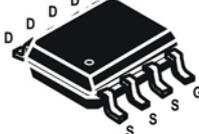
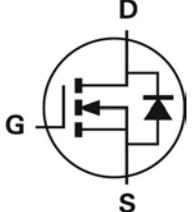


V_{DSS} , 40V $R_{DS(ON)}$, 11m Ω (max.) @ $V_{GS}=10V$ $R_{DS(ON)}$, 16m Ω (max.) @ $V_{GS}=4.5V$ I_D , 11A	SOP-8 	
---	---	---

Description	Features
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.	<ul style="list-style-type: none"> Low On-Resistance Low Input Capacitance Low Miller Charge Low Input/Output Leakage
	Applications <ul style="list-style-type: none"> 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 ($T_A=25^\circ\text{C}$ 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}	I_D	$T_A=25^\circ\text{C}$	11	A
		$T_A=70^\circ\text{C}$	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	P_D	1.5	W	
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ\text{C}$	
Operating Junction Temperature Range	T_J	-55 to +150	$^\circ\text{C}$	

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

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

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

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

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

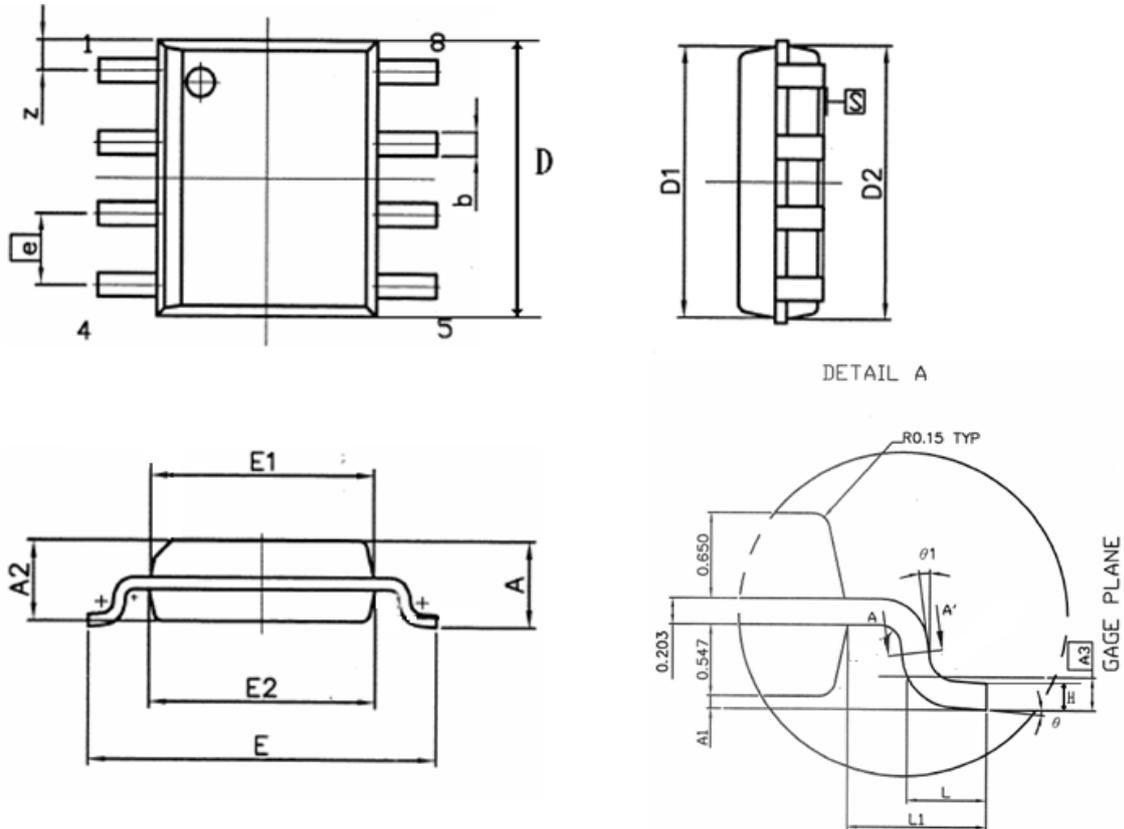
SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	$T_{d(on)}$	$V_{DS}=12V, I_{DS}=6A, V_{GS}=10V, R_{GEN}=3.3\Omega$	-	8.3	-	ns
Rise Time	t_r		-	3.3	-	
Turn-Off Delay Time	$T_{d(off)}$		-	21	-	
Fall Time	t_f		-	2.1	-	
Total Gate Charge at 10V	Q_g	$V_{DS}=20V, I_{DS}=8A, V_{GS}=4.5V$	-	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	$V_C=V_{\overline{S}}=0V, \text{Force Current}$	-	-	11	A
Body Diode Reverse Recovery Charge	I_{SM}		-	-	36	A

Notes:

1. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
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

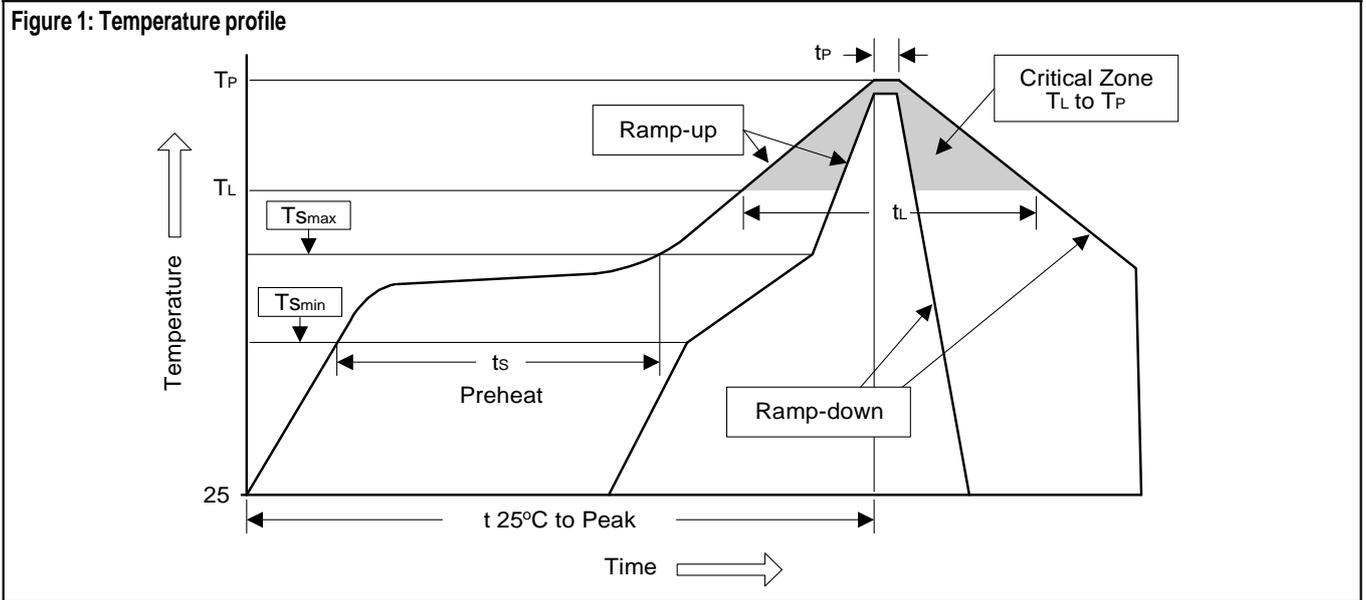


SOP-8 Dimensions

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



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	$<3^\circ\text{C}/\text{sec}$	$<3^\circ\text{C}/\text{sec}$
Preheat		
- Temperature Min (T_{Smin})	100°C	150°C
- Temperature Max (T_{Smax})	150°C	200°C
- Time (min to max) (t_s)	60 to 120 sec	60 to 180 sec
T_{Smax} to T_L		
- Ramp-up Rate	$<3^\circ\text{C}/\text{sec}$	$<3^\circ\text{C}/\text{sec}$
Time maintained above:		
- Temperature (T_L)	183°C	217°C
- Time (t_L)	60 to 150 sec	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	$<6^\circ\text{C}/\text{sec}$	$<6^\circ\text{C}/\text{sec}$
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

©Major Power Corporation

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Major Power cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in an Major Power product. No circuit patent licenses, copyrights, mask work rights, or other intellectual property rights are implied.

Major Power Corporation, its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Major Power"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Major Power makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Major Power disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Major Power's knowledge of typical requirements that are often placed on Major Power products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Major Power's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Major Power products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Major Power product could result in personal injury or death. Customers using or selling Major Power products not expressly indicated for use in such applications do so at their own risk and agree to fully indemnify and hold Major Power and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Major Power or its distributor was negligent regarding the design or manufacture of the part. Please contact authorized Major Power personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Major Power. Product names and markings noted herein may be trademarks of their respective owners.

Major Power and the Major Power logo are trademarks of Major Power Corporation. All other brand and product names appearing in this document are registered trademarks or trademarks of their respective holders.