V, Is=5A	---	0.8	1.2	V
Ism	Maximum Pulsed Drain to Source Diode Forward Current		---	---	---	A

N- Channel Typical Electrical and Thermal Characteristics (Curves)

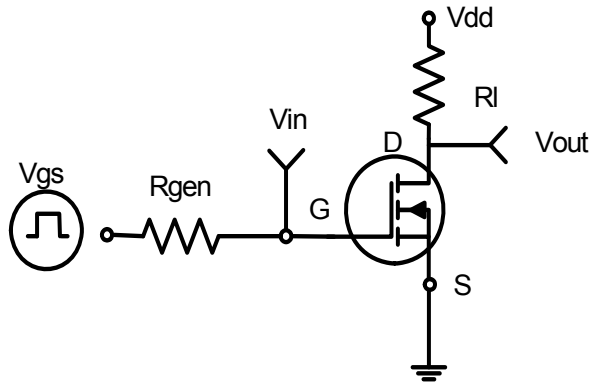


Figure 1:Switching Test Circuit

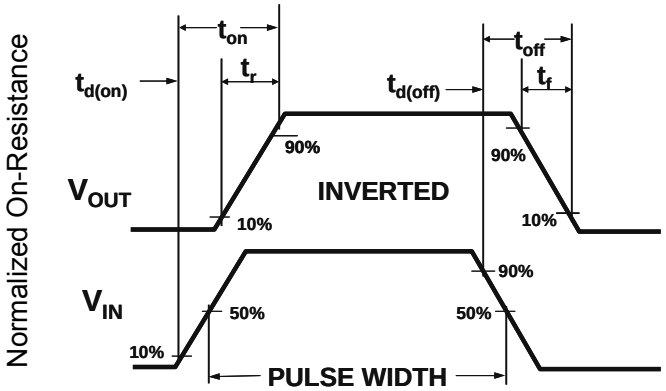


Figure 2:Switching Waveforms

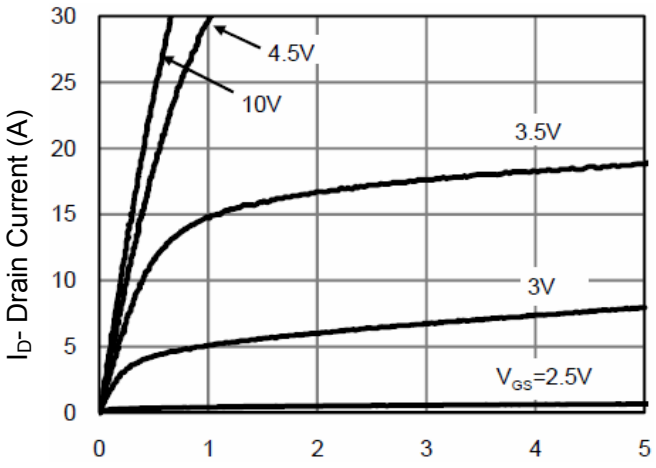


Figure 3 Output Characteristics

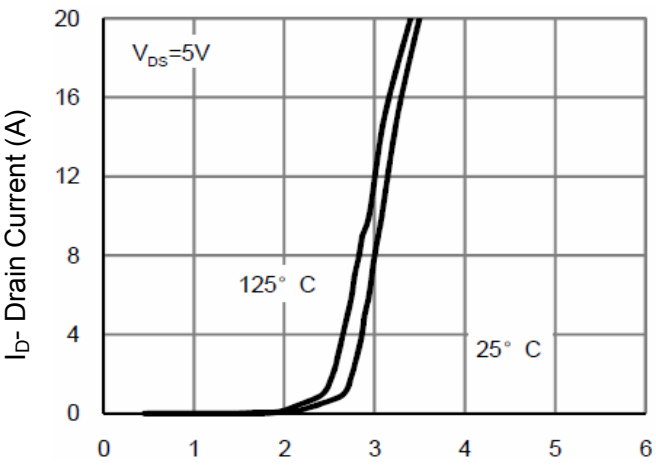


Figure 4 Transfer Characteristics

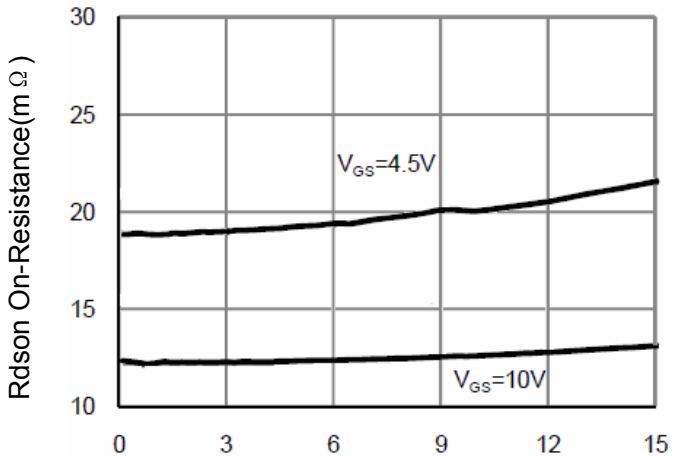


Figure 5 Drain-Source On-Resistance

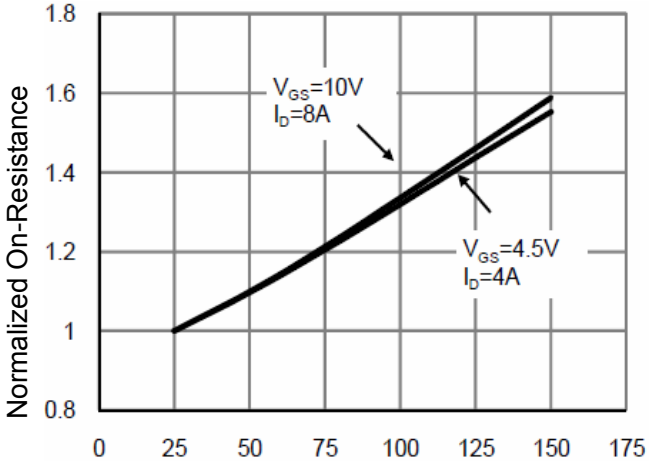


Figure 6 Drain-Source On-Resistance

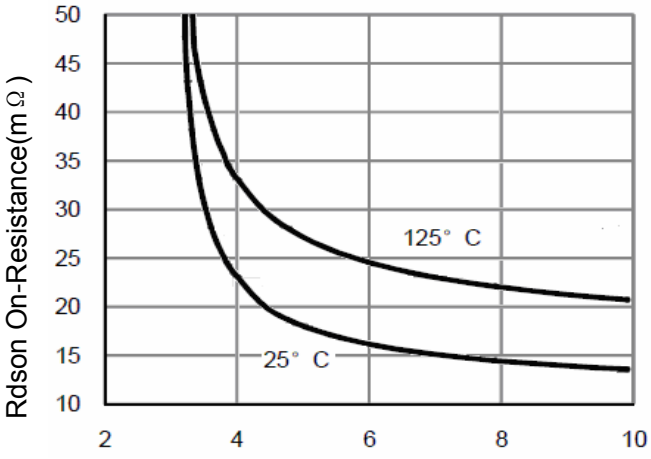


Figure7 Rdson vs Vgs

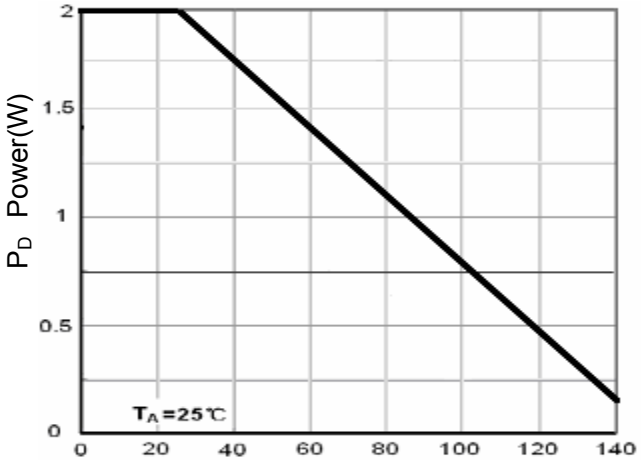


Figure 8 Power Dissipation

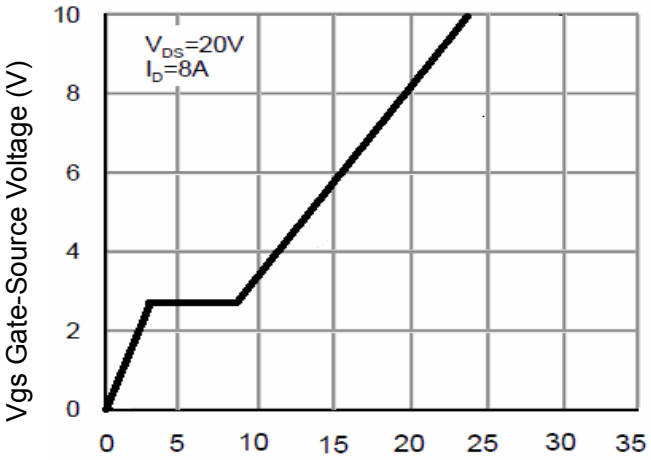


Figure 9 Gate Charge

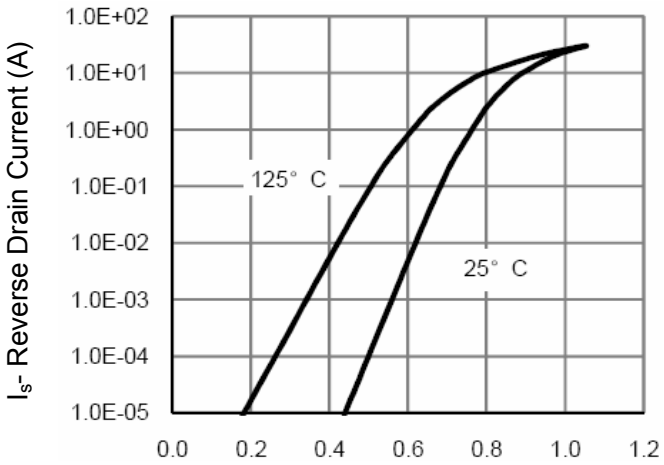


Figure 10 Source- Drain Diode Forward

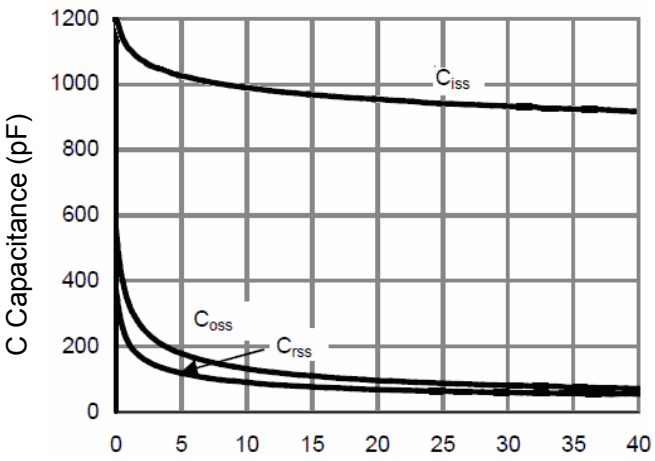


Figure 11 Capacitance vs Vds

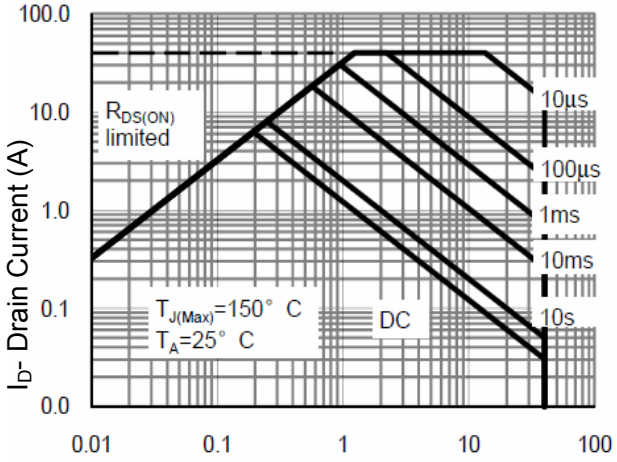


Figure 12 Safe Operation Area

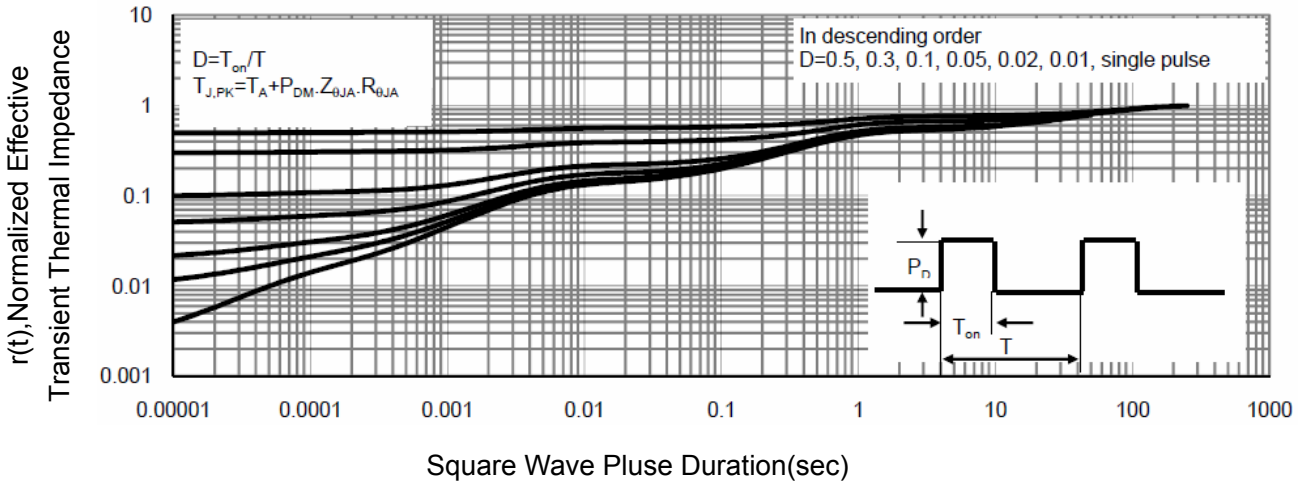
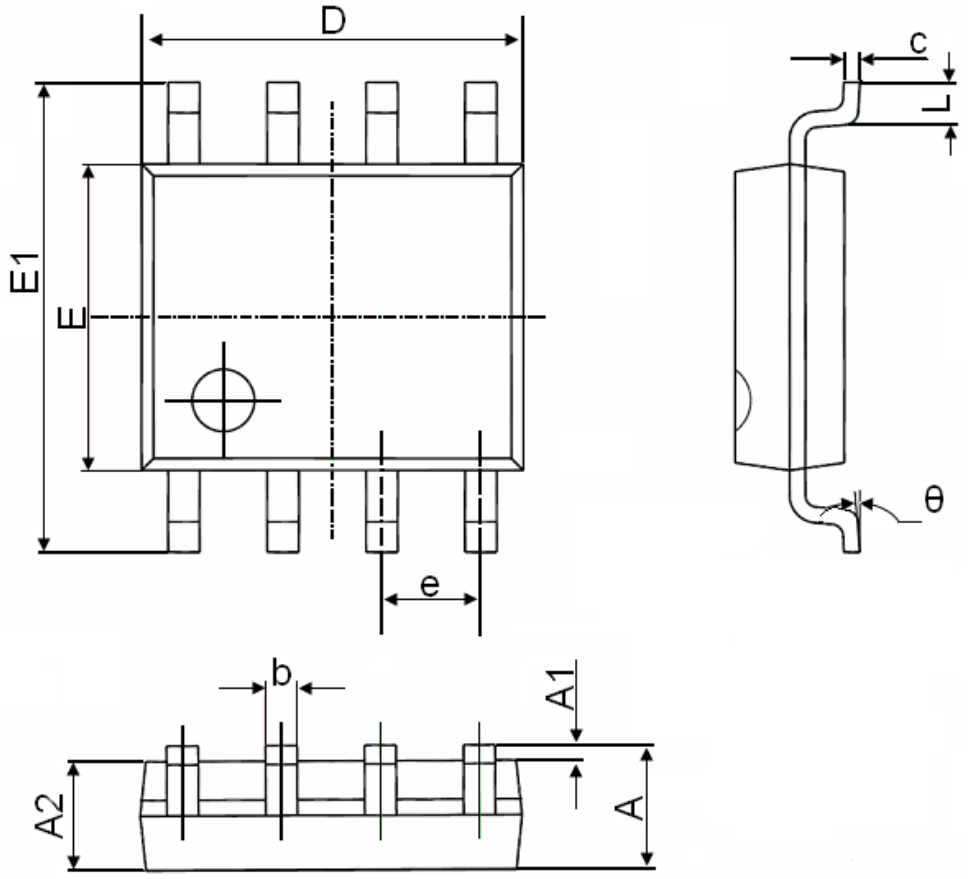


Figure 13 Normalized Maximum Transient Thermal Impedance

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°