

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

Description

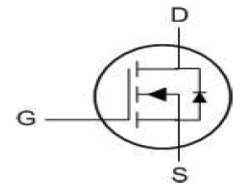
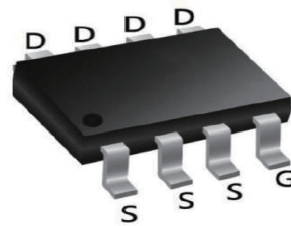
The 4009S is the high cell density trenched N ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications. The 4009S meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

Product Summary



BVDSS	RDSON	ID
40V	12mΩ	9A

SOP8 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	±20	V
I_D	Drain Current-Continuous	9	A
$I_D(100^{\circ}C)$	Drain Current-Continuous($T_c=100^{\circ}C$)	6.4	A
I_{DM}	Pulsed Drain Current	40	A
P_D	Maximum Power Dissipation	2	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150	°C
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient ^(Note 2)	62.5	°C/W

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

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=40V, V_{GS}=0V$	-	-	1	μA
I_{GSS}	Gate-Body Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.5	2	V
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=10V, I_D=8A$	-	12	16	m Ω
		$V_{GS}=4.5V, I_D=4A$	-	19	24	m Ω
g_{FS}	Forward Transconductance	$V_{DS}=5V, I_D=8A$	33	-	-	S
Dynamic Characteristics (Note 4)						
C_{iss}	Input Capacitance	$V_{DS}=20V, V_{GS}=0V, F=1.0MHz$	-	964	-	PF
C_{oss}	Output Capacitance		-	109	-	PF
C_{riss}	Reverse Transfer Capacitance		-	96	-	PF
Switching Characteristics (Note 4)						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=20V, R_L=2.5\Omega$ $V_{GS}=10V, R_{GEN}=3\Omega$	-	5.5	-	nS
t_r	Turn-on Rise Time		-	14	-	nS
$t_{d(off)}$	Turn-Off Delay Time		-	24	-	nS
t_f	Turn-Off Fall Time		-	12	-	nS
Q_g	Total Gate Charge	$V_{DS}=20V, I_D=8A, V_{GS}=10V$	-	22.9	-	nC
Q_{gs}	Gate-Source Charge		-	3.5	-	nC
Q_{gd}	Gate-Drain Charge		-	5.3	-	nC
Drain-Source Diode Characteristics						
V_{SD}	Diode Forward Voltage (Note 3)	$V_{GS}=0V, I_S=9A$	-	0.8	1.2	V

Notes:

- 1.Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$

Typical Electrical and Thermal Characteristics (Curves)

Figure 1: Switching Test Circuit

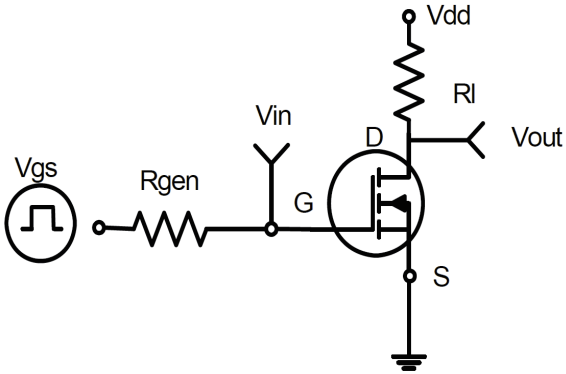


Figure 2: Switching Waveforms

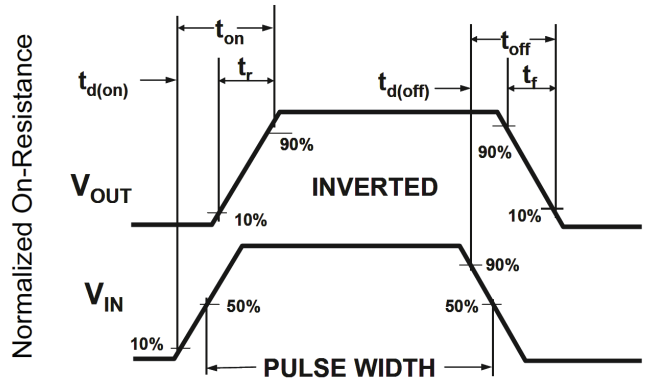


Figure 3: Output Characteristics

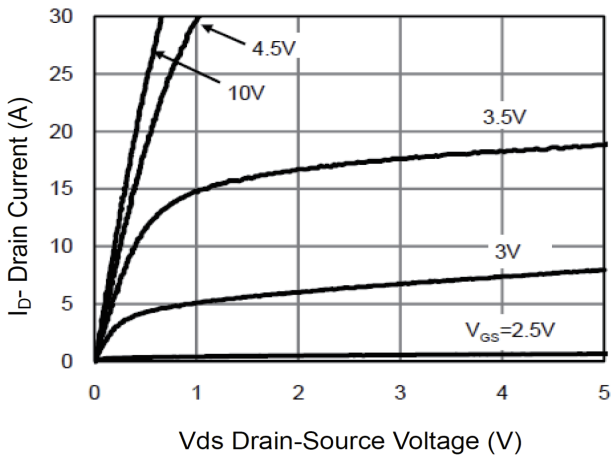


Figure 4: Transfer Characteristics

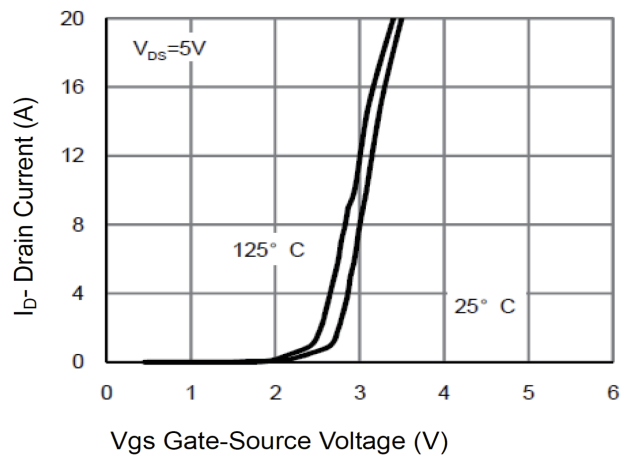


Figure 5: Drain-Source On-Resistance

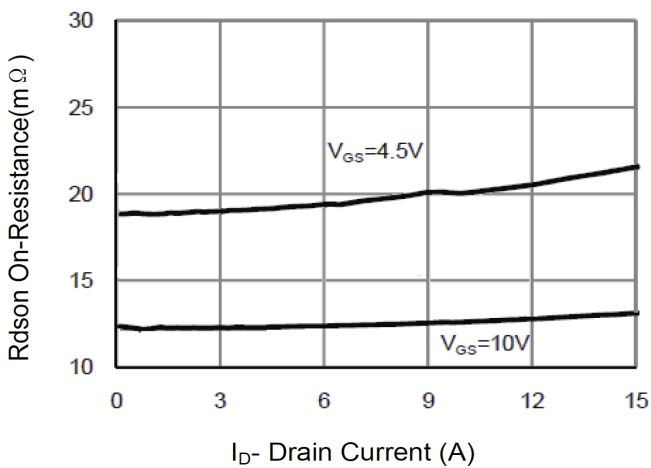
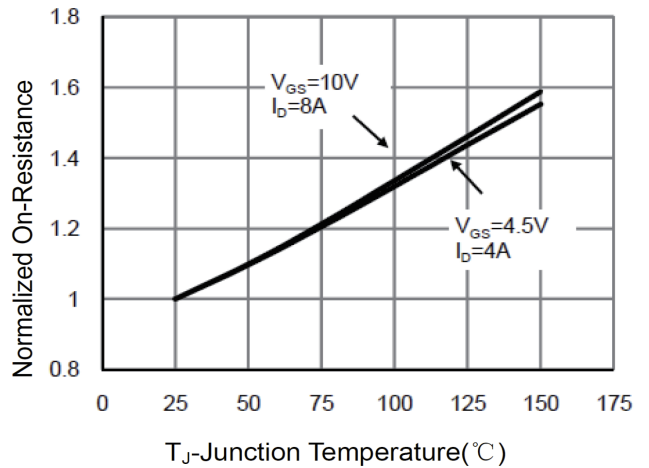


Figure 6: Drain-Source On-Resistance



Typical Performance Characteristics

Figure 7: R_{ds(on)} vs V_{gs}

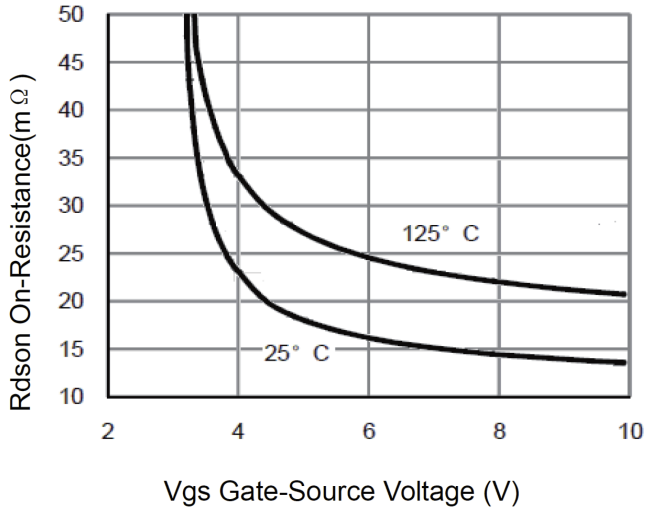


Figure 8: Power Dissipation

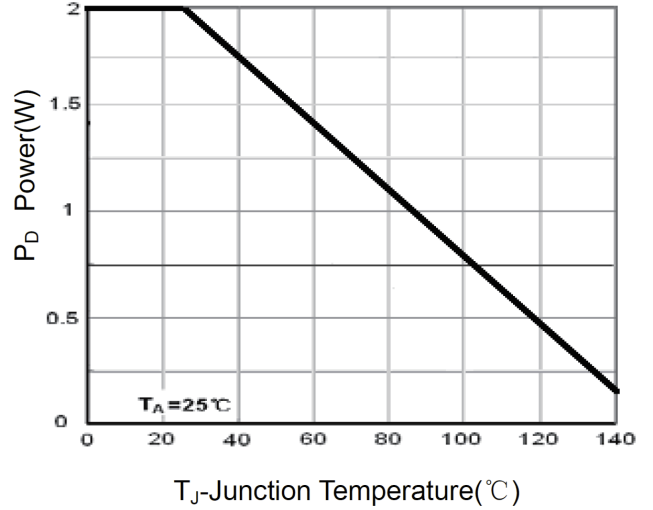


Figure 9: Gate Charge

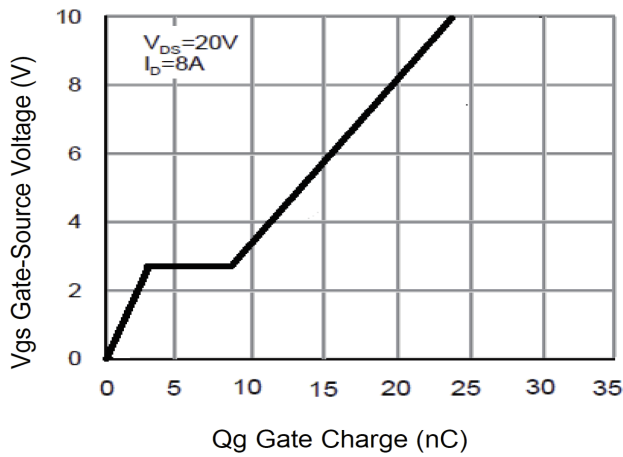


Figure 10: Source- Drain Diode Forward

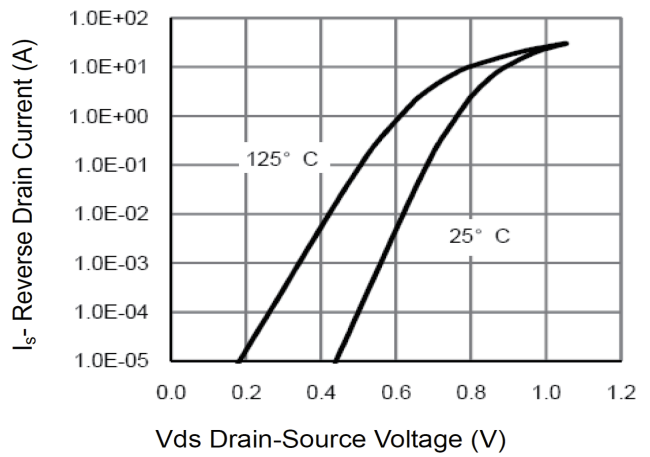


Figure 11: Capacitance vs V_{ds(on)-to-Amb}

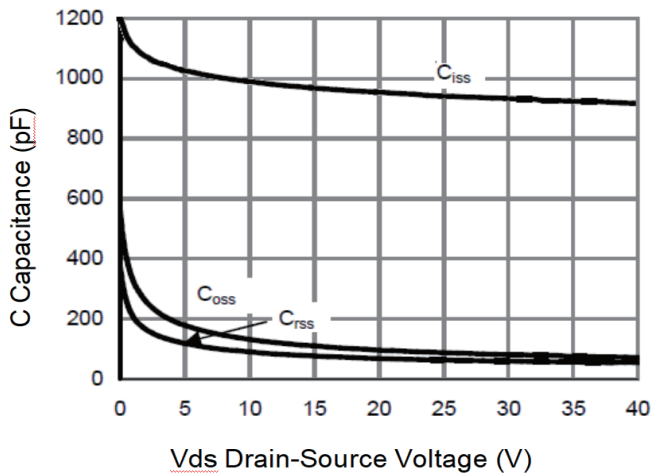
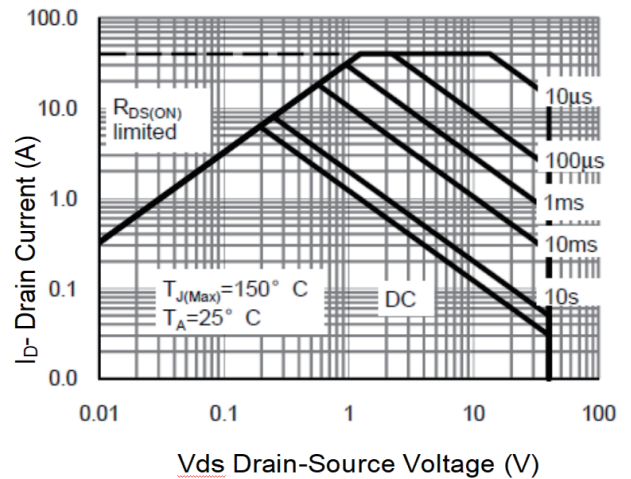
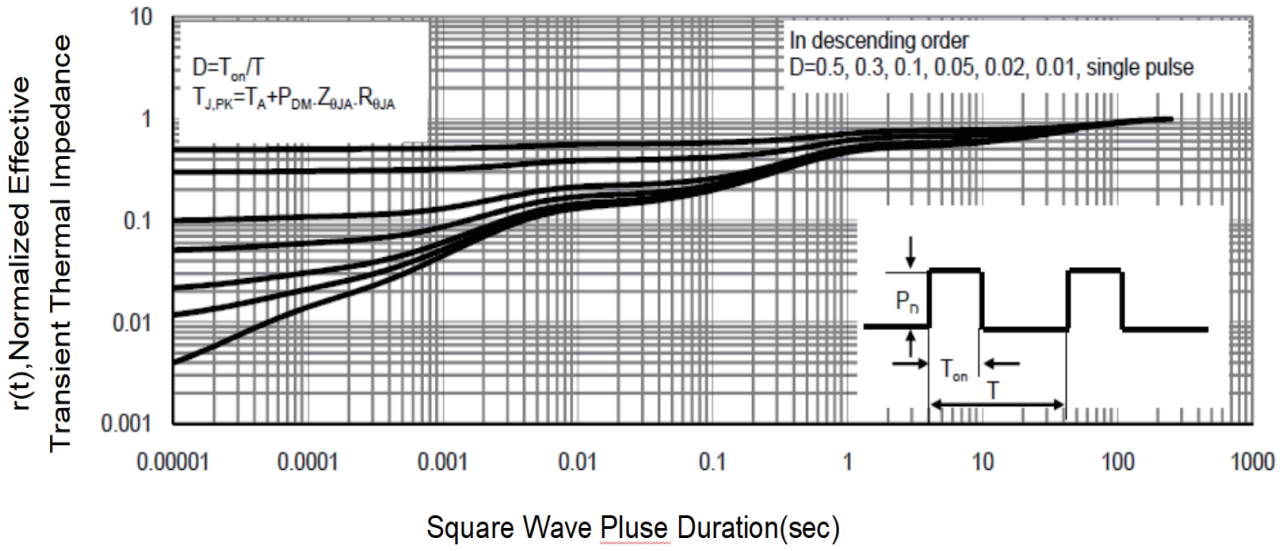


Figure 12: Safe Operation Area, Junction

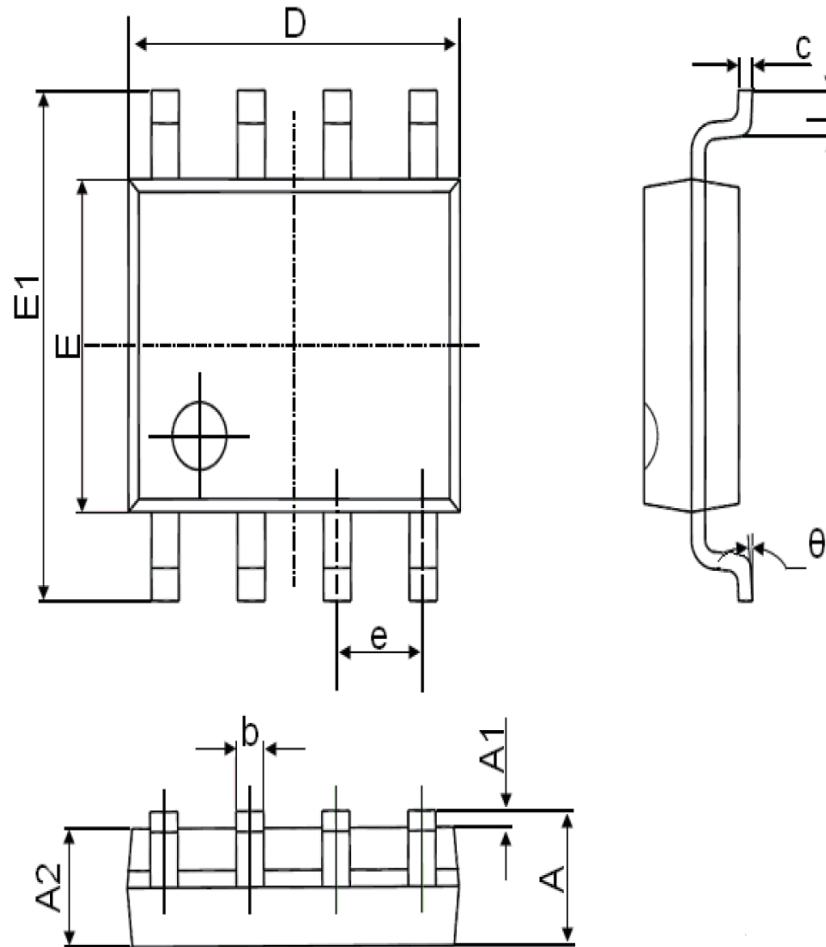


Typical Performance Characteristics

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°

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