

N-Channel : V_{DSS} , 30V $R_{DS(ON)}$, 18m Ω (max.) @ $V_{GS}=10V$ $R_{DS(ON)}$, 28m Ω (max.) @ $V_{GS}=4.5V$ I_D , 31A	P-Channel : V_{DSS} , -30V $R_{DS(ON)}$, 40m Ω (max.) @ $V_{GS}=-10V$ $R_{DS(ON)}$, 63m Ω (max.) @ $V_{GS}=-4.5V$ I_D , -24A	TO-252-4L	

Description	Features
The SGD3225H 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
SGD3225H	Halogen-Free	TO-252-4L	H	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}	30	-30	V
Gate-Source Voltage		V_{GS}	± 20		V
Drain Current-Continuous	$T_C=25^{\circ}\text{C}$	I_D	31	-24	A
	$T_C=100^{\circ}\text{C}$		19	-19	A
	$T_A=25^{\circ}\text{C}$		8.4	-6.0	A
	$T_A=70^{\circ}\text{C}$		6.7	-4.8	A
Drain Current-Pulsed ^{Note 1}		I_{DM}	62	-48	A
Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	P_D	25		W
	$T_A=25^{\circ}\text{C}$		2		W
Avalanche Current		I_{AR}	19		A
Repetitive avalanche energy, $V_{DD}=25V$, $V_{GS}=10V$, $L=0.1mH$		E_{AR}	42		mJ
Storage Temperature Range		T_{STG}	-55 to +175		$^{\circ}\text{C}$
Operating Junction Temperature Range		T_J	-55 to +175		$^{\circ}\text{C}$

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient ^{Note 2}	$R_{\theta JA}$	Steady State	-	-	62	$^{\circ}\text{C/W}$
Maximum Junction-to-Case ^{Note 2}	$R_{\theta JC}$	Steady State	-	-	5	$^{\circ}\text{C/W}$

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	1.5	1.7	2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _{DS} =15A	-	14	18	mΩ
		V _{GS} =4.5V, I _{DS} =10A	-	21	28	

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C _{iss}	V _{DS} =15V, V _{GS} =0V, f=1MHz	-	539	-	pF
Output Capacitance	C _{oss}		-	66	-	
Reverse Transfer Capacitance	C _{rss}		-	54	-	
Forward Transconductance	g _{fs}	V _D =15V, I _D =15A	-	20	-	S
Gate Resistance	R _g	V _{DS} =0V, 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 =15A	-	3	-	ns
Rise Time	t _r		-	7.6	-	
Turn-Off Delay Time	T _{d(off)}		-	21	-	
Fall Time	t _f		-	4	-	
Total Gate Charge at 4.5V	Q _g	V _{DS} =15V, I _{DS} =15A, V _{GS} =4.5V	-	6.2	-	nC
Gate to Source Gate Charge	Q _{gs}		-	2.4	-	
Gate to Drain "Miller" Charge	Q _{gd}		-	2.5	-	

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	-	-	30	A
Pulsed Source Current	I _{SM}		-	-	60	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_{θCA} is determined by the user's board design. R_{θJA} shown below for single device operation on 2oz 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	-1.5	-1.7	-2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _{DS} =-18A	-	32	40	mΩ
		V _{GS} =-4.5V, I _{DS} =-12A	-	50	63	

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 =-18A	-	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 =-10A	-	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 =-10A	-	5.7	-	nC
Gate to Source Gate Charge	Q _{gs}		-	2.9	-	
Gate to Drain "Miller" Charge	Q _{gd}		-	1.7	-	

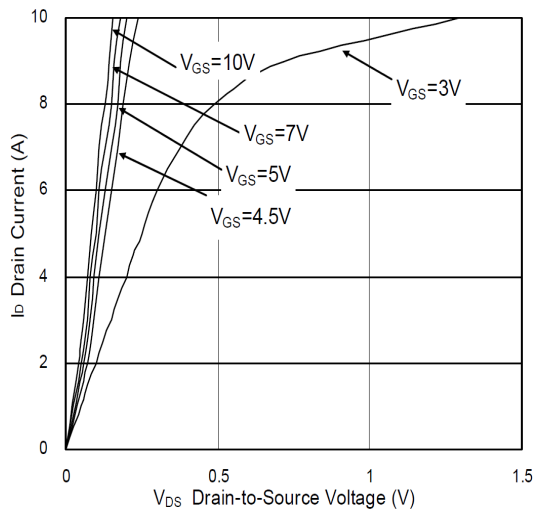
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-6A	-	-	-1.2	V
Continuous Source Current	I _S	V _G =V _D =0V, Force Current	-	-	-24	A
Pulsed Source Current	I _{SM}		-	-	-48	A
Body Diode Reverse Recovery Time	t _{rr}	I _F =15A, dI/dt=100A/μs, T _J =25°C	-	5.6	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	1.3	-	nC

Notes:

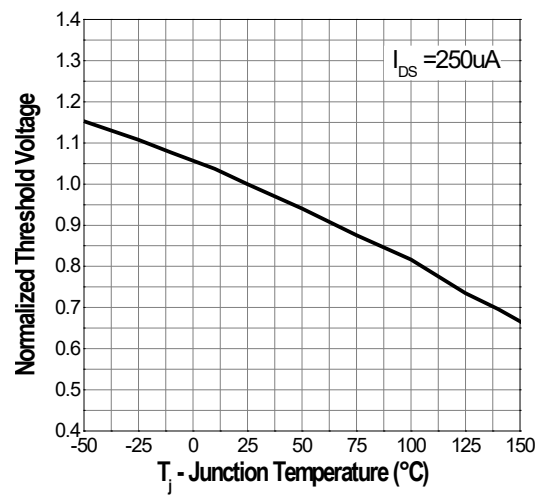
- Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
- R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{θJC} is guaranteed by design while R_{θCA} is determined by the user's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

N-Channel Typical Operating Characteristics

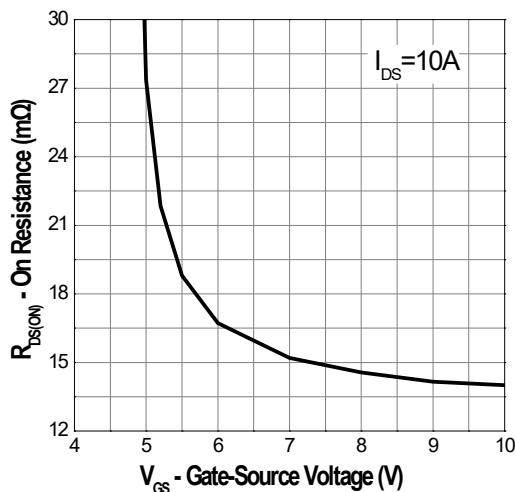
Output Characteristics



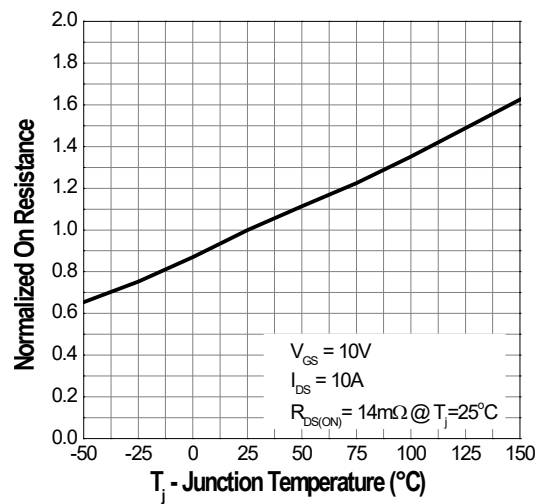
Gate Threshold Voltage



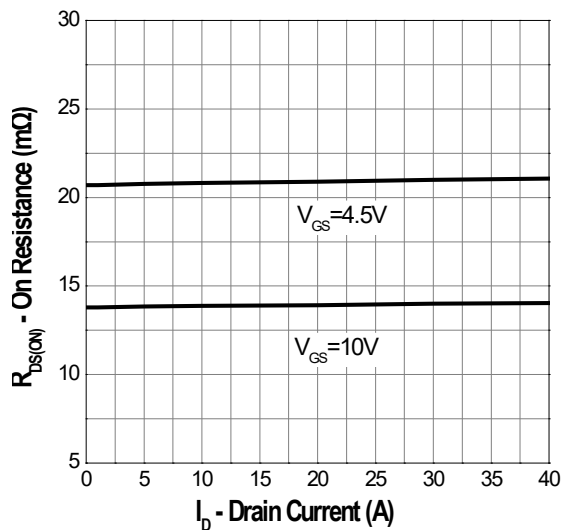
Gate-Source On Resistance



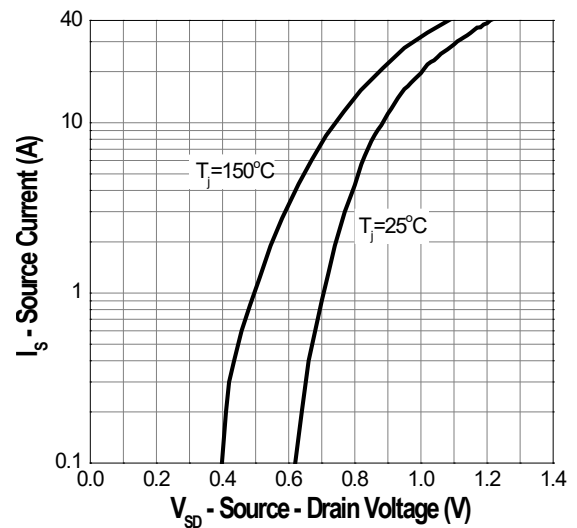
Drain-Source On Resistance



Drain-Source On Resistance

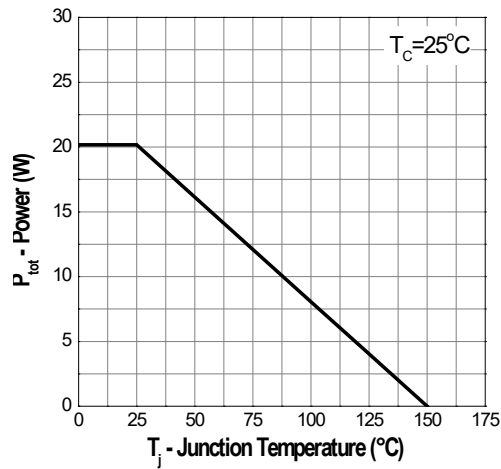


Source-Drain Diode Forward

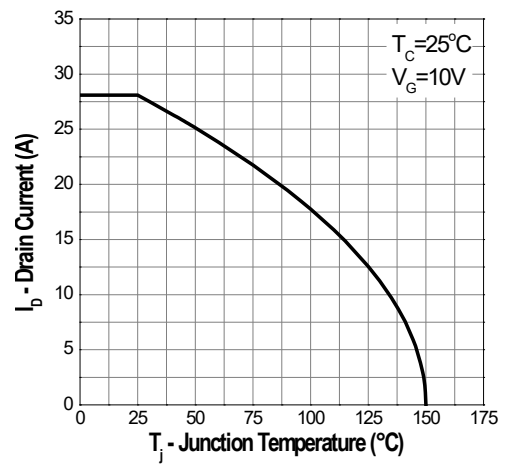


N-Channel Typical Operating Characteristics (Cont.)

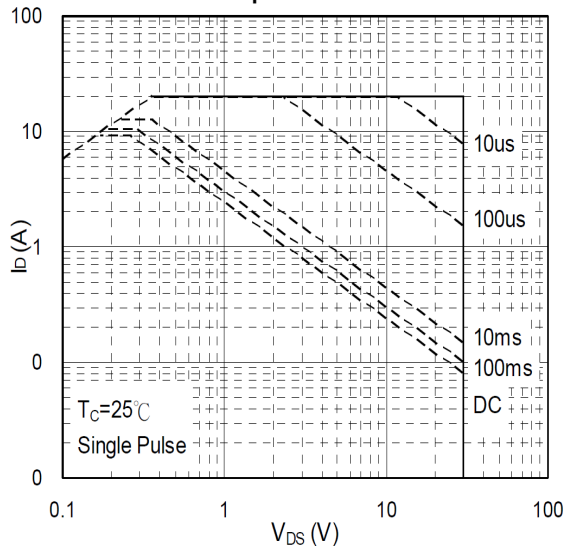
Power Dissipation



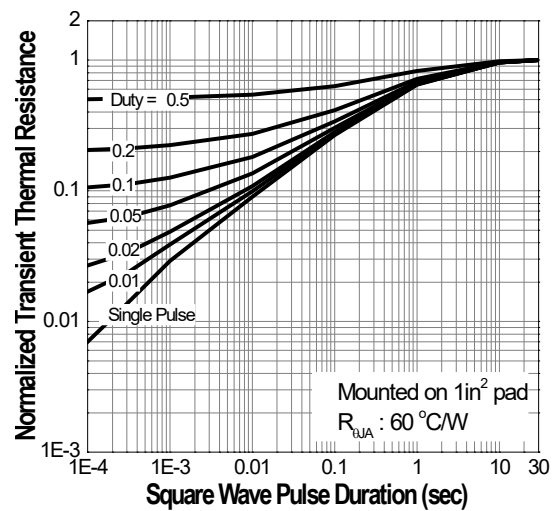
Drain Current



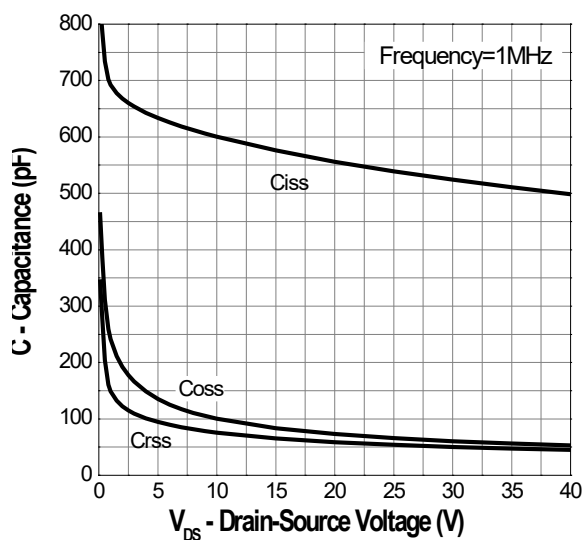
Safe Operation Area



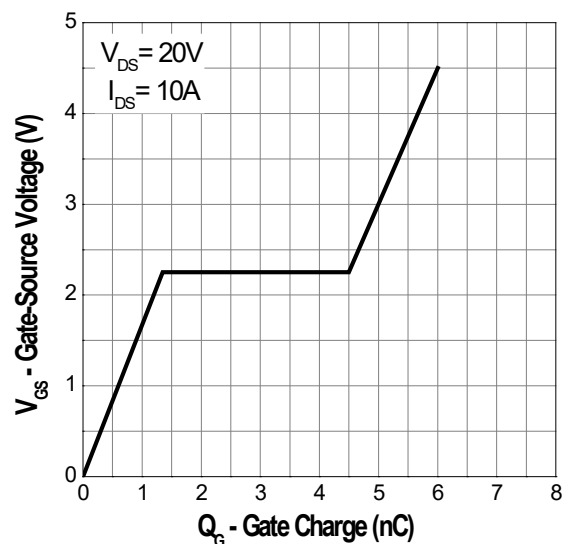
Thermal Transient Impedance



Capacitance

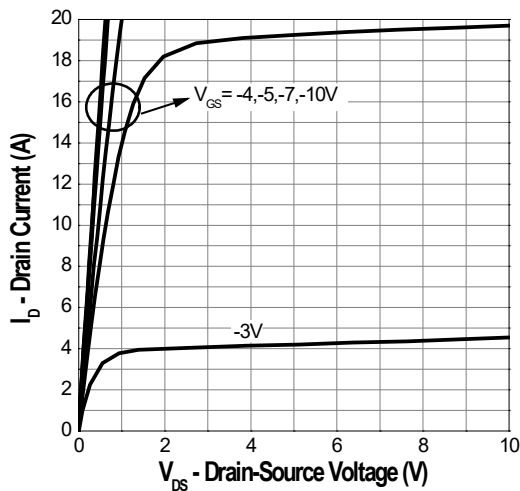


Gate Charge

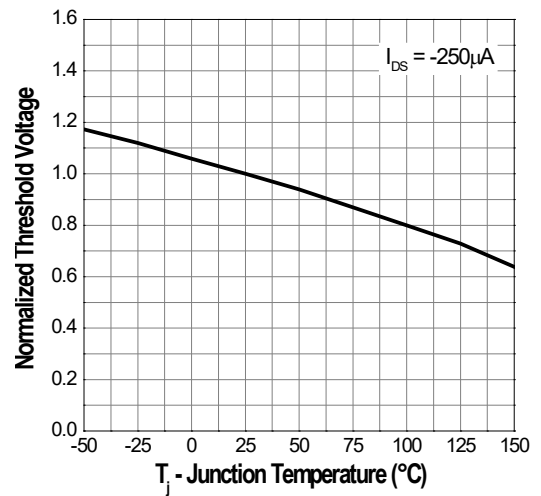


P-Channel Typical Operating Characteristics

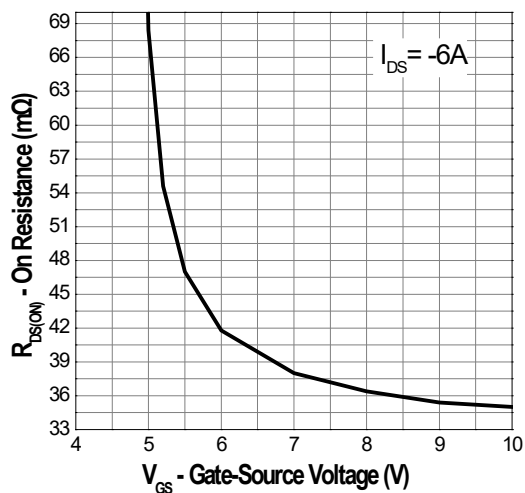
Output Characteristics



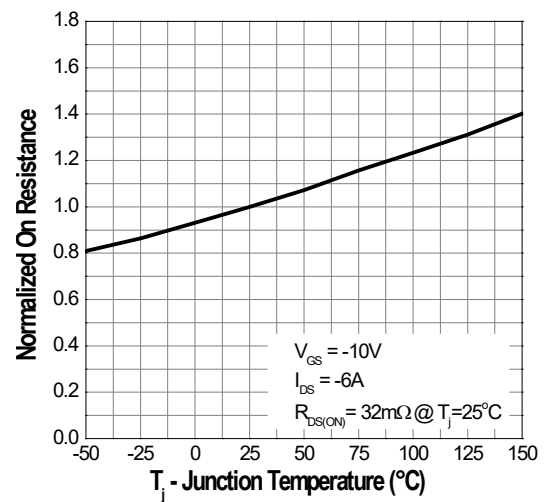
Gate Threshold Voltage



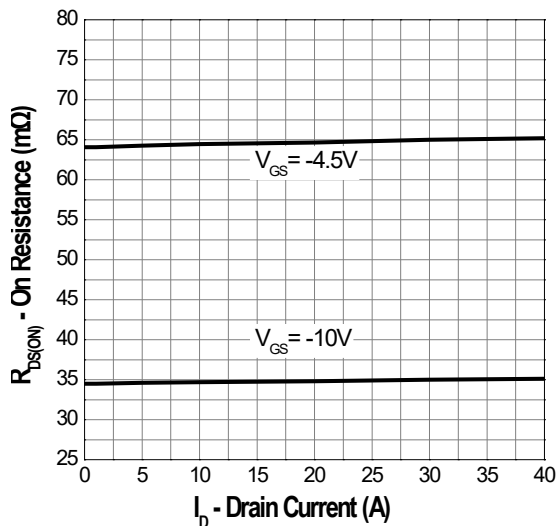
Gate-Source On Resistance



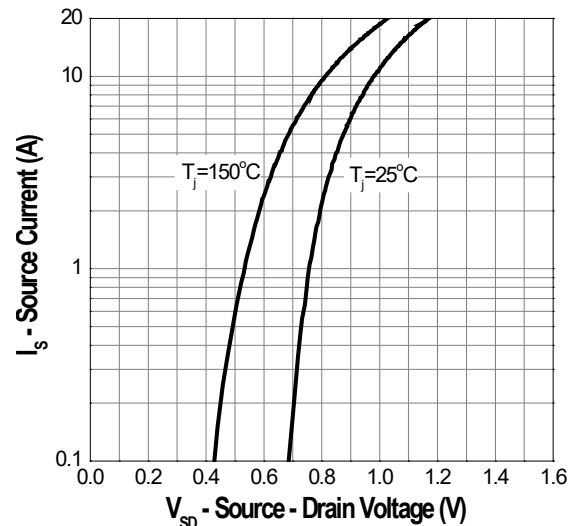
Drain-Source On Resistance



Drain-Source On Resistance

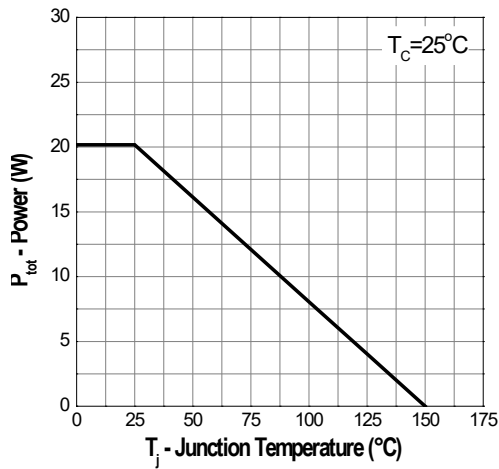


Source-Drain Diode Forward

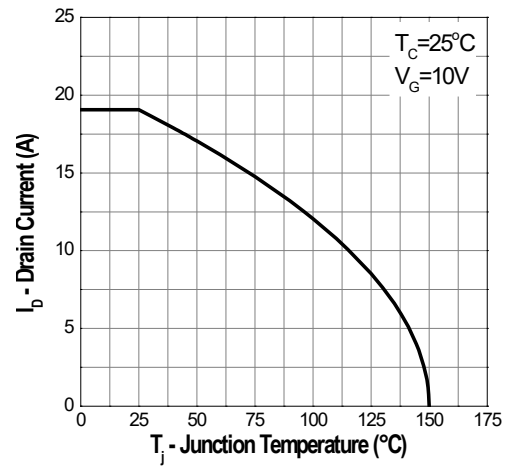


P-Channel Typical Operating Characteristics (Cont.)

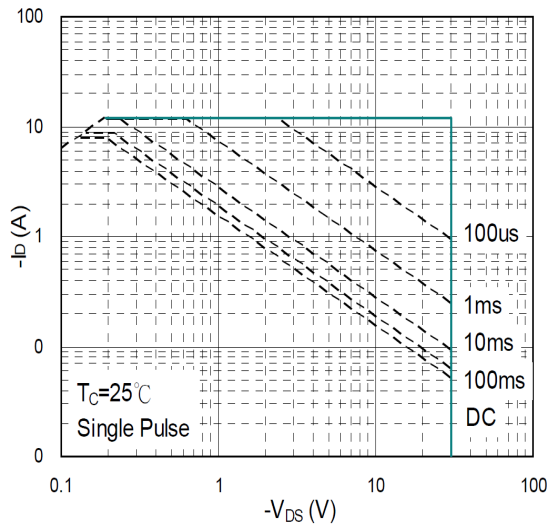
Power Dissipation



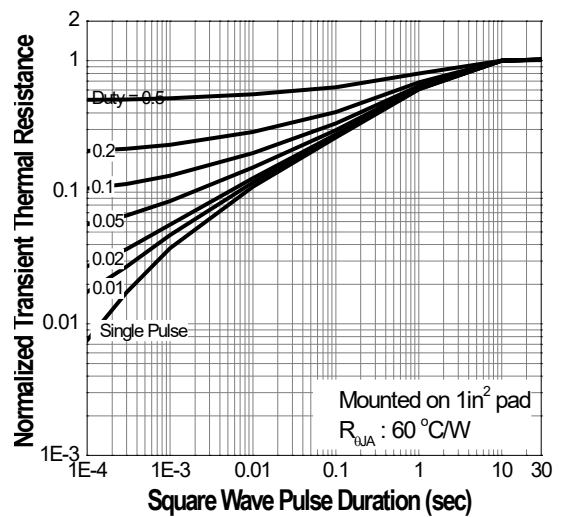
Drain Current



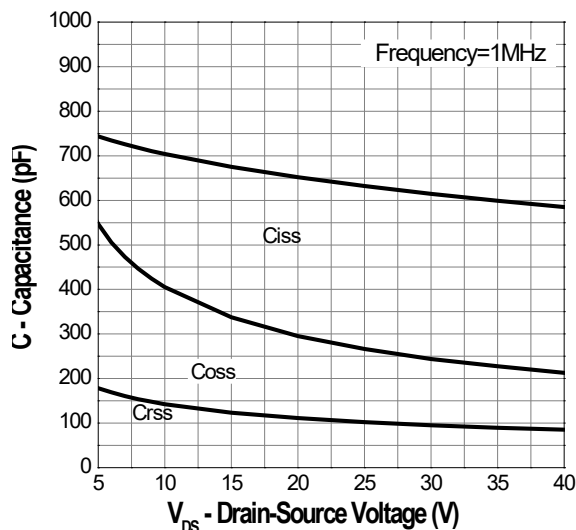
Safe Operation Area



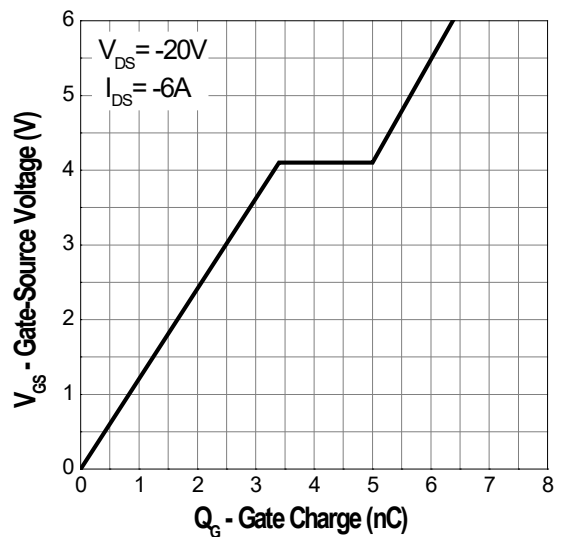
Thermal Transient Impedance



Capacitance



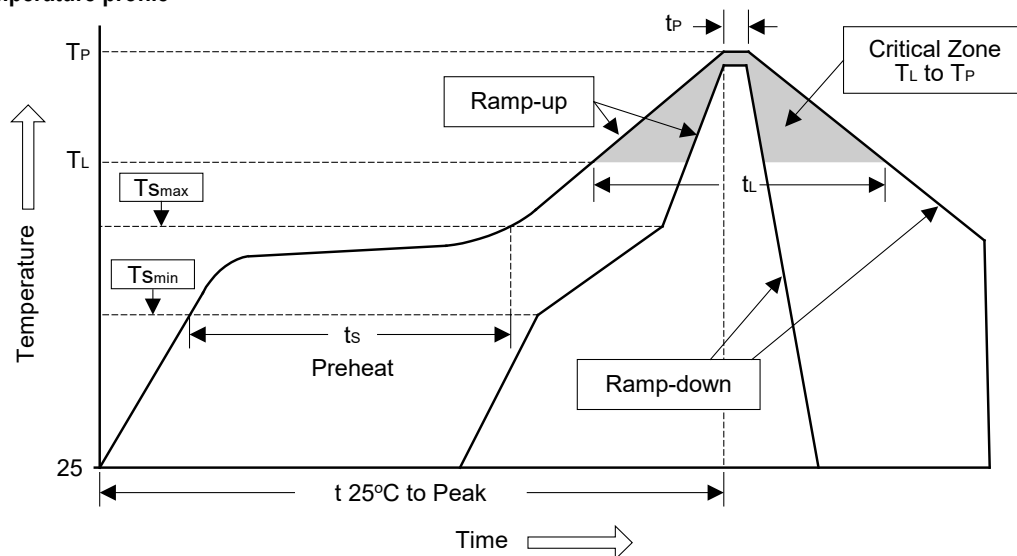
Gate Charge



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 (T _L to T _P)	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min (T _{Smin})	100°C	150°C
- Temperature Max (T _{Smax})	150°C	200°C
- Time (min to max) (ts)	60 to 120 sec	60 to 180 sec
T _{Smax} to T _L		
- Ramp-up Rate	<3°C/sec	<3°C/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°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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