

V_{DSS} , -40V R_{DS(ON)} , 14 mΩ (max.) @ V_{GS}=-10V R_{DS(ON)} , 21 mΩ (max.) @ V_{GS}=-4.5V I_D , -9A	SOP-8	

Description	Features
<p>The SGP4015S is the highest performance trench P-ch MOSFETs with extreme high cell density, which provide excellent R_{DS(ON)} and gate charge for most of the synchronous buck converter applications.</p> <p>The SGP4015S meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.</p>	<ul style="list-style-type: none"> • Low On-Resistance • Low Input Capacitance • Low Miller Charge • Low Input / Output Leakage • Pb-free lead plating; RoHS compliant
	Applications <ul style="list-style-type: none"> • Motor / Body Load Control • Automotive Systems • Load Switch • DC-DC converters and Off-line UPS

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SGP4015S	Halogen-Free	SOP-8	S	Tape & Reel	3,000

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	T _A =25°C	I _D	-9	A
	T _A =70°C		-7.2	A
Drain Current-Pulsed ^{Note 1}		I _{DM}	-19	A
Avalanche Current, L=0.1mH		I _{AS}	-55	A
Avalanche Energy, L=0.1mH ^{Note 3}		E _{AS}	151	mJ
Maximum Power Dissipation	T _A =25°C	P _D	1.5	W
	T _A =70°C		0.9	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 1}	R _{θJA}	Steady State	-	-	85	°C/W
Maximum Junction-to-Case	R _{θJC}	Steady State	-	-	24	°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	-	12	14	mΩ
		V _{GS} =-4.5V, I _{DS} =-6A	-	17	21	
Forward Transconductance ^{Note 1}	g _{fs}	V _{DS} =-5V, I _D =-8A	-	26	-	S

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C _{iss}	V _{DS} =-20V, V _{GS} =0V, f=1MHz	-	3431	-	pF
Output Capacitance	C _{oss}		-	316	-	
Reverse Transfer Capacitance	C _{rss}		-	217	-	

SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T _{d(on)}	V _{DD} =-20V, V _{GS} =-10V, R _G =3.3Ω, I _D =-8A	-	49	-	ns
Rise Time	t _r		-	34	-	
Turn-Off Delay Time	T _{d(off)}		-	98	-	
Fall Time	t _f		-	9.4	-	
Total Gate Charge at 10V	Q _g	V _{DS} =-20V, V _{GS} =-4.5V, I _D =-8A	-	27	-	nC
Gate to Source Gate Charge	Q _{gs}		-	7.5	-	
Gate to Drain "Miller" Charge	Q _{gd}		-	7.3	-	

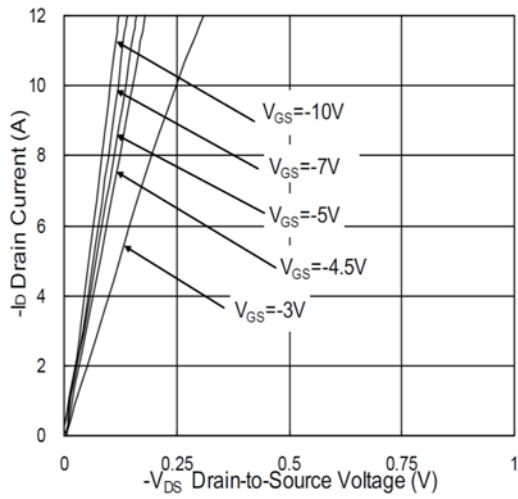
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-8A	-	-	-1.2	V
Body Diode Reverse Recovery Time	I _S	V _G =V _D =0V, Force Current	-	-	-9	A
Body Diode Reverse Recovery Charge	I _{SM}		-	-	-20	A

Notes:

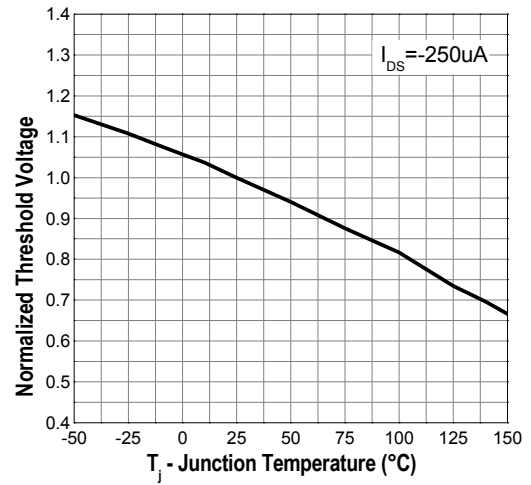
- Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
- R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{θJC} is guaranteed by design while R_{θJA} is determined by the user's board design. R_{θJA} shown below for single device operation on FR-4 in still air.
- The EAS data shows Max. rating. The test condition is V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-55A

Typical Operating Characteristics

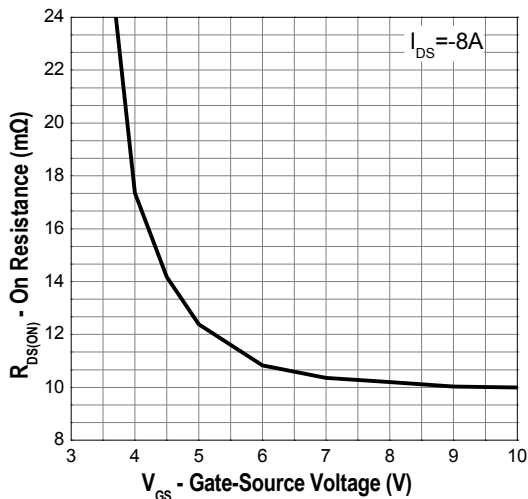
Output Characteristics



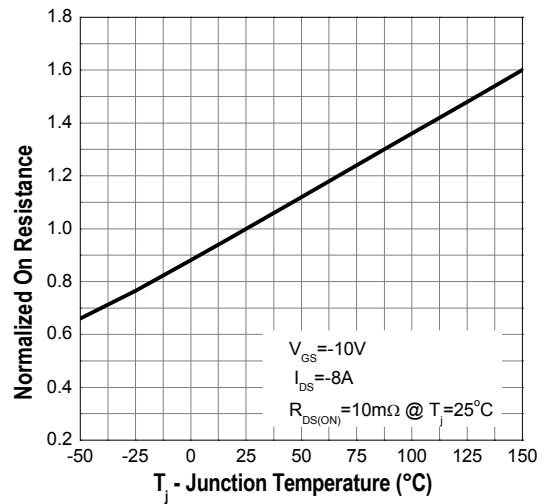
Gate Threshold Voltage



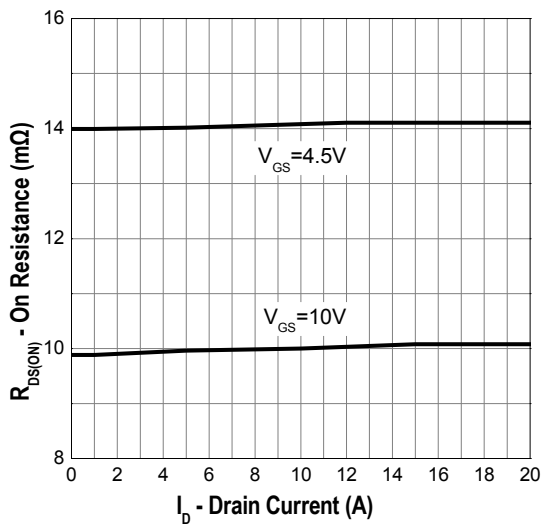
Gate-Source On Resistance



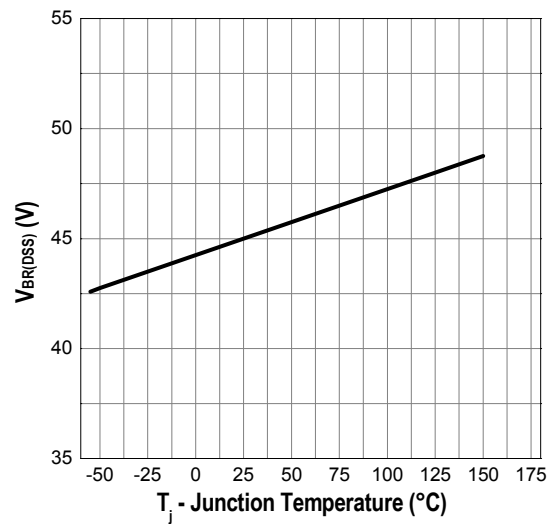
Drain-Source On Resistance



Drain-Source On Resistance

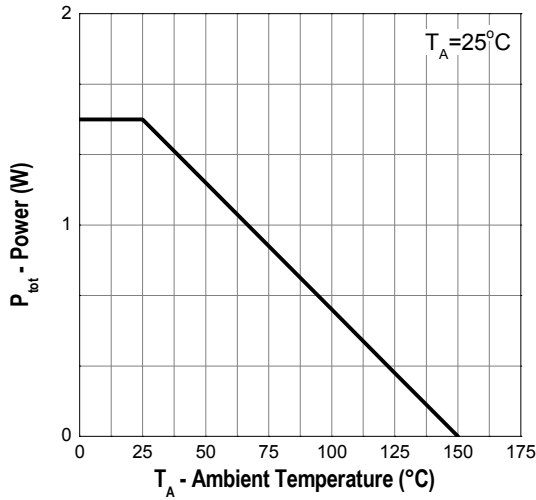


Source-Drain Diode Forward

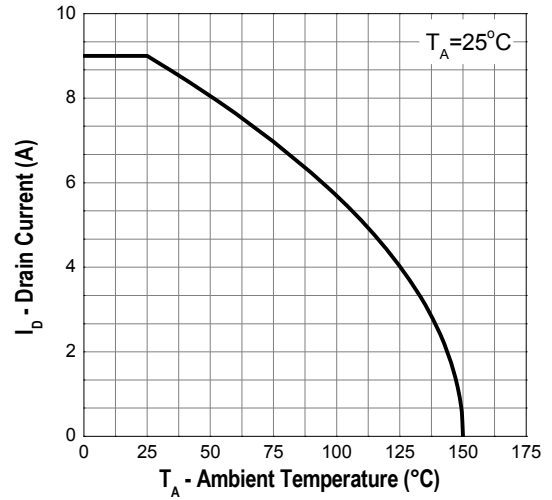


Typical Operating Characteristics (Cont.)

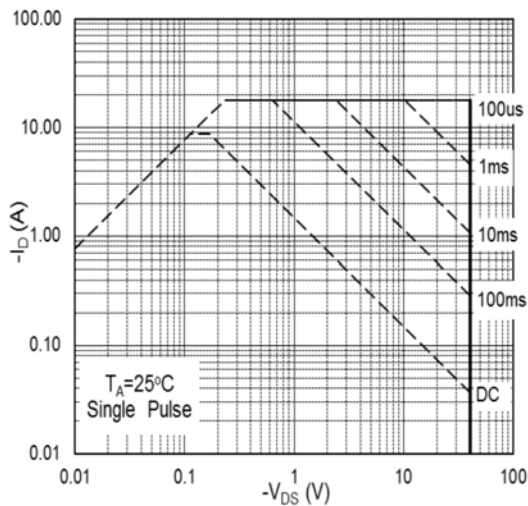
Power Dissipation



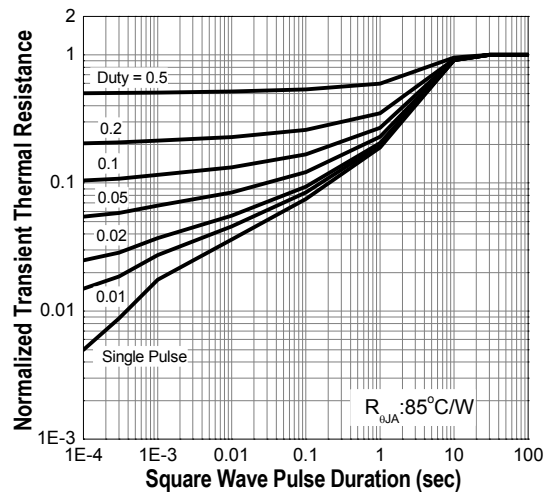
Drain Current



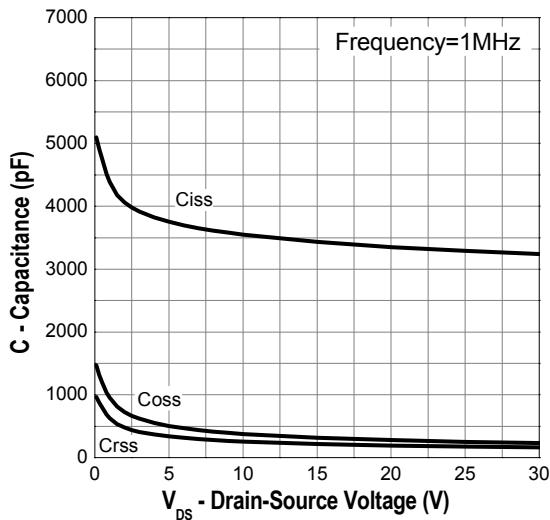
Safe Operation Area



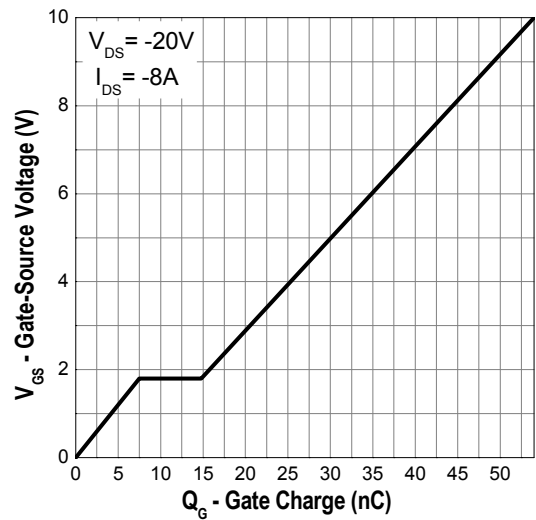
Transient Thermal Impedance




Capacitance



Gate Charge

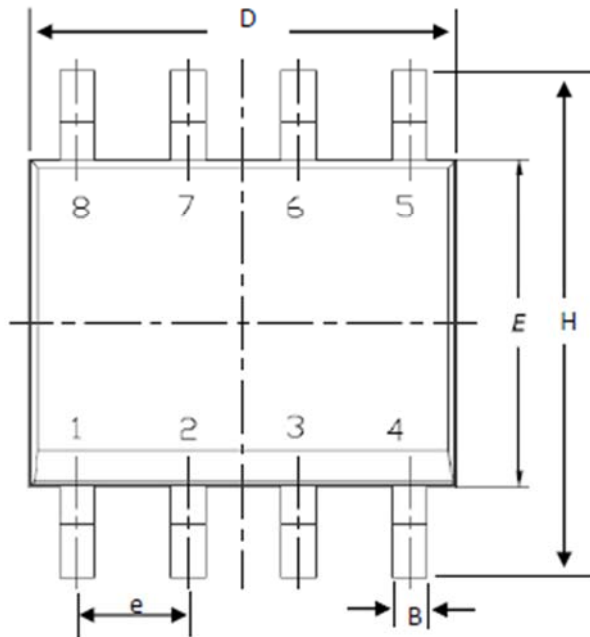


Marking Information

SOP-8 (S)	Marking Rule
<p>Laser Marking</p> 	<p><u>Line 1</u> : Device Name SGP4015S</p> <p><u>Line 2</u> : Date Code YYMMXXX</p> <p>YY : Year Code MM : Month Code XXX : Serial Number</p>

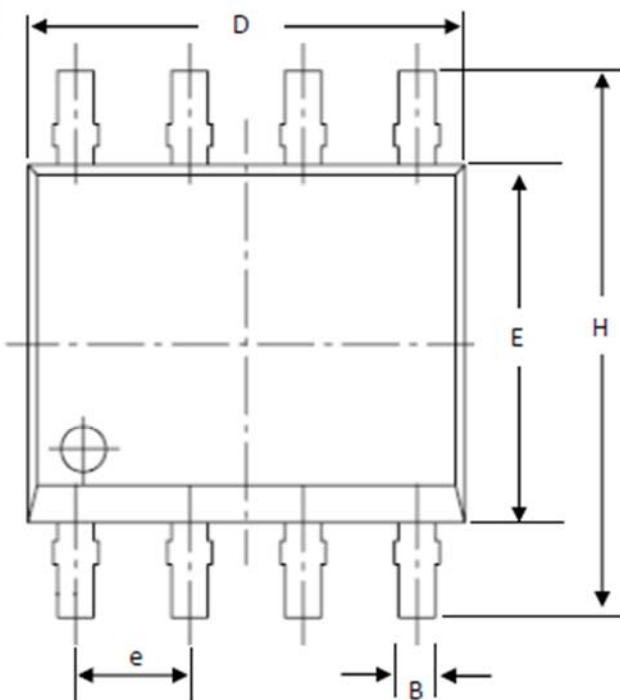
Package of Dimension

G-TYPE



Symbol	Min	Nor	Max
A	1.35	1.55	1.75
A1	0.10	0.18	0.25
B	0.31	0.41	0.51
c	0.17	0.21	0.25
D	4.80	4.90	5.00
E	3.80	3.90	4.00
e	1.27	1.27	1.27
H	5.80	6.00	6.20
L	0.40	0.84	1.27
α	0.00	4.00	8.00

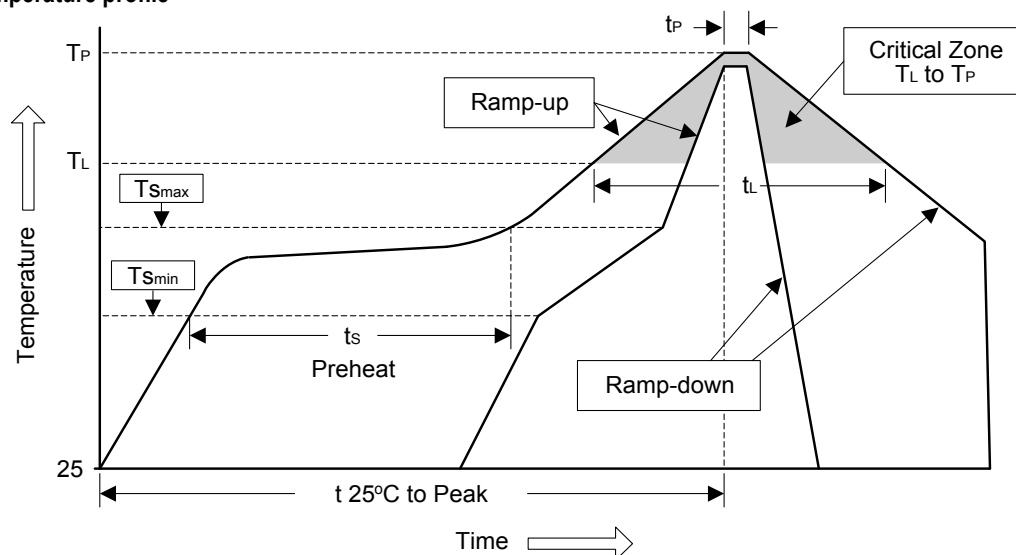
B-TYPE



Soldering Methods for Silicongear'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 (TL to TP)	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min (TSmin)	100°C	150°C
- Temperature Max (TSmax)	150°C	200°C
- Time (min to max) (ts)	60 to 120 sec	60 to 180 sec
TSmax to TL		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature (TL)	183°C	217°C
- Time (tL)	60 to 150 sec	60 to 150 sec
Peak Temperature (TP)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (tP)	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

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