

N-Channel : V_{DSS} , 30V $R_{DS(ON)}$, 18m Ω (max.) @ $V_{GS}=10V$ $R_{DS(ON)}$, 26m Ω (max.) @ $V_{GS}=4.5V$ I_D , 7.6A	P-Channel : V_{DSS} , -30V $R_{DS(ON)}$, 36m Ω (max.) @ $V_{GS}=-10V$ $R_{DS(ON)}$, 55m Ω (max.) @ $V_{GS}=-4.5V$ I_D , -5.4A	SOP-8 	
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Description	Features
The SGD3225S uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary Power MOSFETs may be used in H-bridge, Inverters and other applications.	- Low On-Resistance - Low Input Capacitance - Low Miller Charge - Low Input / Output Leakage - Pb-free lead plating; RoHS compliant
	Applications
	- Motor / Body Load Control - Automotive Systems - Load Switch

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SGD3225S	Halogen-Free	SOP-8	S	Tape & Reel	3,000

Absolute Maximum Ratings ($T_A=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	30 -30	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	$T_A=25^{\circ}C$ 7.6	A
		$T_A=100^{\circ}C$ 4.8	A
Drain Current-Pulsed ^{Note 1}	I_{DM}	35 -25	A
Maximum Power Dissipation	P_D	$T_A=25^{\circ}C$ 1.5 1.5	W
Storage Temperature Range	T_{STG}	-55 to +175	$^{\circ}C$
Operating Junction Temperature Range	T_J	-55 to +175	$^{\circ}C$

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient ^{Note 2}	$R_{\theta JA}$	$t < 10$ sec.	-	-	85	$^{\circ}C/W$
Maximum Junction-to-Case ^{Note 2}	$R_{\theta JC}$	Steady State	-	-	25	$^{\circ}C/W$

N-Channel 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	30	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =30V, 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	1.5	2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _{DS} =7A	-	-	18	mΩ
		V _{GS} =4.5V, I _{DS} =4A	-	-	26	

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1MHz	-	539	-	pF
Output Capacitance	C _{oss}		-	66	-	
Reverse Transfer Capacitance	C _{rss}		-	54	-	
Forward Transconductance	g _{fs}	V _D =5V, I _D =7A	-	6	-	S
Gate Resistance	R _g	V _{DS} =24V, V _{GS} =0V, f=1MHz	-	2	-	Ω

SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T _{d(on)}	V _{DD} =15V, V _{GS} =10V, R _G =3.3Ω, I _D =7A	-	1.2	-	ns
Rise Time	t _r		-	40	-	
Turn-Off Delay Time	T _{d(off)}		-	18	-	
Fall Time	t _f		-	7.2	-	
Total Gate Charge at 4.5V	Q _g	V _{DS} =15V, I _{DS} =7A, V _{GS} =4.5V	-	6	-	nC
Gate to Source Gate Charge	Q _{gs}		-	2.2	-	
Gate to Drain "Miller" Charge	Q _{gd}		-	2	-	

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 =1A	-	-	1.2	V
Continuous Source Current	I _S	V _G =V _D =0V, Force Current	-	-	7.6	A
Pulsed Source Current	I _{SM}		-	-	35	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.

P-Channel 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	-30	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-30V, 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} =-5.3A	-	-	36	mΩ
		V _{GS} =-4.5V, I _{DS} =-4.2A	-	-	55	

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C _{iss}	V _{DS} =-15V, V _{GS} =0V, f=1MHz	-	554	-	pF
Output Capacitance	C _{oss}		-	95	-	
Reverse Transfer Capacitance	C _{rss}		-	80	-	
Forward Transconductance	g _{fs}	V _D =-10V, I _D =-5A	-	13	-	S

SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T _{d(on)}	V _{DD} =-24V, V _{GS} =-10V, R _G =3.3Ω, I _D =-1A	-	2.4	-	ns
Rise Time	t _r		-	8.1	-	
Turn-Off Delay Time	T _{d(off)}		-	31.7	-	
Fall Time	t _f		-	5.6	-	
Total Gate Charge at -4.5V	Q _g	V _{DS} =-15V, V _{GS} =-4.5V, I _D =-1A	-	5.7	-	nC
Gate to Source Gate Charge	Q _{gs}		-	2.9	-	
Gate to Drain "Miller" Charge	Q _{gd}		-	1.7	-	

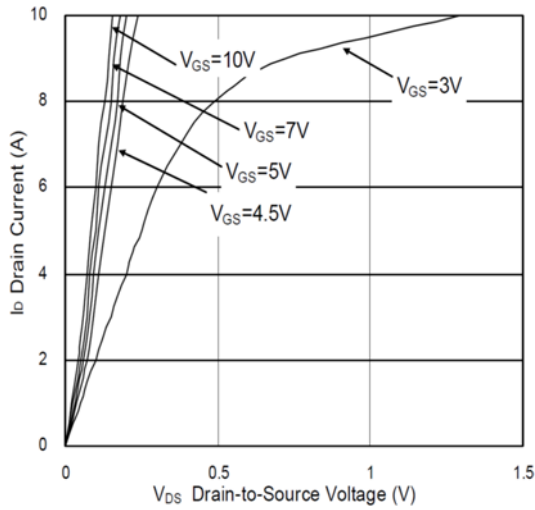
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-1A	-	-	-1.2	V
Continuous Source Current	I _S	V _G =V _D =0V, Force Current	-	-	-24	A
Pulsed Source Current	I _{SM}		-	-	-48	A
Body Diode Reverse Recovery Time	t _{rr}	I _F =1A, dI/dt=100A/μs, T _J =25°C	-	5.6	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	1.3	-	nC

Notes:

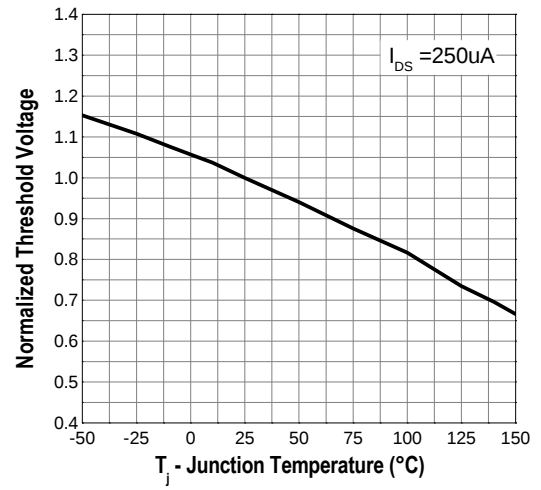
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
2. R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{θJC} is guaranteed by design while R_{θJA} is determined by the user's board design. R_{θJA} shown below for single device operation on FR-4 in still air.

N-Channel Typical Operating Characteristics

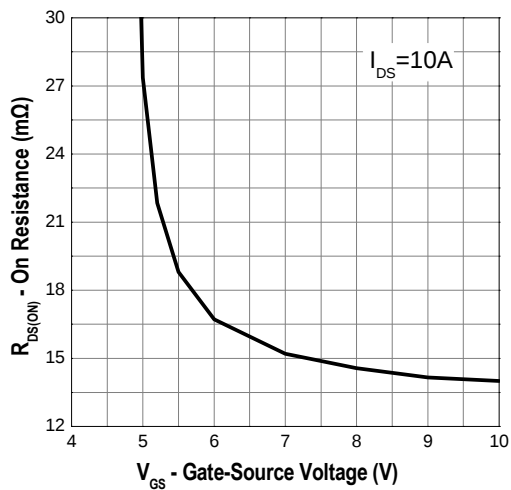
Output Characteristics



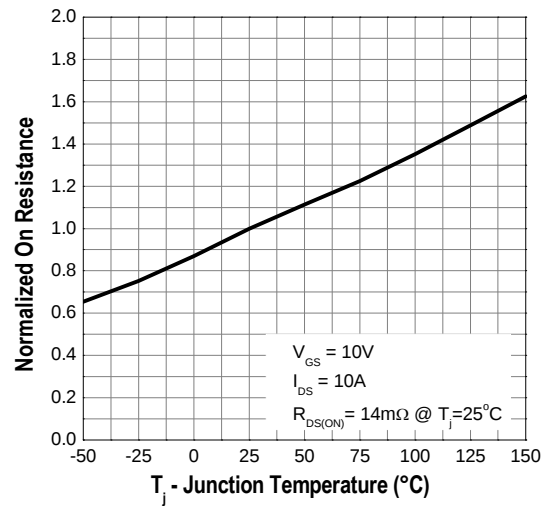
Gate Threshold Voltage



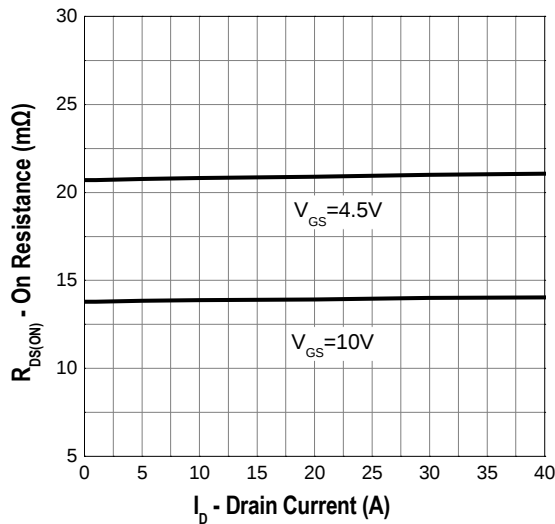
Gate-Source On Resistance



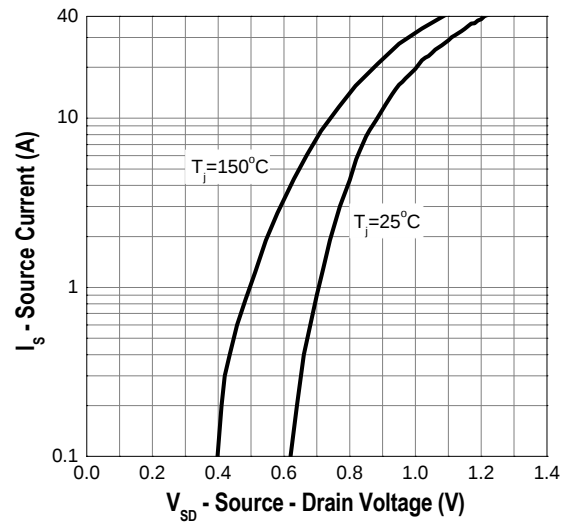
Drain-Source On Resistance



Drain-Source On Resistance

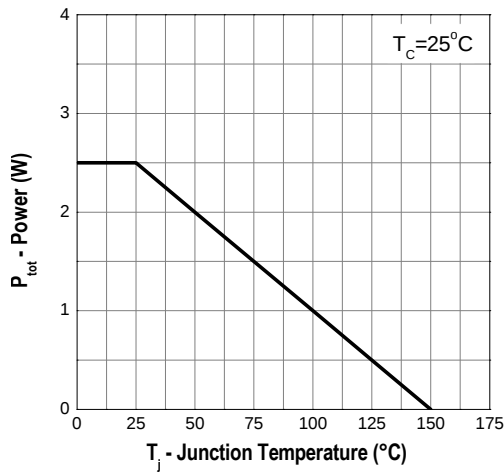


Source-Drain Diode Forward

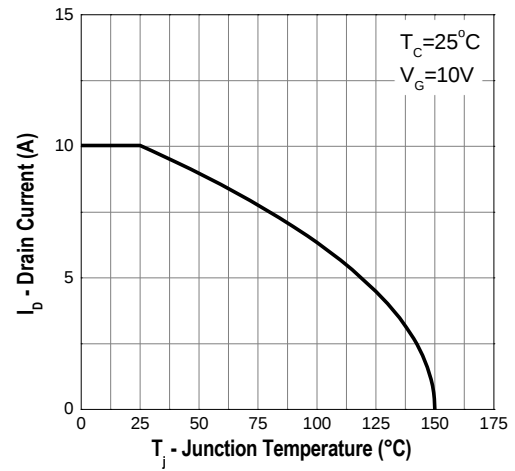


N-Channel Typical Operating Characteristics (Cont.)

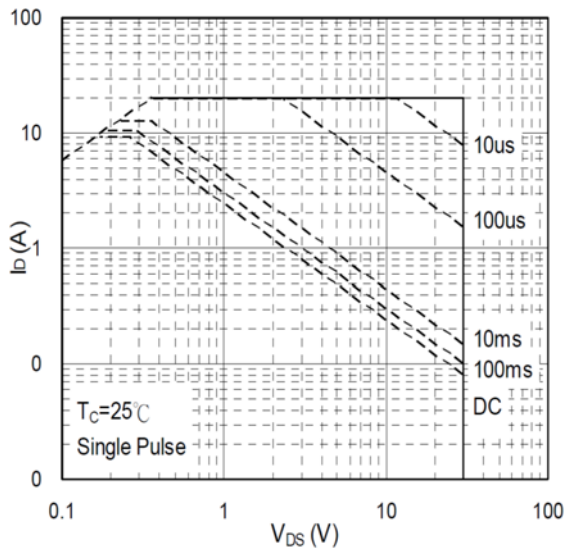
Power Dissipation



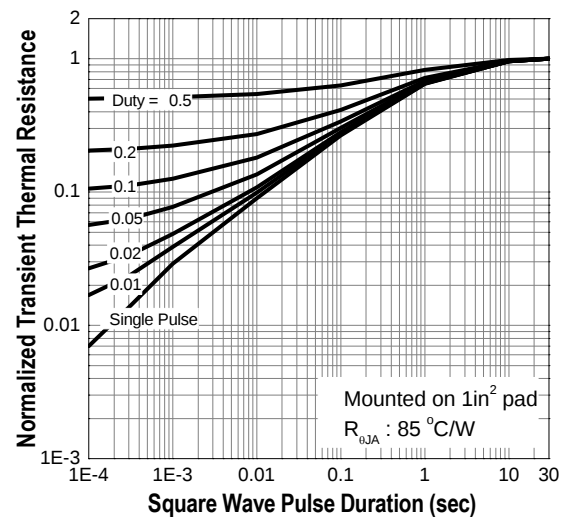
Drain Current



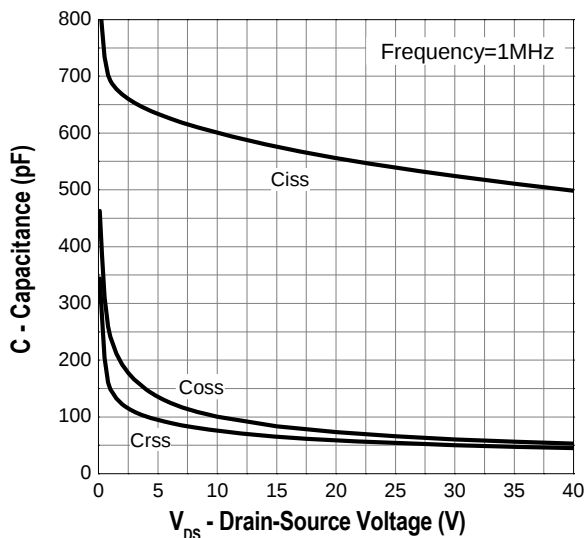
Safe Operation Area



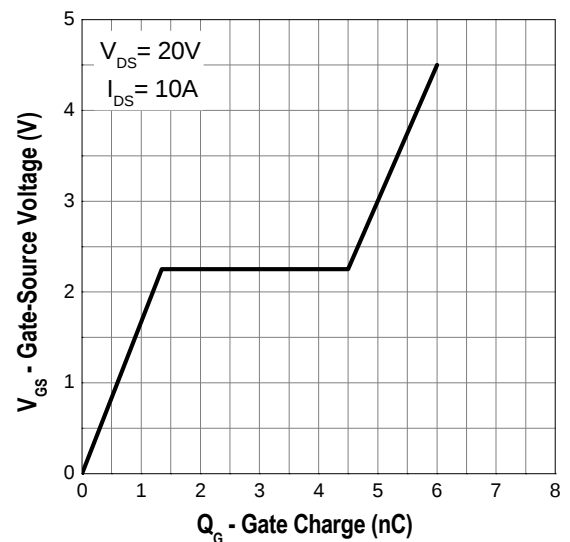
Thermal Transient Impedance



Capacitance

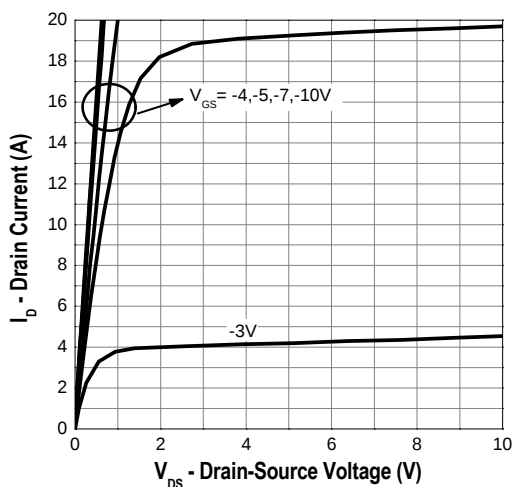


Gate Charge

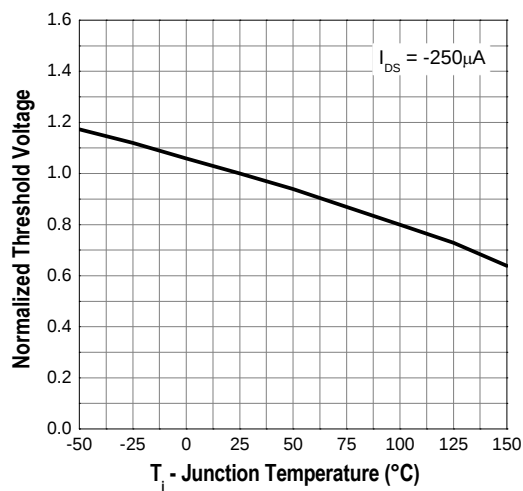


P-Channel Typical Operating Characteristics

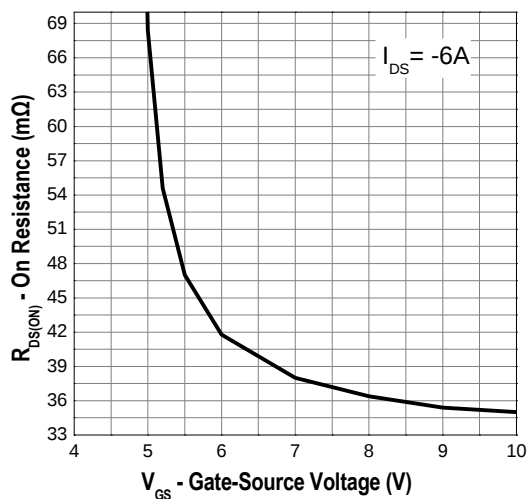
Output Characteristics



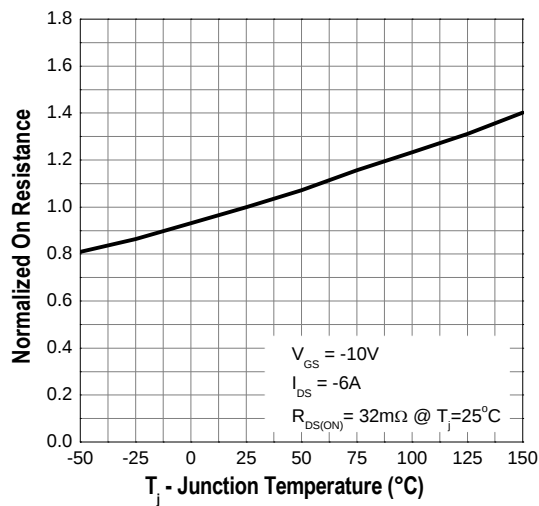
Gate Threshold Voltage



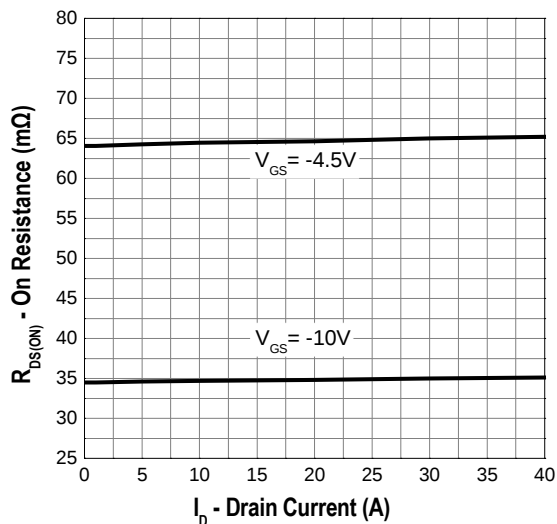
Gate-Source On Resistance



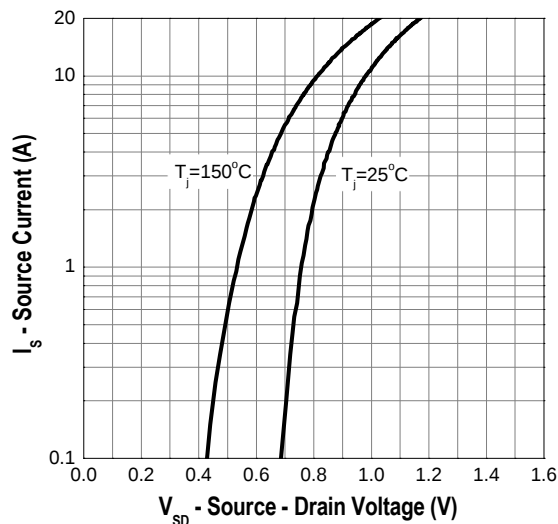
Drain-Source On Resistance



Drain-Source On Resistance

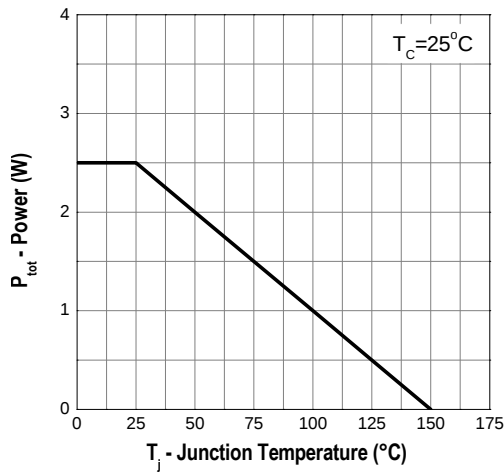


Source-Drain Diode Forward

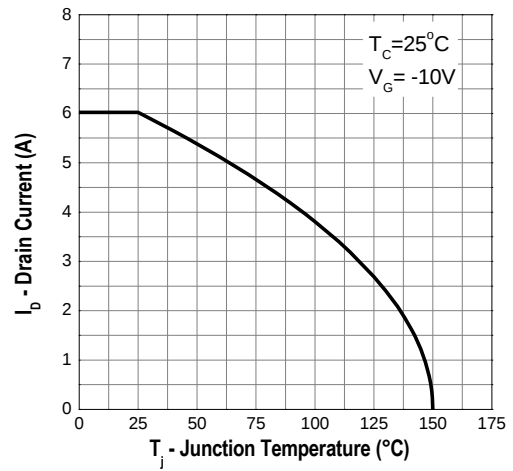


P-Channel Typical Operating Characteristics (Cont.)

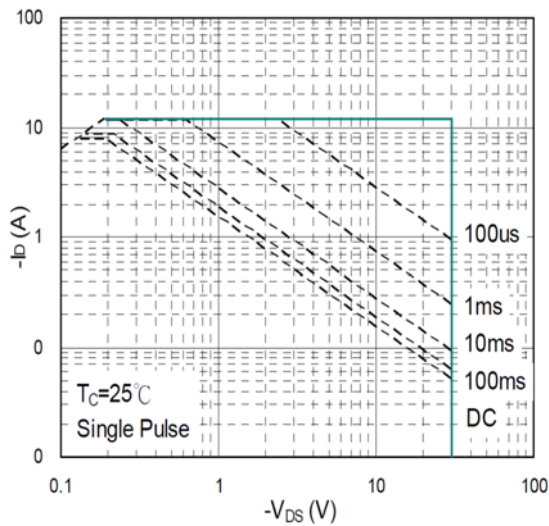
Power Dissipation



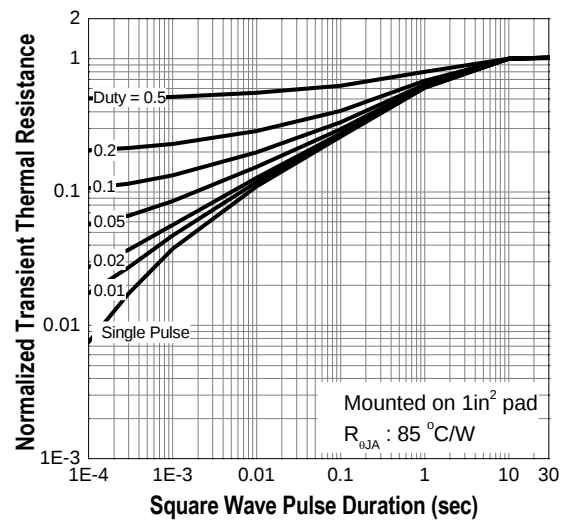
Drain Current



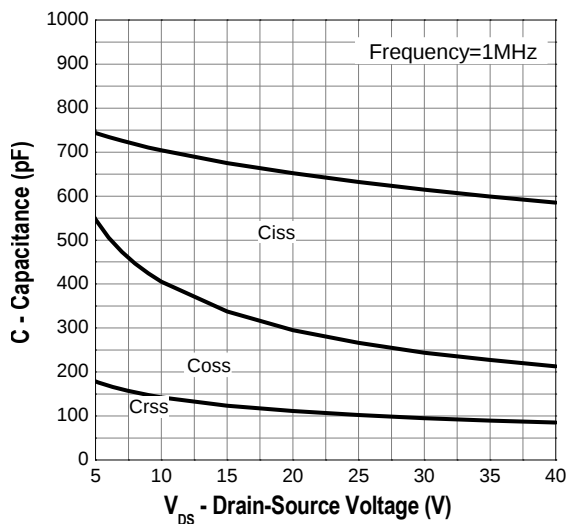
Safe Operation Area



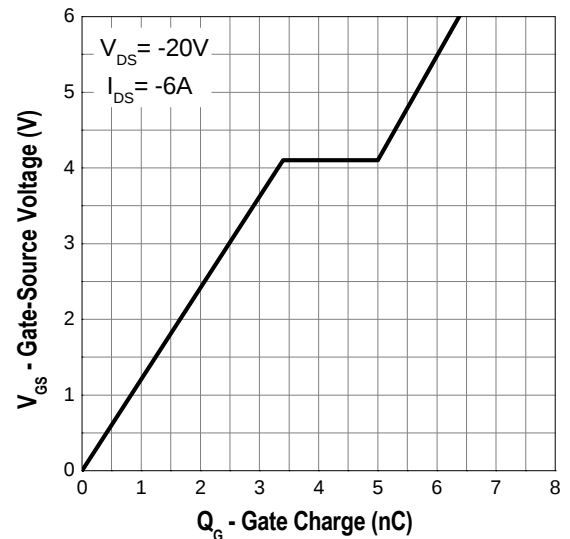
Thermal Transient Impedance



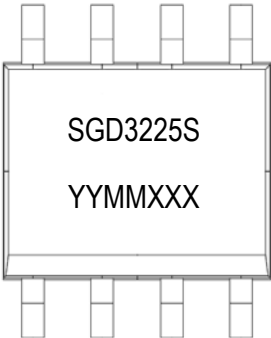
Capacitance



Gate Charge

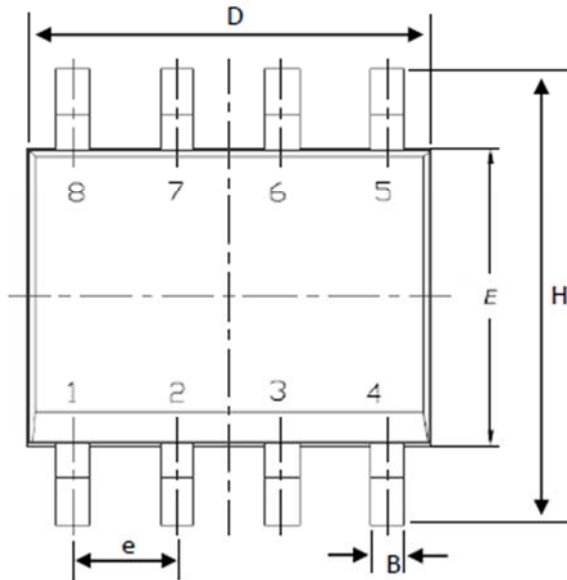


Marking Information

SOP-8 (S)	Marking Rule
Laser Marking  Diagram	<u>Line 1</u> : Device Name SGD3225S <u>Line 2</u> : Date Code YYMMXXX YY : Year Code MM : Month Code XXX : Serial Number

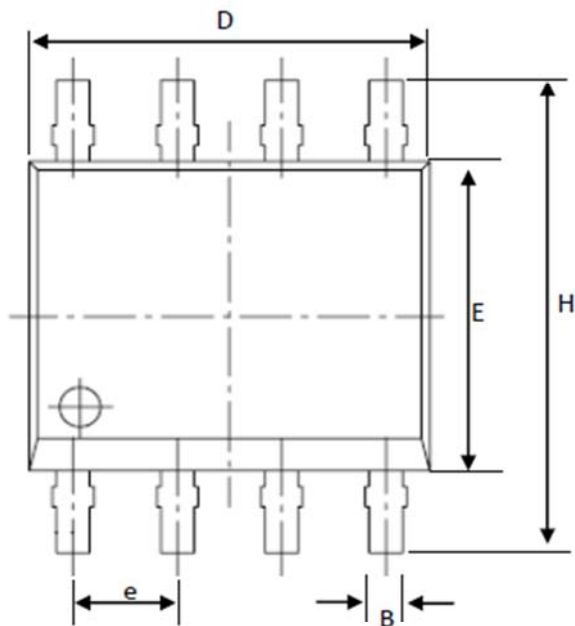
Package of Dimension

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

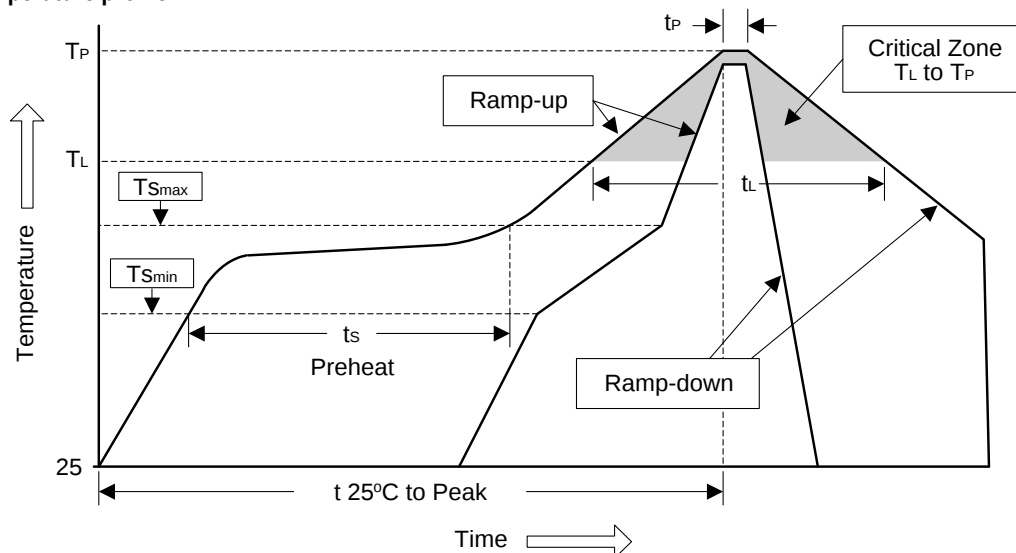


1. All dimension are in millimeters.
2. Dimension does not include burrs and mold flash/protrusions.

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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