

N-Channel : V_{DSS} , 40V $R_{DS(ON)}$, 11m Ω (max.) @ $V_{GS}=10V$ $R_{DS(ON)}$, 15.5m Ω (max.) @ $V_{GS}=4.5V$ I_D , 42A	P-Channel : V_{DSS} , -40V $R_{DS(ON)}$, 30m Ω (max.) @ $V_{GS}=-10V$ $R_{DS(ON)}$, 43m Ω (max.) @ $V_{GS}=-4.5V$ I_D , -28A	TO-252-4L 	
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Description	Features
The SGD4220H 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
SGD4220H	Halogen-Free	TO-252-4L	H	Tape & Reel	2,500

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	40 -40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	$T_C=25^{\circ}C$	42 -28
		$T_C=100^{\circ}C$	26 -22
		$T_a=25^{\circ}C$	10 -6.6
		$T_a=70^{\circ}C$	8.0 -5.3
Drain Current-Pulsed ^{Note 1}	I_{DM}	100 -55	A
Maximum Power Dissipation	P_D	$T_C=25^{\circ}C$	34.7
		$T_C=70^{\circ}C$	22.2
		$T_a=25^{\circ}C$	2.0
		$T_a=70^{\circ}C$	1.2
Storage Temperature Range	T_{STG}	-55 to +150	$^{\circ}C$
Operating Junction Temperature Range	T_J	-55 to +150	$^{\circ}C$

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient ^{Note 2}	$R_{\theta JA}$	Steady State	-	-	62	$^{\circ}C/W$
Maximum Junction-to-Case ^{Note 2}	$R_{\theta JC}$	Steady State	-	-	3.6	$^{\circ}C/W$

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	40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =40V, 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} =15A	-	-	11	mΩ
		V _{GS} =4.5V, I _{DS} =10A	-	-	15.5	

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C _{iss}	V _{DS} =15V, V _{GS} =0V, f=1MHz	-	1288	-	pF
Output Capacitance	C _{oss}		-	117	-	
Reverse Transfer Capacitance	C _{rss}		-	86	-	
Forward Transconductance	g _{fs}	V _{DS} =5V, I _D =12A	-	35	-	S
Internal Gate Resistance	R _G	V _{DS} =0V, V _{GS} =0V, f=1MHz	-	2	4	Ω

SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T _{d(on)}	V _{DD} =12V, V _{GS} =10V, R _G =3.3Ω, I _D =6A	-	8.4	-	ns
Rise Time	t _r		-	3.2	-	
Turn-Off Delay Time	T _{d(off)}		-	23	-	
Fall Time	t _f		-	2	-	
Total Gate Charge at 4.5V	Q _g	V _{DS} =20V, I _{DS} =12A, V _{GS} =4.5V	-	10.5	-	nC
Gate to Source Gate Charge	Q _{gs}		-	3.1	-	
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 _S =1A	-	-	1.2	V
Continuous Source Current	I _S	V _G =V _D =0V, Force Current	-	-	42	A
Pulsed Source Current	I _{SM}		-	-	100	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	-40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-40V, 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	-	-	30	mΩ
		V _{GS} =-4.5V, I _{DS} =-4A	-	-	43	

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C _{iss}	V _{DS} =-15V, V _{GS} =0V, f=1MHz	-	1487	-	pF
Output Capacitance	C _{oss}		-	131	-	
Reverse Transfer Capacitance	C _{rss}		-	100	-	
Forward Transconductance	g _{fs}	V _{DS} =-5V, I _D =-8A	-	10	-	S

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 =-1A	-	21	-	ns
Rise Time	t _r		-	15.5	-	
Turn-Off Delay Time	T _{d(off)}		-	57	-	
Fall Time	t _f		-	5.3	-	
Total Gate Charge at -4.5V	Q _g	V _{DS} =-15V, I _{DS} =-11A, V _{GS} =-4.5V	-	11.3	-	nC
Gate to Source Gate Charge	Q _{gs}		-	3.3	-	
Gate to Drain "Miller" Charge	Q _{gd}		-	3.1	-	

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	-	-	-28	A
Pulsed Source Current	I _{SM}		-	-	-55	A

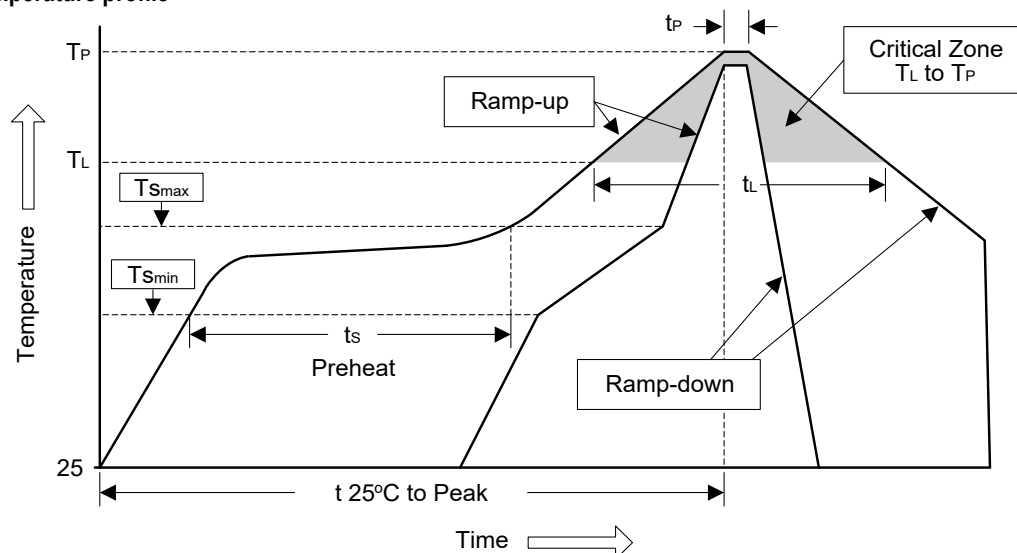
Notes:

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_{θCA} is determined by the user's board design. R_{θJA} shown below for single device operation on FR-4 in still air.

Soldering Methods for Silicongear's Products

- Storage environment: Temperature=10°C to 35°C Humidity=65%±15%
- 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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