

N-Channel : V_{DS} , 30V $R_{DS(ON)}$, 18mΩ (max.) @ $V_{GS}=10V$ $R_{DS(ON)}$, 28mΩ (max.) @ $V_{GS}=4.5V$ I_D , 40A	P-Channel : V_{DS} , -30V $R_{DS(ON)}$, 40mΩ (max.) @ $V_{GS}=-10V$ $R_{DS(ON)}$, 63mΩ (max.) @ $V_{GS}=-4.5V$ I_D , -27A	PDFN 5x6-8L (Dual)	
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Description	Features
The SGD3225QD 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
SGD3225QD	Halogen-Free	PDFN 5x6-8L (Dual)	QD	Tape & Reel	2,500

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	$T_C=25^{\circ}C$	I_D	40	-27	A
	$T_C=100^{\circ}C$		25	-17	A
	$T_A=25^{\circ}C$		8.9	-5.9	A
	$T_A=70^{\circ}C$		7.2	-4.7	A
Drain Current-Pulsed ^{Note 1}		I_{DM}	80	-55	A
Maximum Power Dissipation	$T_C=25^{\circ}C$	P_D	41.7		W
	$T_A=25^{\circ}C$		2		W
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	$^{\circ}C/W$

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} =15A	-	-	18	mΩ
		V _{GS} =4.5V, I _{DS} =10A	-	-	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	-	-	40	A
Pulsed Source Current	I _{SM}		-	-	80	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 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	-	-2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _{DS} =-18A	-	-	40	mΩ
		V _{GS} =-4.5V, I _{DS} =-12A	-	-	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	-	

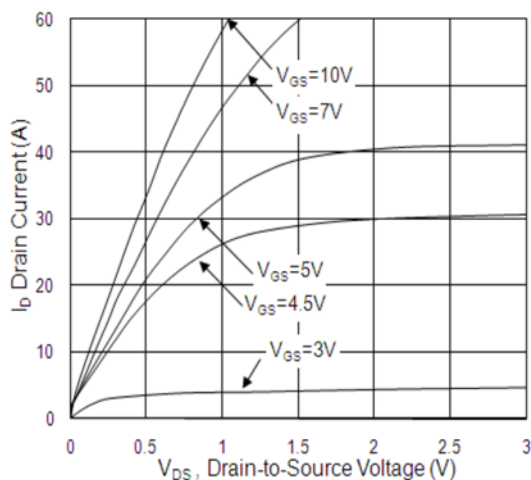
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-6A	-	-	-1.2	V
Continuous Source Current	I _S	V _G =V _D =0V, Force Current	-	-	-24	A
Pulsed Source Current	I _{SM}		-	-	-48	A
Body Diode Reverse Recovery Time	t _{rr}	I _F =10A, dI/dt=100A/μs, T _J =25°C	-	5.6	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	1.3	-	nC

Notes:

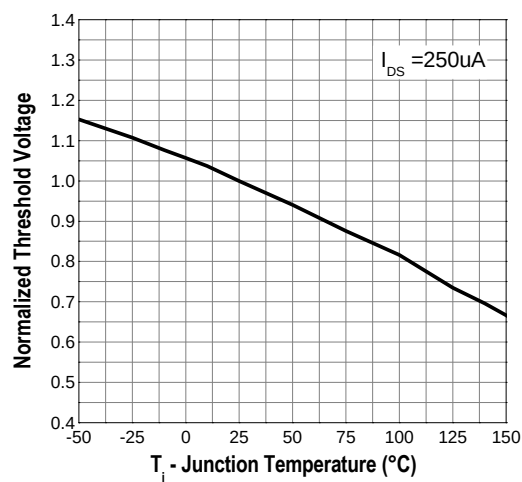
- Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
- R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{θJC} is guaranteed by design while R_{θCA} is determined by the user's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

N-Channel Typical Operating Characteristics

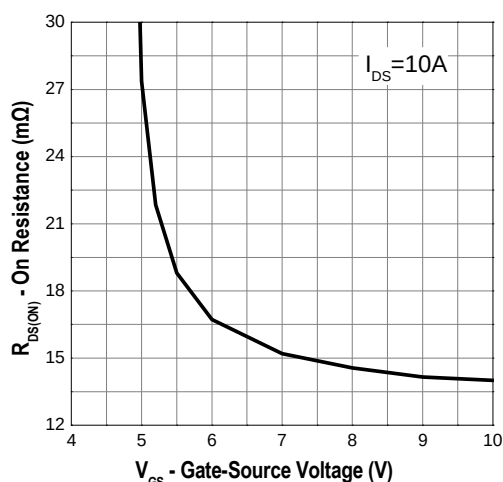
Output Characteristics



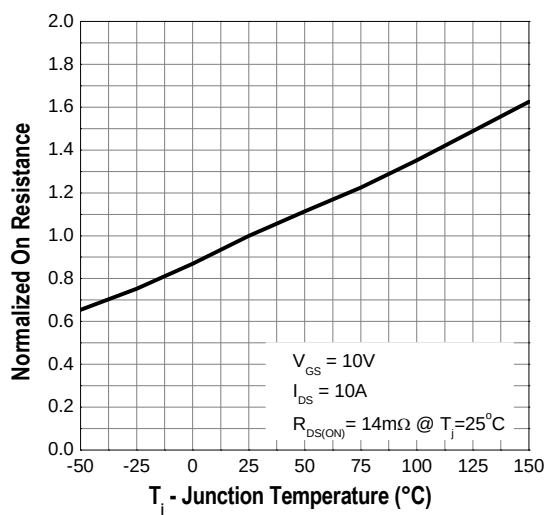
Gate Threshold Voltage



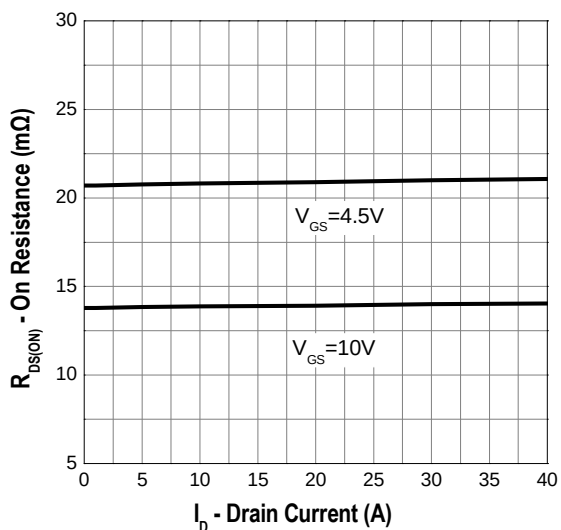
Gate-Source On Resistance



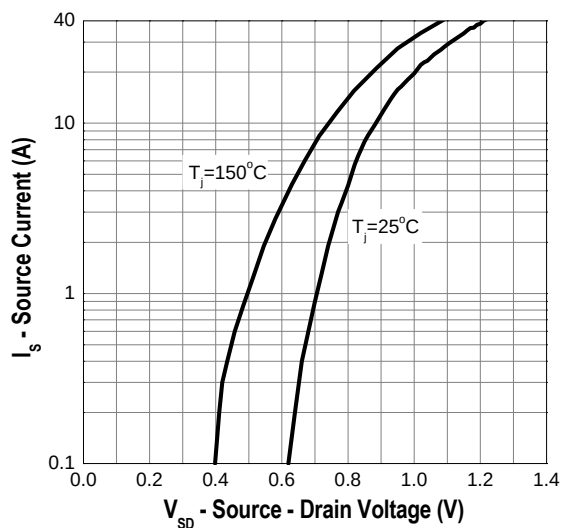
Drain-Source On Resistance



Drain-Source On Resistance

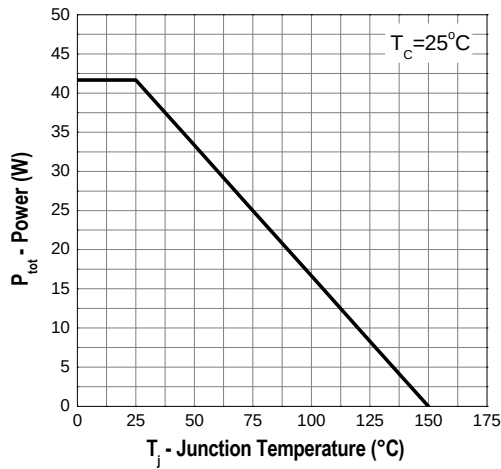


Source-Drain Diode Forward

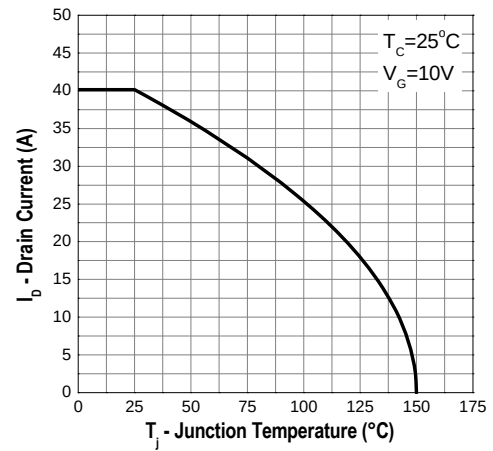


N-Channel Typical Operating Characteristics (Cont.)

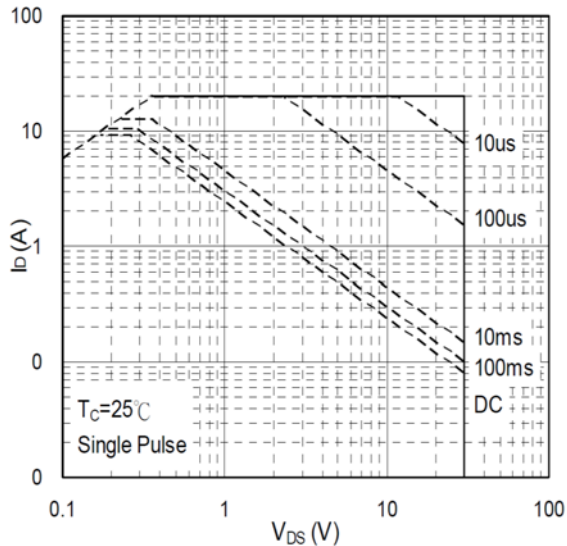
Power Dissipation



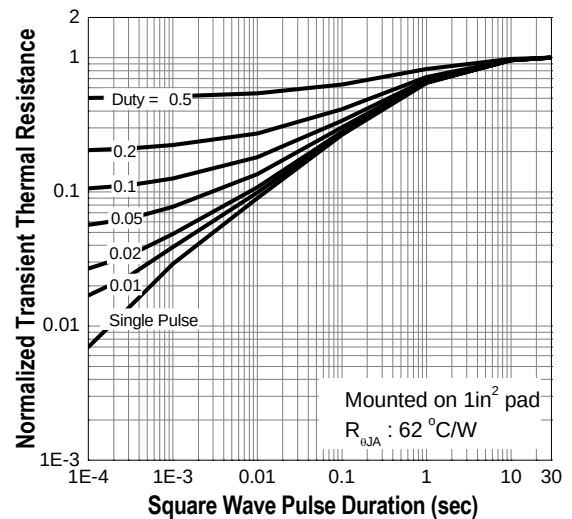
Drain Current



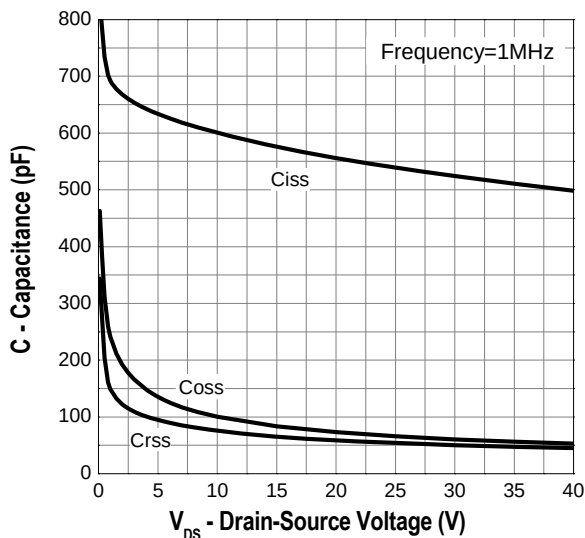
Safe Operation Area



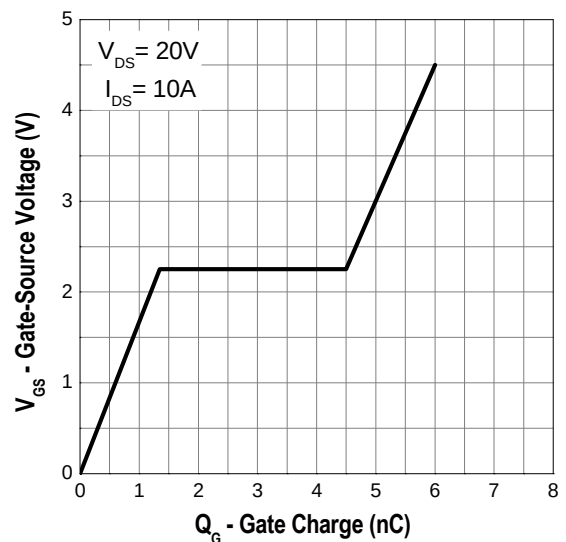
Thermal Transient Impedance



Capacitance

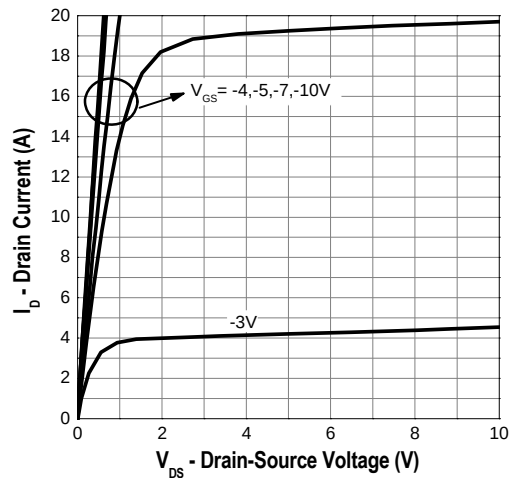


Gate Charge

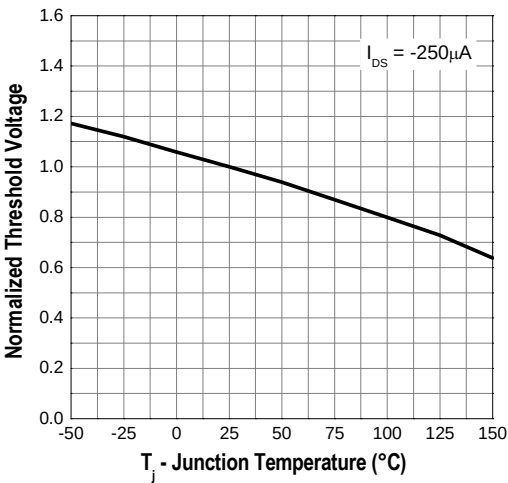


P-Channel Typical Operating Characteristics

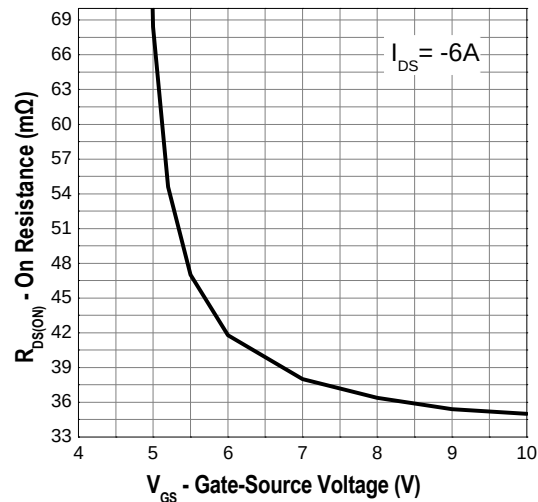
Output Characteristics



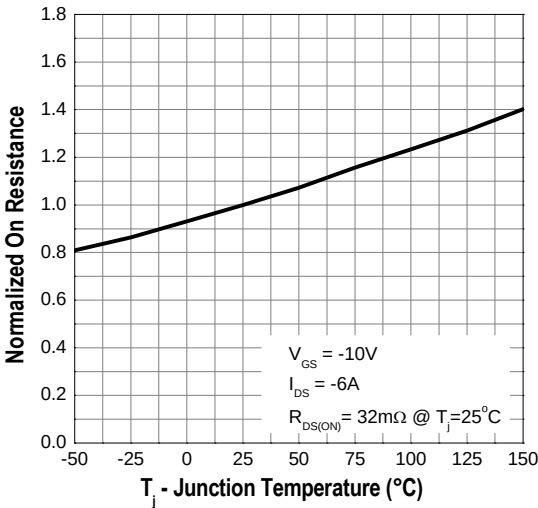
Gate Threshold Voltage



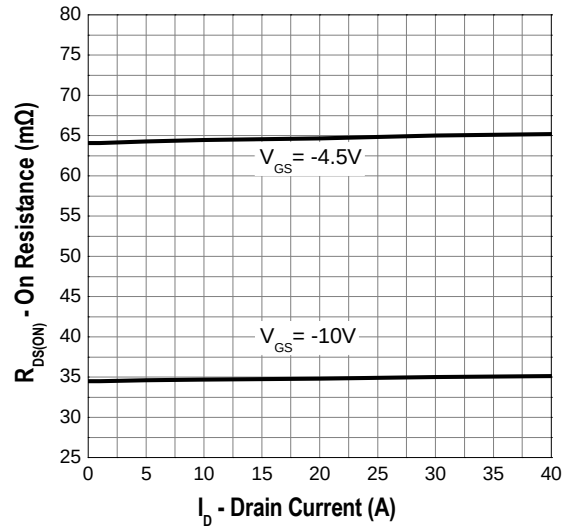
Gate-Source On Resistance



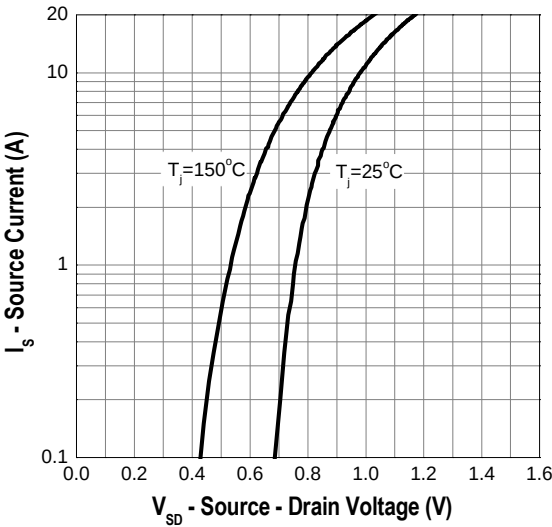
Drain-Source On Resistance



Drain-Source On Resistance

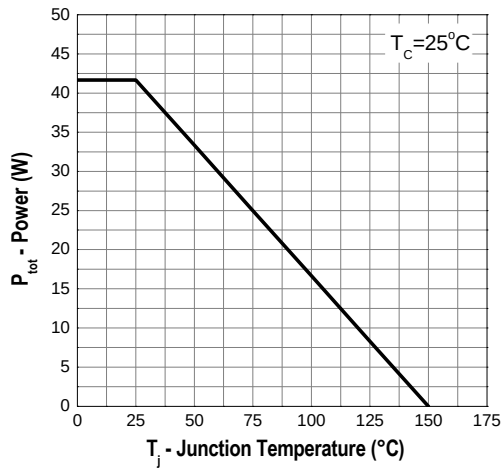


Source-Drain Diode Forward

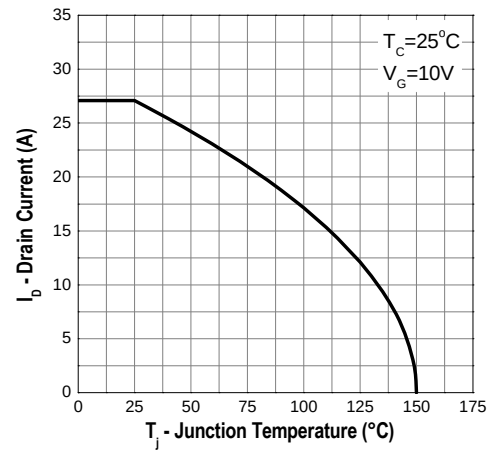


P-Channel Typical Operating Characteristics (Cont.)

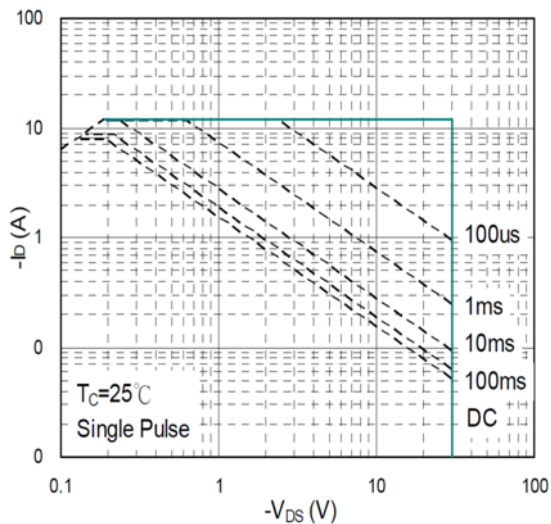
Power Dissipation



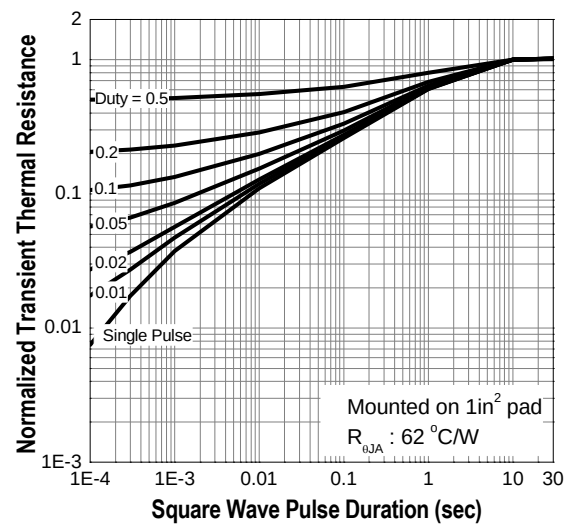
Drain Current



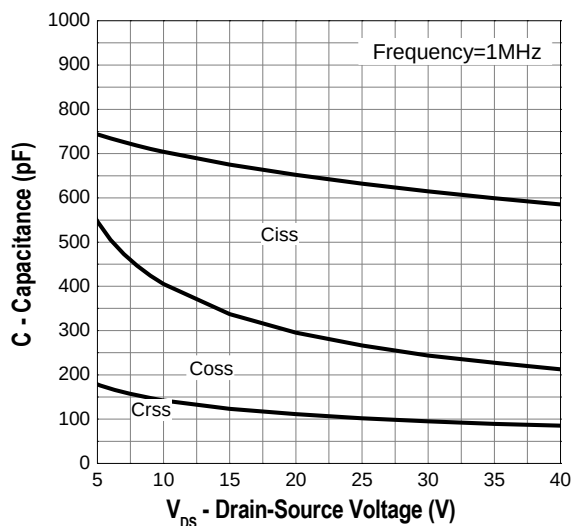
Safe Operation Area



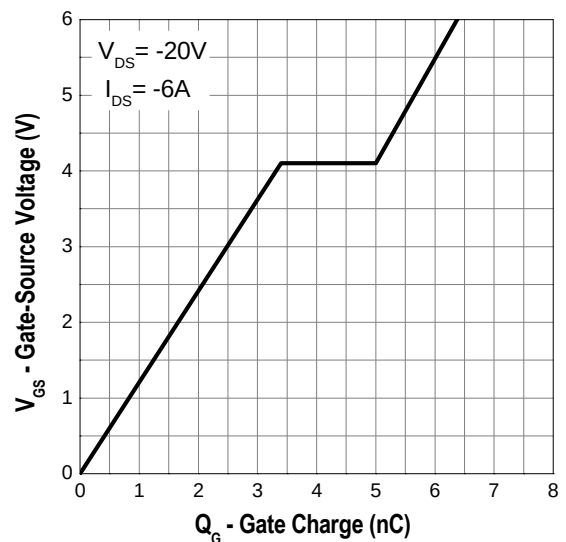
Thermal Transient Impedance



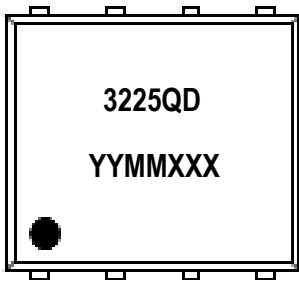
Capacitance



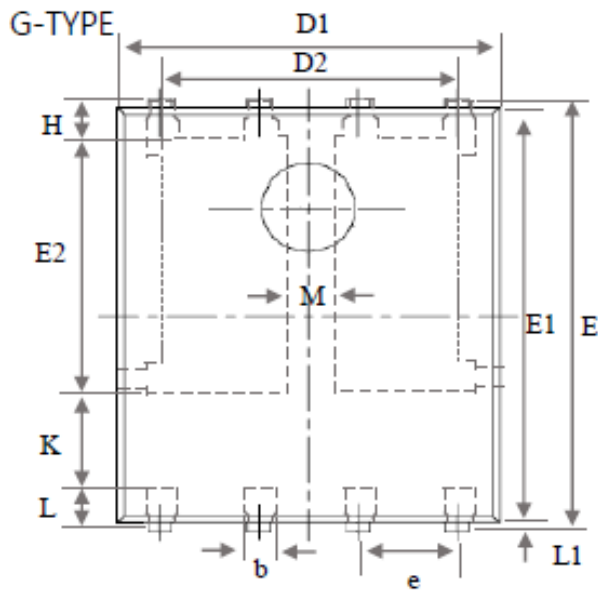
Gate Charge



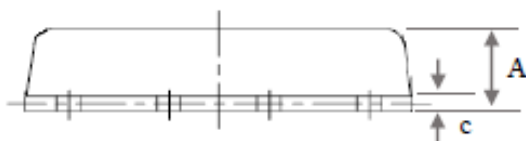
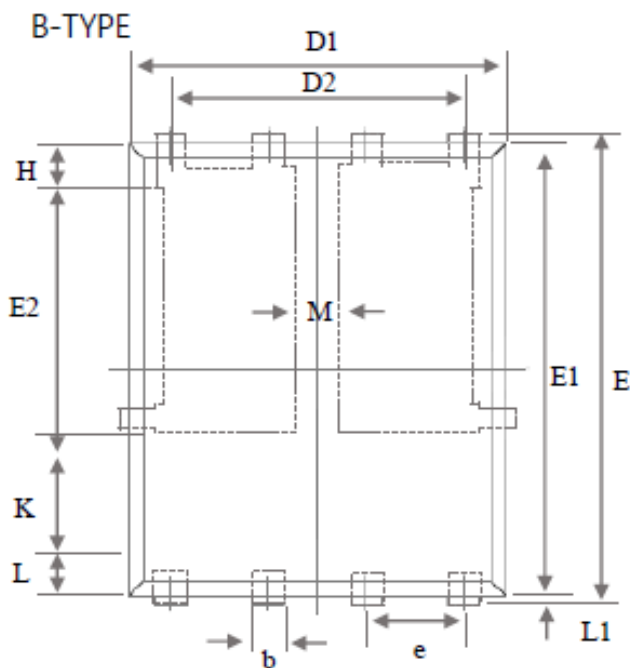
Marking Information

PDFN 5x6-8L (Dual) (QD)	Marking Rule
Laser Marking  Diagram	<u>Line 1</u> : Device 3225QD <u>Line 2</u> : Date Code YYMMXXX YY : Year Code MM : Month Code XXX : Serial Number

Package of Dimension



Symbol	Min	Nor	Max
A	0.90	1.04	1.17
b	0.33	0.42	0.51
c	0.203 BSC		
D1	4.80	4.90	5.00
D2	3.61	3.96	4.30
E	5.90	6.03	6.15
E1	5.65	5.75	5.85
E2	3.30	3.54	3.78
e	1.27 BSC		
H	0.38	0.50	0.61
K	1.10	-	-
L	0.38	0.56	0.74
L1	0.50	0.38	0.25
M	0.50	-	-

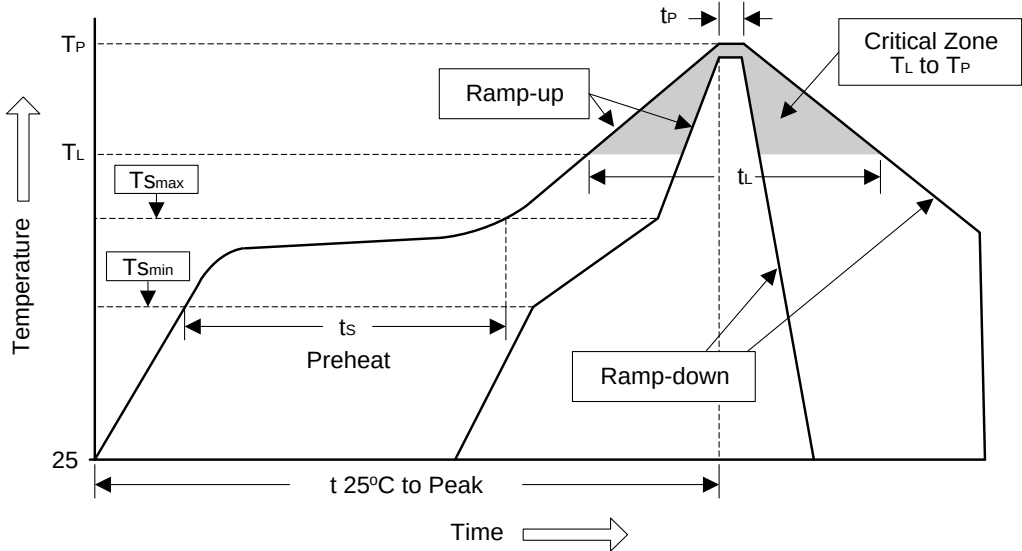


1. All dimension are in millimeters.
2. Dimension does not include burrs and mold flash/protrusions.

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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