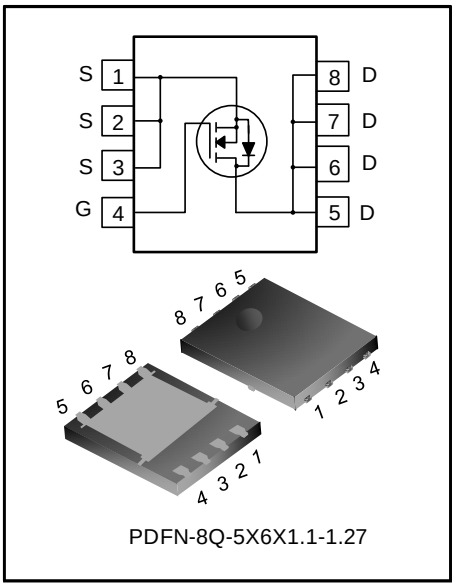
190A, 40V N-CHANNEL MOSFET

DESCRIPTION

SVGQ041R3NL5V-2HS is an N-channel enhancement mode power MOS field effect transistor which is produced using Silan's LVMOS technology. The improved process and cell structure have been especially tailored to minimize on-state resistance, provide superior switching performance and high avalanche breakdown tolerance.

This device is widely used in 12V motor control system, Start-stop micro-hybrid and so on.



PDFN-8Q-5X6X1.1-1.27

FEATURES

- Qualification in accordance with AEC-Q101
- 190A, 40V, $R_{DS(on)(typ.)}$=1.1mΩ@V_{GS}=10V
- Low gate charge
- Low Crss
- Fast switching
- Extreme dv/dt rated
- 100% avalanche tested
- Pb-free lead plating
- RoHS compliant
- Wettable flanks
- Max. junction temperature: $T_{jmax.}$=175 ºC

KEY PERFORMANCE PARAMETERS

Characteristics	Ratings	Unit
V_{DS}	40	V
$V_{GS(th)}$	2.4~3.4	V
$R_{DS(on),max}$	1.3	mΩ
I_D	190	A
$Q_{g.typ}$	68	nC

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SVGQ041R3NL5V-2HSTR	PDFN-8Q-5X6X1.1-1.27	Q41R3-2HS	Halogen free	Tape & Reel

ABSOLUTE MAXIMUM RATINGS (UNLESS OTHERWISE NOTED, T_J=25°C)

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Drain-source Voltage	V_{DS}	--	40	--	--	V
Gate-source Voltage	V_{GS}	--	-20	--	20	V
Drain Current (Note 1)	I_D	T_C=25°C	--	--	190	A
		T_C=100°C	--	--	134	A
Drain Current Pulsed (Note 2)	I_{DM}	T_C=25°C	--	--	760	A
Power Dissipation (Note 3)	P_D	T_C=25°C	--	--	125	W
Single Pulsed Avalanche Energy	E_{AS}	L=0.1mH, V_{DD}=32V, R_G=25Ω, starting temperature T_J=25°C	--	--	198	mJ
Single Pulsed Avalanche Current	I_{AS}		--	--	63	A
Single Pulsed Avalanche Energy	E_{AS}	L=0.5mH, V_{DD}=32V, R_G=25Ω, starting temperature T_J=25°C	--	--	342	mJ
Single Pulsed Avalanche Current	I_{AS}		--	--	37	A
Operation Junction Temperature Range	T_J	--	-55	--	175	°C
Storage Temperature Range	T_{stg}	--	-55	--	175	°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Thermal Resistance, Junction-case, Bottom	$R_{\theta JC}$	--	--	--	1.2	°C/W
Thermal Resistance, Junction-ambient	$R_{\theta JA}$	--	--	--	50	°C/W
Soldering Temperature(SMD)	T_{sold}	Reflow soldering: 10±1 sec, 3times	--	--	260	°C

ELECTRICAL CHARACTERISTICS (UNLESS OTHERWISE NOTED, T_J=25°C)

Static characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Drain-source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250μA	40	--	--	V
Drain-source Leakage Current	I_{DSS}	V_{DS}=40V, V_{GS}=0V, T_J=25°C	--	--	1.0	μA
		V_{DS}=40V, V_{GS}=0V, T_J=125°C	--	1.5	--	
Gate-source Leakage Current	I_{GSS}	V_{GS}=±20V, V_{DS}=0V	--	--	±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_D=250μA	2.4	--	3.4	V
Static Drain-source On State Resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=50A	--	1.1	1.3	mΩ
Gate Resistance	R_g	f=1MHz	--	2.8	--	Ω

Dynamic characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Input Capacitance	C_{iss}	f=1MHz, V_{GS}=0V, V_{DS}=20V	--	5090	--	pF
Output Capacitance	C_{oss}		--	2020	--	
Reverse Transfer Capacitance	C_{rss}		--	135	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V, V_{GS}=10V, R_G=4.7Ω, I_D=50A (Notes 4, 5)	--	29	--	ns
Turn-on Rise Time	t_r		--	63	--	
Turn-off Delay Time	$t_{d(off)}$		--	56	--	
Turn-off Fall Time	t_f		--	32	--	
Total Gate Charge	Q_g	V_{DD}=20V, V_{GS}=10V, I_D=50A (Notes 4, 5)	--	68	--	nC
Gate-source Charge	Q_{gs}		--	35	--	
Gate-drain Charge	Q_{gd}		--	7.0	--	
Gate-plateau Voltage	$V_{plateau}$		--	6.4	--	V

Reverse diode characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Continuous Diode Forward Current	I_S	Integral reverse P-N junction diode in the MOSFET	--	--	190	A
Diode Pulse Current	$I_{S,pulse}$		--	--	760	
Source-Drain Diode Voltage Drop	V_{SD}	I_S=100A, V_{GS}=0V	--	--	1.4	V
Reverse Recovery Time	T_{rr}	I_S=37.5A, V_{GS}=0V, V_R=40V dI$_F$/dt=100A/μs (Note 4)	--	61	--	ns
Reverse Recovery Charge	Q_{rr}		--	62	--	nC

Notes:

1. The rated value only refers to the maximum absolute value at the case temperature of 25°C in the specification. If the case temperature is higher than 25°C, it should be derated according to the actual environmental conditions;
2. Pulse time 5μs;
3. The dissipation power will change with temperature, derating above 25°C: 0.83W/°C;
4. Pulse Test: Pulse width ≤300μs, Duty cycle≤2%;
5. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

Figure 1. Output Characteristics

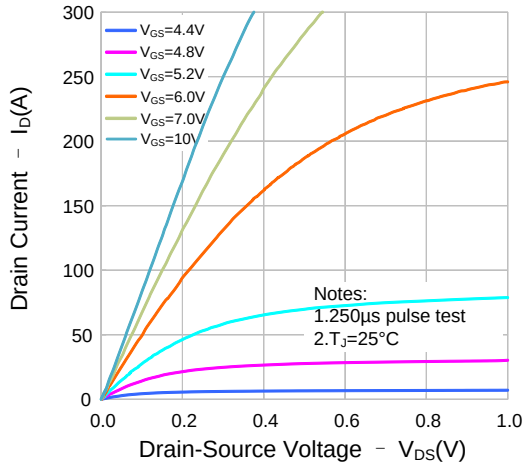


Figure 2. Transfer Characteristics

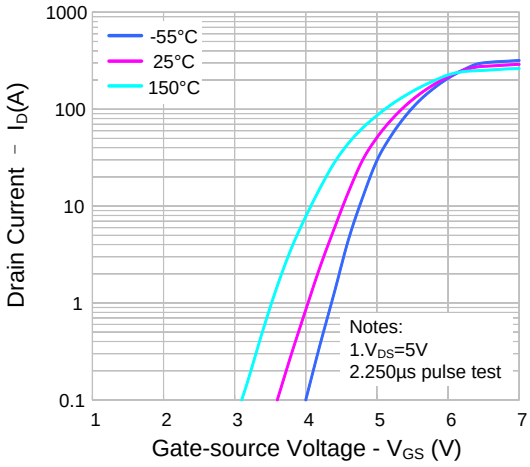


Figure 3. On-resistance vs. Drain Current

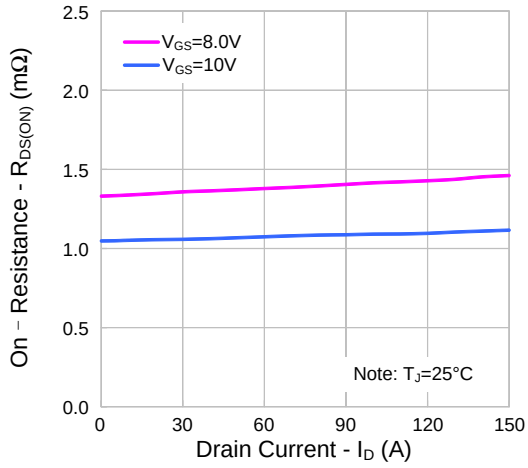


Figure 4. On-resistance vs. Gate-source Voltage

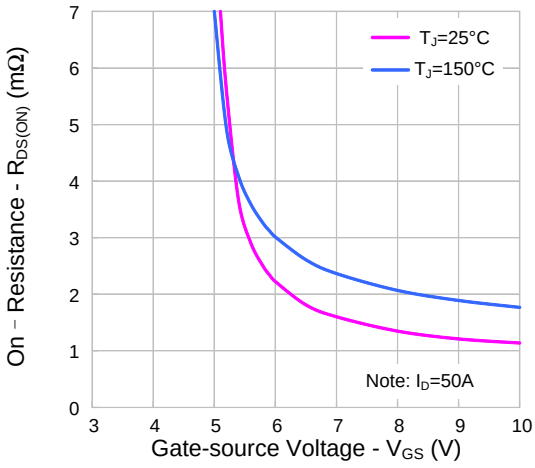


Figure 5. Gate-source Turn-on Voltage vs. Temperature characteristics

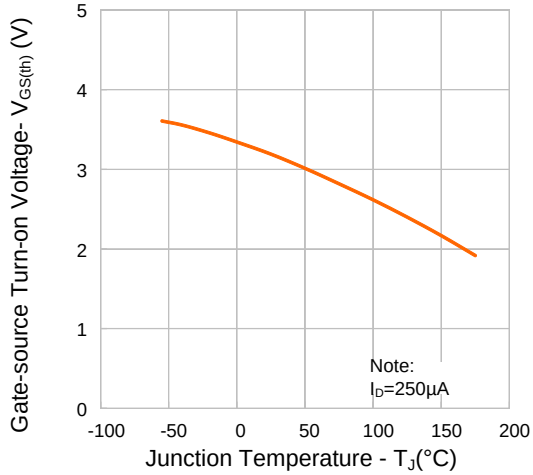
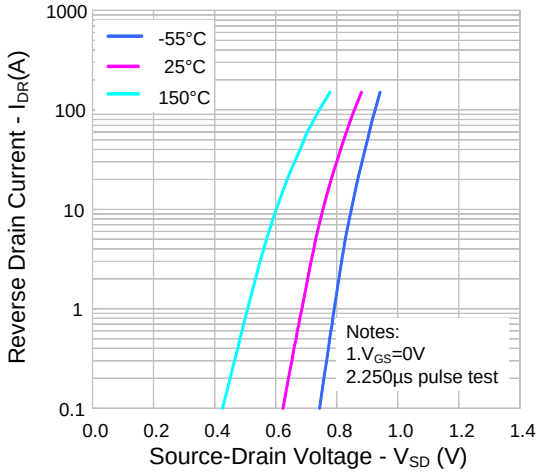


Figure 6. Body Diode Forward Voltage Variation vs. Source Current and Temperature



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 7. Capacitance Characteristics

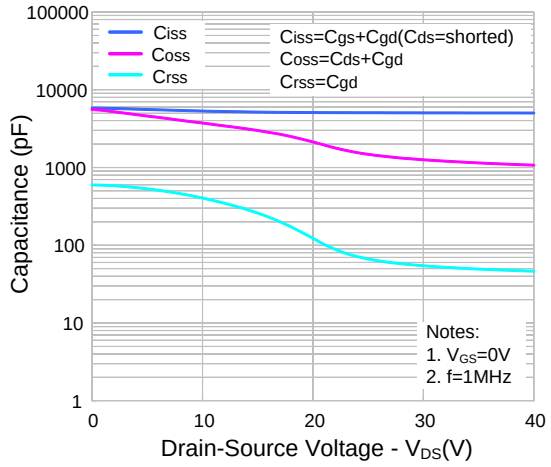


Figure 8. Gate Charge

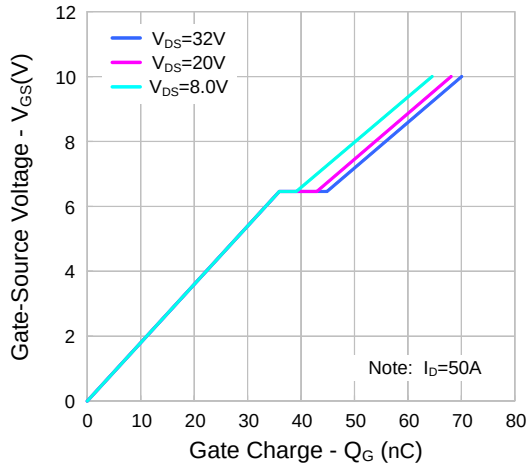


Figure 9. Breakdown Voltage Variation vs. Temperature

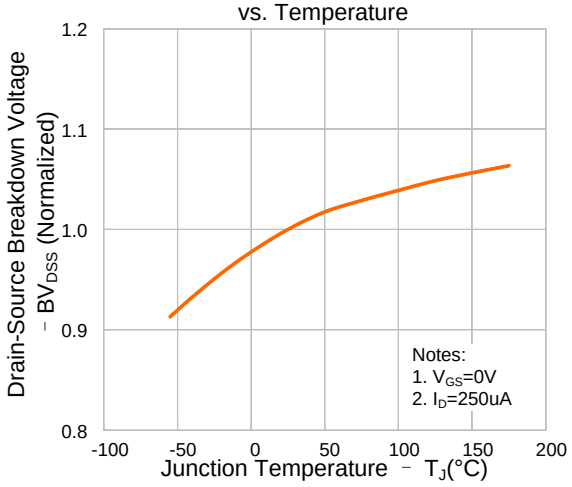


Figure 10. On-resistance Variation vs. Temperature

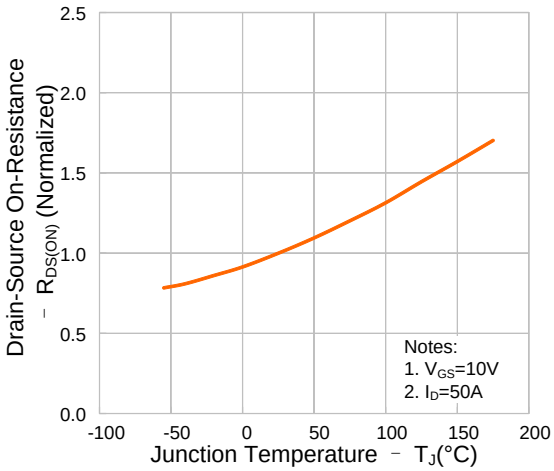


Figure 11. Max. Safe Operating Area

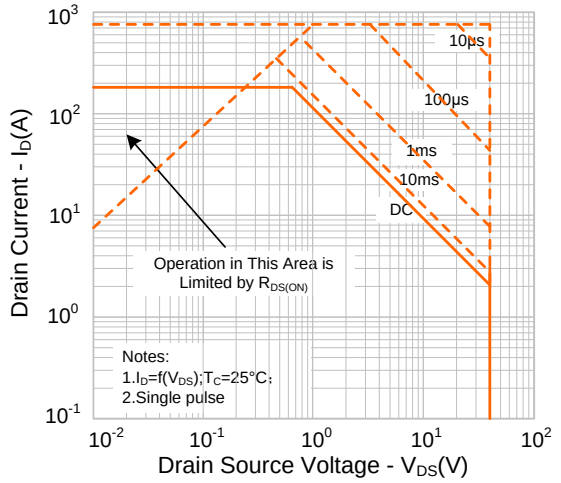
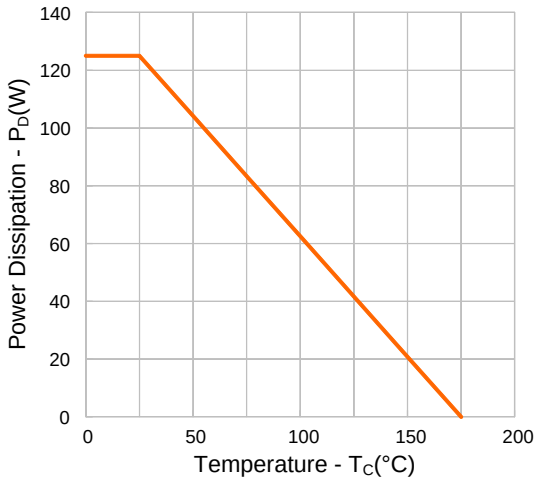


Figure 12. Power Dissipation vs. Case Temperature



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 13. Drain Current vs. Case Temperature

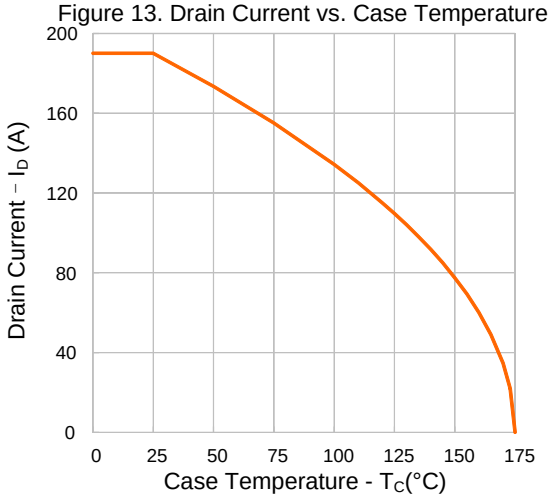
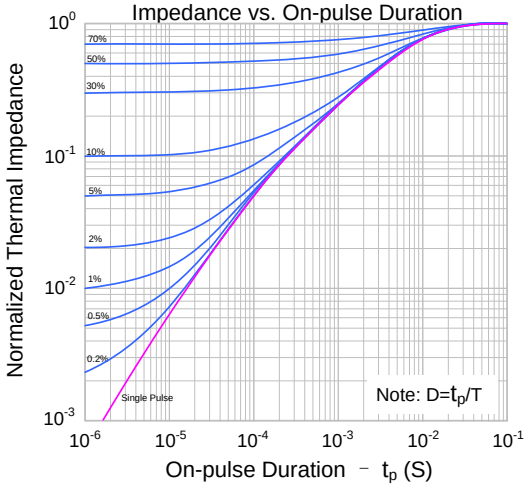
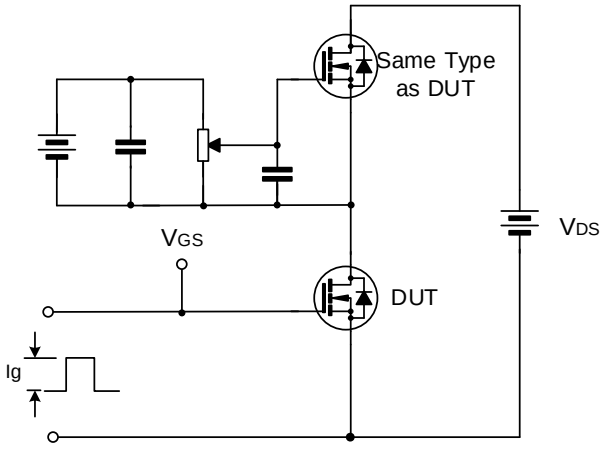


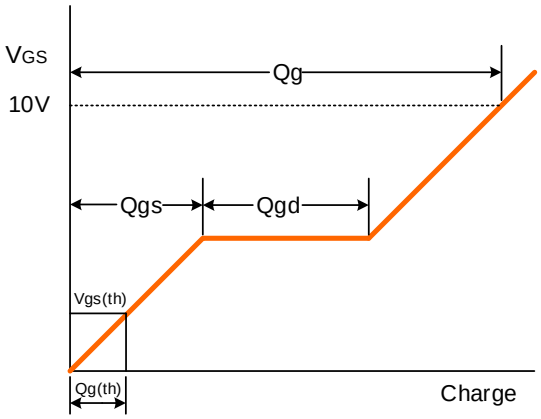
Figure 14. Transient Thermal Impedance vs. On-pulse Duration



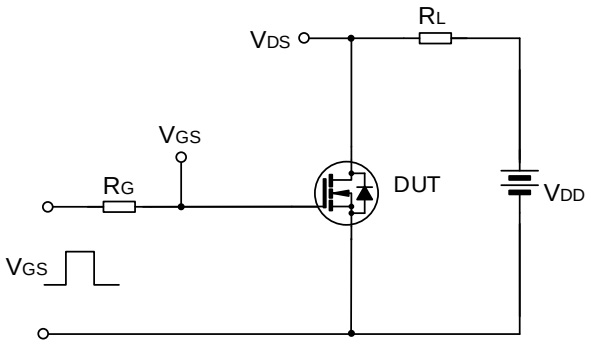
TYPICAL TEST CIRCUIT

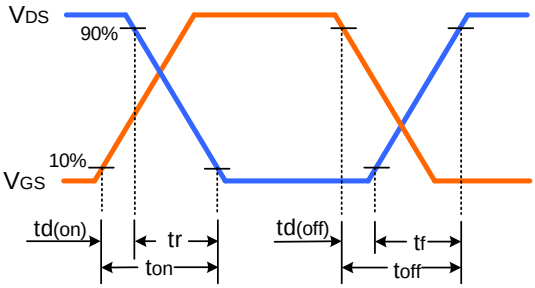
Gate Charge Test Circuit & Waveform



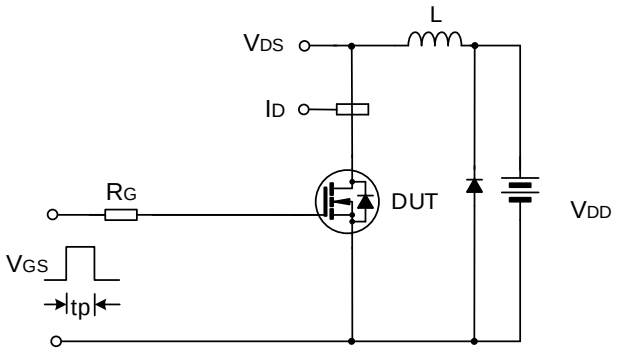


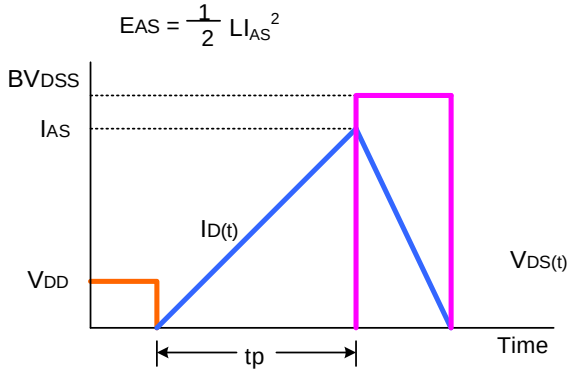
Resistive Switching Test Circuit & Waveform





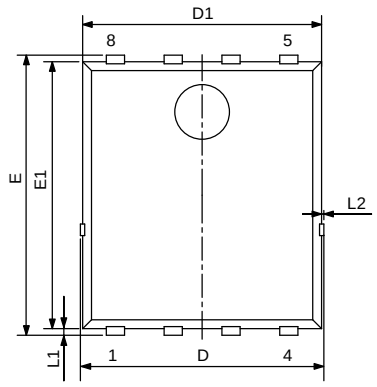
Unclamped Inductive Switching Test Circuit & Waveform



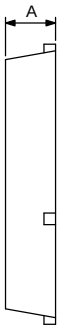


PACKAGE OUTLINE

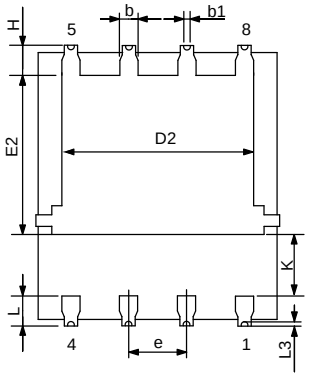
PDFN-8Q-5X6X1.1-1.27 **UNIT: mm**



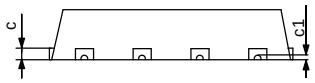
Top View



Side View



Bottom View



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.00	1.10	1.20
b	0.35	0.40	0.55
b1	0.05	—	—
c	0.21	0.25	0.34
c1	0.05	—	—
D	—	—	5.10
D1	4.80	4.90	5.00
D2	4.11	4.21	4.31
e	1.17	1.27	1.37
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.52	3.62	3.72
K	1.10	—	—
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
L2	—	—	0.10
L3	0.03	—	—
H	0.38	0.48	0.58

MOS DEVICES OPERATE NOTES:

Electrostatic charges may exist in many things. Please take following preventive measures to prevent effectively the MOS electric circuit as a result of the damage which is caused by discharge:

- The operator must put on wrist strap which should be earthed to against electrostatic.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed in antistatic/conductive containers for transportation.

Important notice:

1. Silan reserves the right to make changes of this instruction without notice.
2. Customers should obtain the latest relevant information when purchasing and should verify whether such information is latest and complete. Please read this instruction and application manual and related materials carefully before using products, including the circuit operation precautions, etc.
3. Silan does not give any warranties as to the suitability of the Silan's product for any specific use. The design intent, design definition and design of the product are not intended for application (the application stated in this instruction includes use, etc.) in medical equipment, life-saving equipment, aerospace equipment, non-civil equipment or non-civil use, etc. (the equipment stated in this instruction includes systems, devices, etc., all referred to as equipment),.The product should not be used in any equipment or system whose manufacture, use or sale is prohibited under any applicable laws or regulations ("unintended use"). If the product is used for unintended use, therefore the full risks of such products application are borne by the customer and Silan assumes no liability for the product used for the unintended use. If the customer intends to use the Silan's product in a application where malfunction or failure can be reasonably be expected to result in personal injury, or serious property, or environment damage, the customer shall make adequate assessment, testing and verification, and Silan shall not be liable for such applications.
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8. Product promotion is endless, our company will wholeheartedly provide customers with better products!
9. Website: http: //www.silan.com.cn

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Rev.: 1.3

Revision History:

1. Delete wave soldering condition
2. Update the typical test circuit

Rev.: 1.2

Revision History:

1. Add description of “Qualification in accordance with AEC-Q101”;
2. Modify the important notice.
3. Modify the package outline

Rev.: 1.1

Revision History:

1. Add E_{AS} and I_{AS} when L=0.1mH

Rev.: 1.0

Revision History:

1. First release