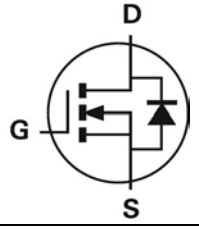
SG40N04S

40V N-CHANNEL POWER MOSFET

V_{DSS} , 40V $R_{DS(ON)}$, 11mΩ (max.) @ V_{GS}=10V $R_{DS(ON)}$, 16mΩ (max.) @ V_{GS}=4.5V I_D , 11A	SOP-8	

Description

The SG40N04S uses advanced Trench technology and designs to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.

Features

- Low On-Resistance
- Low Input Capacitance
- Low Miller Charge
- Low Input/Output Leakage

Applications

- Lithium-Ion Secondary Batteries
- Load Switch
- DC-DC converters and Off-line UPS

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SG40N04S	Halogen-Free	SOP-8	S	Tape & Reel	2,500

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

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	V
Drain Current-Continuous Note 1	T_A=25°C	I_D	11	A
	T_A=70°C		49	A
Drain Current-Pulsed Note 1		I_{DM}	36	A
Avalanche Current		I_{AS}	26	A
Avalanche Energy, L=0.1mH		E_{AS}	33	mJ
Maximum Power Dissipation	T_A=25°C	P_D	1.5	W
Storage Temperature Range		T_{STG}	-55 to +150	°C
Operating Junction Temperature Range		T_J	-55 to +150	°C

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient Note 2	$R_{\theta JA}$	Steady State	-	-	65	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	30	°C/W

Electrical Characteristics (T_J=25°C unless otherwise noted)

OFF CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_{DS}=250μA	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=32V, V_{GS}=0V	-	-	1	μA
Gate-Body Leakage	I_{GSS}	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA

ON CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_{DS}=250μA	1	-	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_{DS}=8A	-	-	11	mΩ
		V_{GS}=4.5V, I_{DS}=6A	-	-	16	mΩ

DYNAMIC CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C_{iss}	V_{DS}=15V, V_{GS}=0V, f=1MHz	-	1274	-	pF
Output Capacitance	C_{oss}		-	116	-	
Reverse Transfer Capacitance	C_{rss}		-	85	-	

SWITCHING CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	$T_{d(on)}$	V_{DS}=12V, I_{DS} =6A, V_{GS}=10V, R_{GEN}=3.3Ω	-	8.3	-	ns
Rise Time	t_r		-	3.3	-	
Turn-Off Delay Time	$T_{d(off)}$		-	21	-	
Fall Time	t_f		-	2.1	-	
Total Gate Charge at 10V	Q_g	V_{DS}=20V, I_{DS}=8A, V_{GS}=4.5V	-	10.3	-	nC
Gate to Source Gate Charge	Q_{gs}		-	3.2	-	
Gate to Drain “Miller” Charge	Q_{gd}		-	4	-	

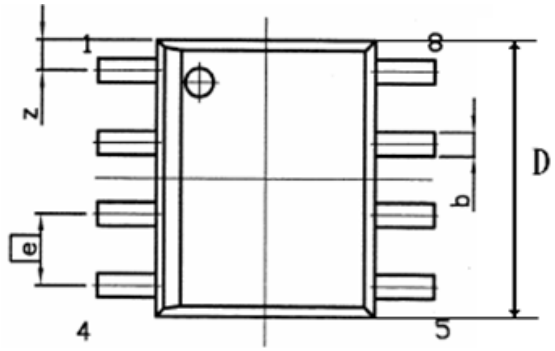
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

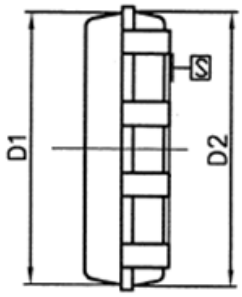
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_{DS}=1A	-	-	1.2	V
Body Diode Reverse Recovery Time	I_S	V_G=V 0V, Force Current	-	-	11	A
Body Diode Reverse Recovery Charge	I_{SM}		-	-	36	A

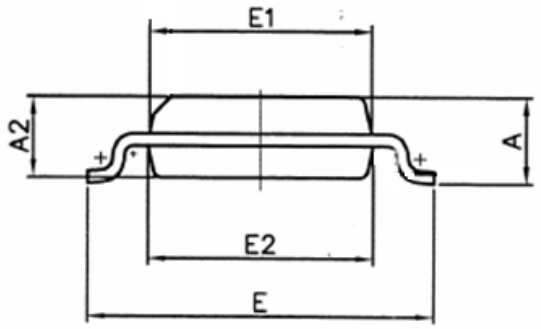
Notes:

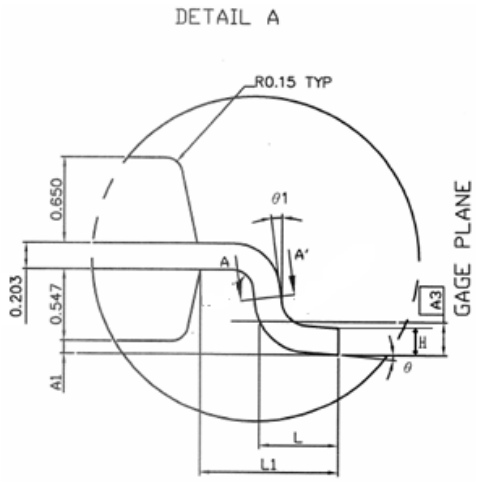
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
2. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design. $R_{\theta JA}$ shown below for single device operation on FR-4 in still air.
3. The maximum current rating is limited by package.

Package Dimensions







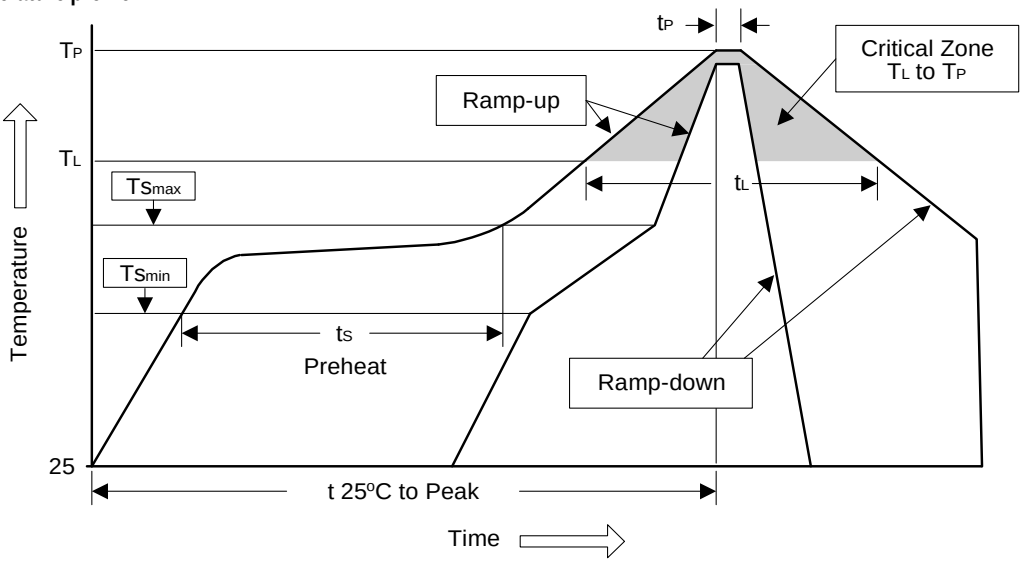


SOP-8 Dimensions						
Symbols	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	1.35	1.55	1.753	0.053	0.061	0.069
A1	0.10	0.15	0.25	0.004	0.006	0.010
A2	1.27	1.52	1.626	0.050	0.060	0.064
A3	-	0.254	-	-	0.010	-
b	0.30	0.40	0.51	0.012	0.016	0.020
D	4.70	4.90	5.10	0.185	0.193	0.201
D1	4.70	4.90	5.00	0.185	0.193	0.197
D2	4.80	4.90	5.00	0.189	0.193	0.197
E	5.79	6.00	6.20	0.228	0.236	0.244
E1	3.75	3.90	4.00	0.148	0.154	0.157
E2	3.75	3.90	4.00	0.148	0.154	0.157
H	0.17	0.21	0.25	0.007	0.008	0.010
e	-	1.27	-	-	0.050	-
L	0.40	0.76	1.27	0.016	0.030	0.050
L1	0.95	1.05	1.15	0.037	0.041	0.045
θ	0°	4°	8°	0°	4°	8°
θ1	0°	-	-	0°	-	-

Soldering Methods for Major Power's Products

1. Storage environment: Temperature=10°C to 35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	<3°C/sec	<3°C/sec
Preheat - Temperature Min (Ts_{min}) - Temperature Max (Ts_{max}) - Time (min to max) (ts)	 100°C 150°C 60 to 120 sec	 150°C 200°C 60 to 180 sec
Tsmax to T_L - Ramp-up Rate	 <3°C/sec	 <3°C/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 183°C 60 to 150 sec	 217°C 60 to 150 sec
Peak Temperature (T_P)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t_P)	10 to 30 sec	20 to 40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<8 minutes

3. Flow (wave) soldering (solder dipping)

Products	Peak Temperature	Dipping Time
Pb devices.	245°C ±5°C	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec

Important Notice