

5A, 650V SUPER JUNCTION MOS POWER TRANSISTOR

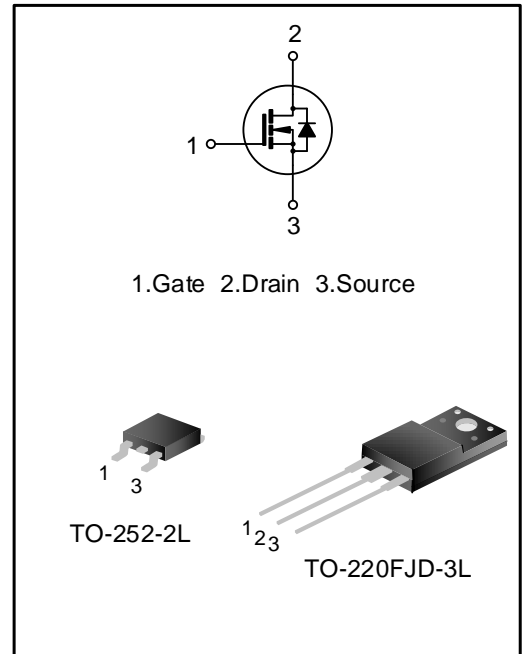
DESCRIPTION

SVS65R960D(FJD)D4 is an N-channel enhancement mode high voltage power MOSFETs produced using Silan's super junction MOS technology. It achieves low conduction loss and switching losses. It leads the design engineers to their power converters with high efficiency, high power density, and superior thermal behavior.

Furthermore, it's universal applicable, i.e., suitable for hard and soft switching topologies.

FEATURES

- ◆ 5A, 650V, $R_{DS(on)(typ.)}=0.8\Omega@V_{GS}=10V$
- ◆ New revolutionary high voltage technology
- ◆ Ultra low gate charge
- ◆ Periodic avalanche rated
- ◆ Extreme dv/dt rated
- ◆ High peak current capability
- ◆ 100% avalanche tested
- ◆ Pb-free lead plating
- ◆ RoHS compliant



KEY PERFORMANCE PARAMETERS

Characteristics	Ratings	Unit
$V_{DS}@T_J,max$	700	V
$V_{GS(th)}$	2.0~4.0	V
$R_{DS(on), max.}$	0.96	Ω
$I_{D,pulse}$	20	A
$Q_g,typ.$	9.8	nC

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SVS65R960DD4TR	TO-252-2L	65R960D4	Halogen free	Tape & Reel
SVS65R960FJDD4	TO-220FJD-3L	65R960D4	Halogen free	Tube

ABSOLUTE MAXIMUM RATINGS (UNLESS OTHERWISE NOTED, $T_J=25^{\circ}\text{C}$)

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Gate-source Voltage (Static)	V_{GS}	--	-20	--	20	V
Gate-source Voltage (Dynamic)	V_{GS}	AC($f>1\text{Hz}$)	-30	--	30	V
Drain Current	I_D	$T_C=25^{\circ}\text{C}$	--	--	5.0	A
		$T_C=100^{\circ}\text{C}$	--	--	3.2	A
Drain Current Pulsed (Note 1)	I_{DM}	$T_C=25^{\circ}\text{C}$	--	--	20	A
Power Dissipation (Note 2) (TO-252-2L)	P_D	$T_C=25^{\circ}\text{C}$	--	--	59	W
Power Dissipation (Note 2) (TO-220FJD-3L)	P_D	$T_C=25^{\circ}\text{C}$	--	--	20	W
Single Pulsed Avalanche Energy	E_{AS}	$L=79\text{mH}$, $V_{DD}=100\text{V}$, $R_G=25\Omega$, starting temperature $T_J=25^{\circ}\text{C}$	--	--	89	mJ
Single Pulsed Current	I_{AS}	--	--	--	1.4	A
Reverse Diode dv/dt	dv/dt	$V_{DS}=0\sim 400\text{V}$, $I_{SD}\leq I_S$, $T_J=25^{\circ}\text{C}$	--	--	15	V/ns
MOS dv/dt Ruggedness	dv/dt	$V_{DS}=0\sim 480\text{V}$	--	--	50	V/ns
Operation Junction Temperature Range	T_J	--	-55	--	150	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	--	-55	--	150	$^{\circ}\text{C}$
Continuous Diode Forward Current	I_S	$T_C=25^{\circ}\text{C}$, integral reverse P-N junction diode in the MOSFET	--	--	5.0	A
Diode Pulse Current	$I_{S,pulse}$		--	--	20	A
Maximum Diode Commutation Speed	di/dt	$V_{DS}=0\sim 400\text{V}$, $I_{SD}\leq I_S$, $T_J=25^{\circ}\text{C}$	--	--	500	A/ μs

THERMAL CHARACTERISTICS

Table 1. TO-252-2L (SVS65R960DD4) thermal characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Thermal Resistance, Junction-case, Bottom	$R_{\theta JC}$	--	--	--	2.12	°C/W
Thermal Resistance, Junction-ambient	$R_{\theta JA}$	--	--	--	62.0	°C/W
Soldering Temperature (SMD)	T_{sold}	Reflow soldering: 10 ± 1 sec, 3times	--	--	260	°C

Table 2. TO-220FJD-3L (SVS65R960FJDD4) thermal characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Thermal Resistance, Junction-case, Bottom	$R_{\theta JC}$	--	--	--	6.25	°C/W
Thermal Resistance, Junction-ambient	$R_{\theta JA}$	--	--	--	62.5	°C/W
Soldering Temperature (in line)	T_{sold}	15^{+2}_{-0} sec, 1time	--	--	260	°C

ELECTRICAL CHARACTERISTICS (UNLESS OTHERWISE NOTED, $T_J=25^{\circ}\text{C}$)
Static characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Drain-source Breakdown Voltage	V_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650	--	--	V
Drain-source Leakage Current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V, T_J=25^{\circ}\text{C}$	--	--	1.0	μA
		$V_{DS}=650V, V_{GS}=0V, T_J=125^{\circ}\text{C}$	--	1.0	--	
Gate-source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	--	--	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2.0	--	4.0	V
Static Drain-source On State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=2.5A, T_J=25^{\circ}\text{C}$	--	0.8	0.96	Ω
		$V_{GS}=10V, I_D=2.5A, T_J=150^{\circ}\text{C}$	--	2.0	--	
Gate Resistance	R_G	$f=1\text{MHz}$	--	3.4	--	Ω

Dynamic characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Input Capacitance	C_{iss}	$f=1\text{MHz}, V_{GS}=0V, V_{DS}=100V$	--	302	--	pF
Output Capacitance	C_{oss}		--	14	--	
Reverse Transfer Capacitance	C_{rss}		--	0.62	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=325V, V_{GS}=10V,$ $R_G=24\Omega, I_D=5.0A$ (Notes 3, 4)	--	8.8	--	ns
Turn-on Rise Time	t_r		--	25	--	
Turn-off Delay Time	$t_{d(off)}$		--	18	--	
Turn-off Fall Time	t_f		--	22	--	
Total Gate Charge	Q_g	$V_{DD}=520V, V_{GS}=10V, I_D=5.0A$ (Notes 3, 4)	--	9.8	--	nC
Gate-source Charge	Q_{gs}		--	3.2	--	
Gate-drain Charge	Q_{gd}		--	5.0	--	
Gate-plateau Voltage	$V_{plateau}$		--	7.6	--	V

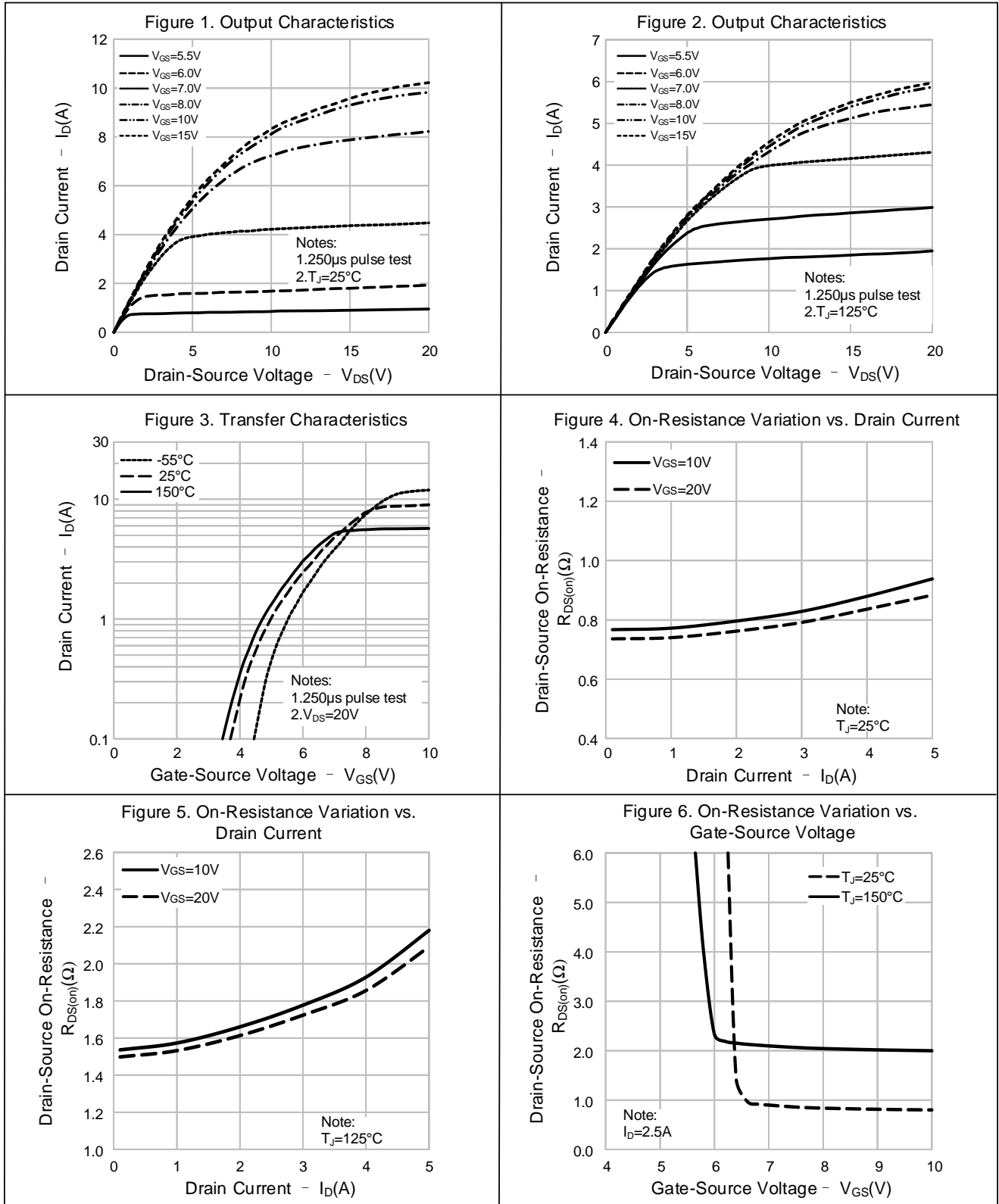
Reverse diode characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_{SD}	$I_S=5.0A, V_{GS}=0V$	--	--	1.4	V
Reverse Recovery Time	T_{rr}	$I_S=5.0A, V_{GS}=0V, V_R=50V,$ $di_F/dt=100A/\mu s$ (Note 3)	--	207	--	ns
Reverse Recovery Charge	Q_{rr}		--	1.63	--	μC
Reverse Recovery Peak Current	I_{rrm}		--	14	--	A

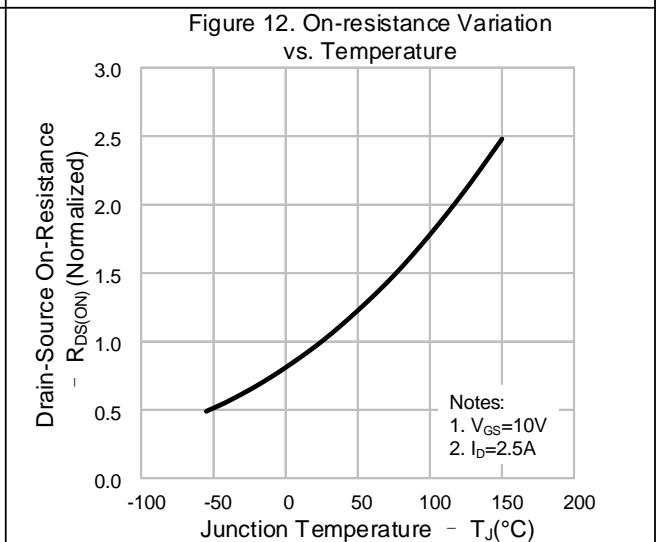
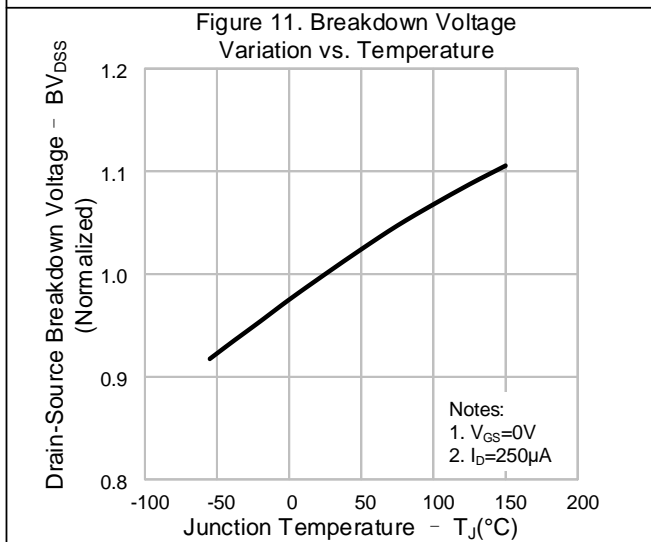
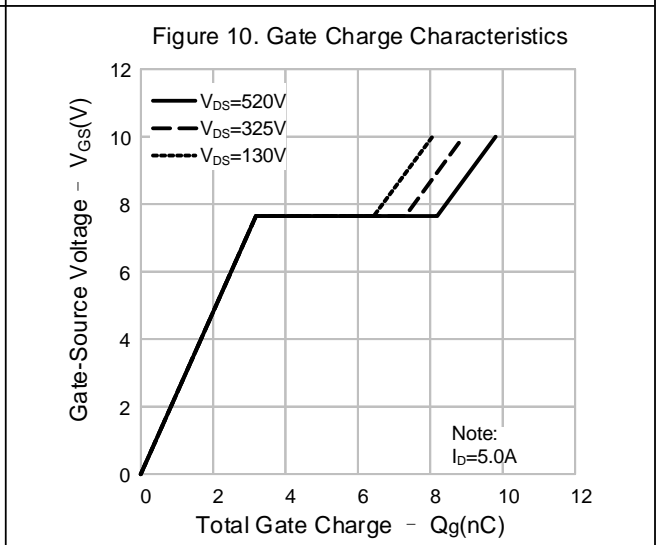
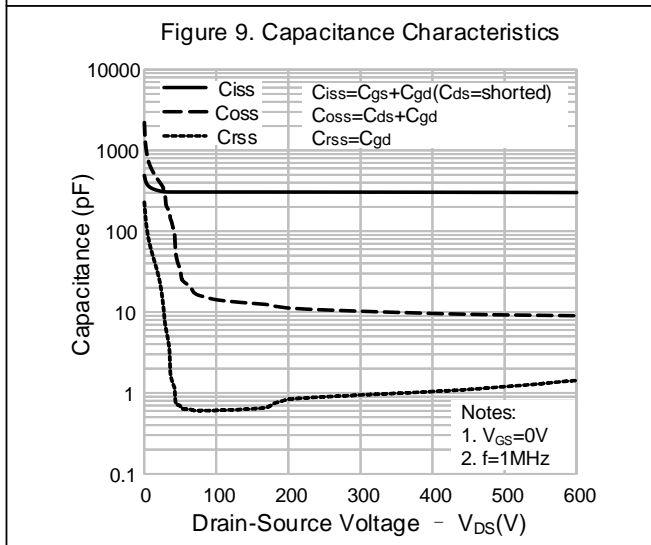
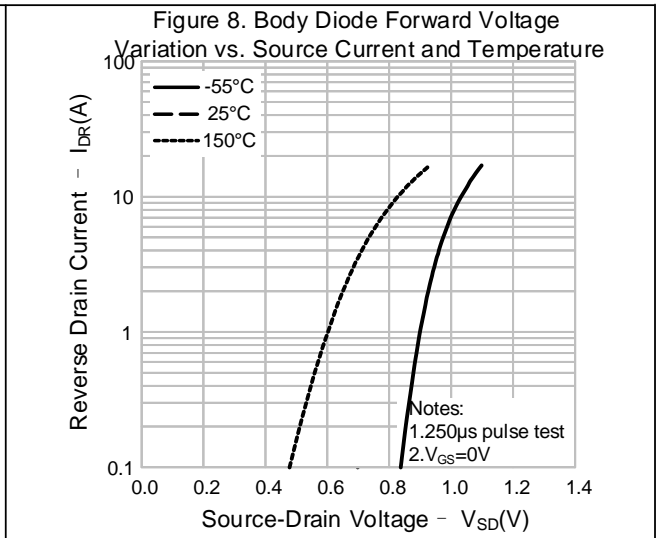
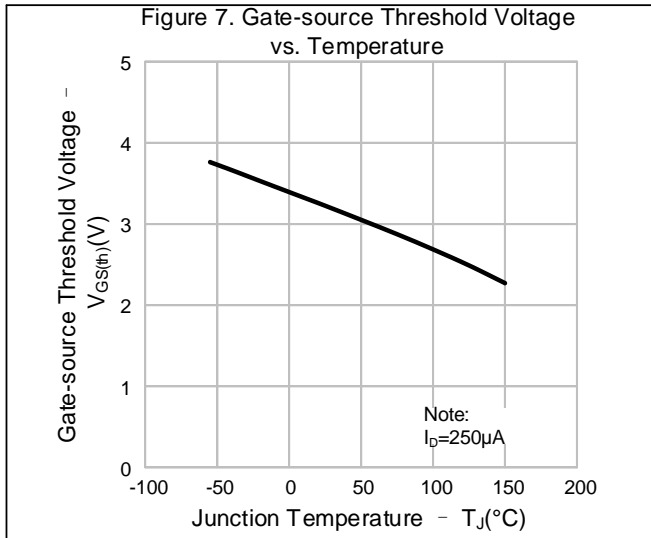
Notes:

- Pulse time $5\mu s$;
- The dissipation power will change with temperature, derating above 25°C :
 $0.47W/^{\circ}\text{C}(\text{TO-252-2L})/0.16W/^{\circ}\text{C}(\text{TO-220FJD-3L})$;
- Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$;
- Essentially independent of operating temperature.

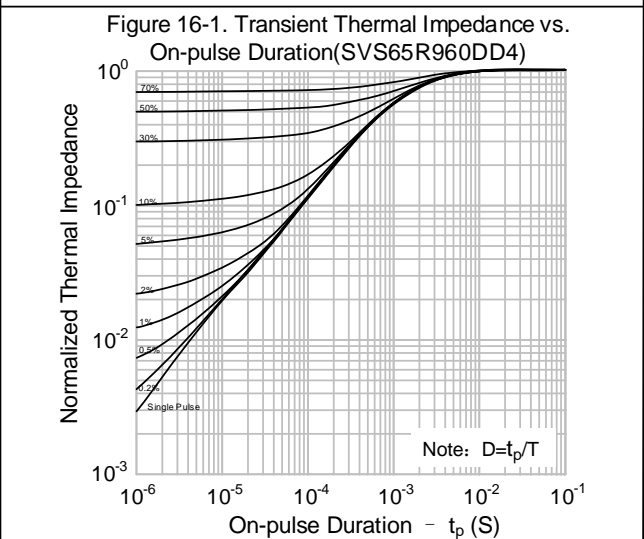
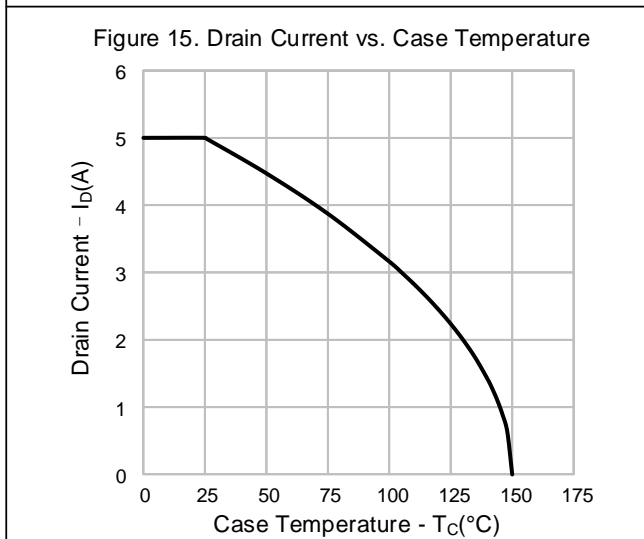
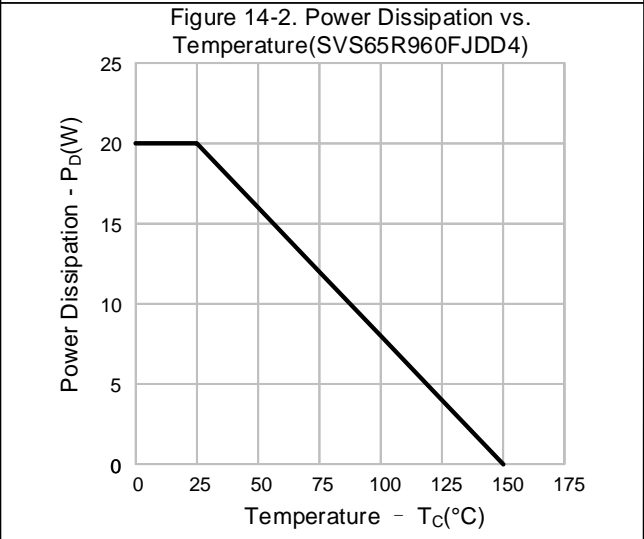
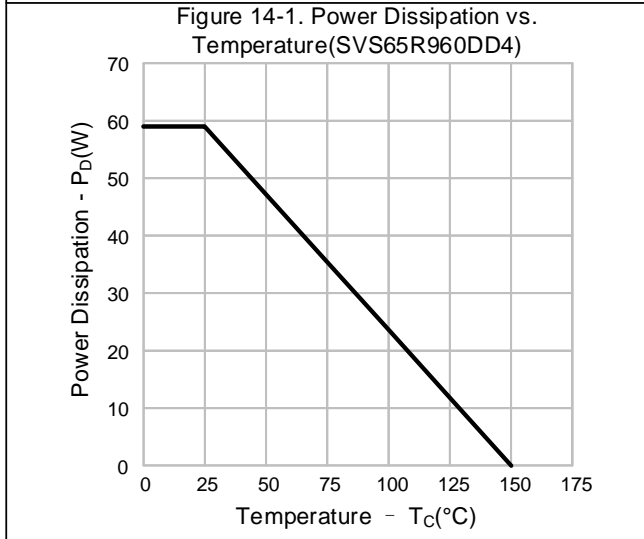
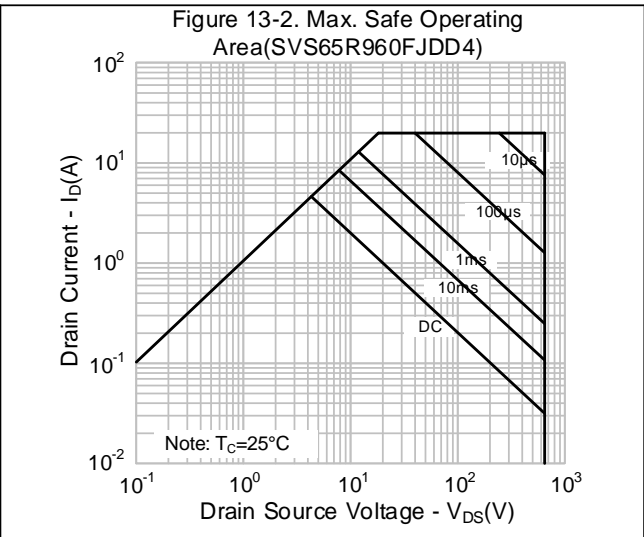
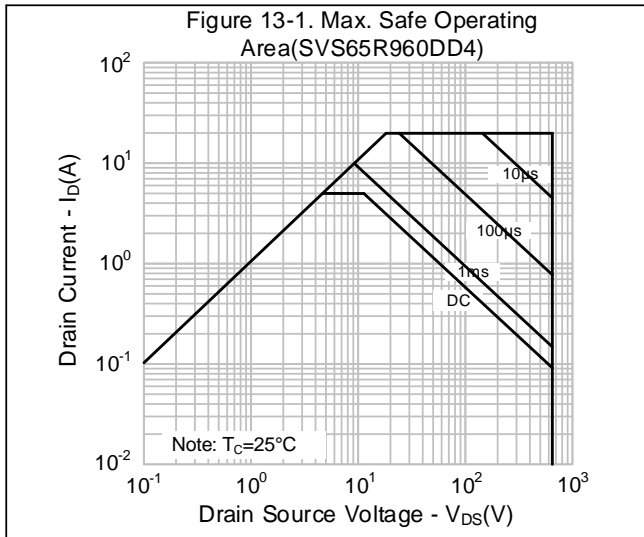
TYPICAL CHARACTERISTICS



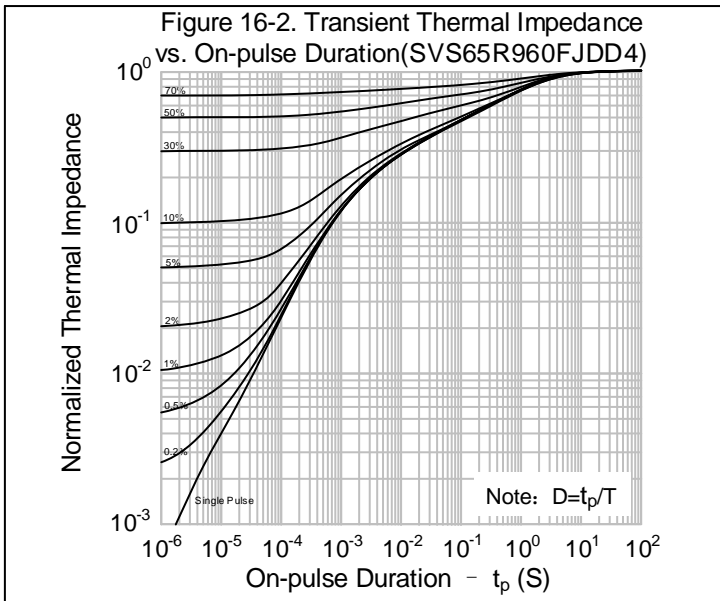
TYPICAL CHARACTERISTICS (CONTINUED)



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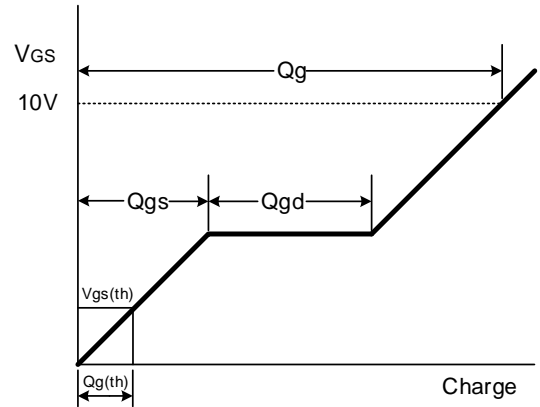
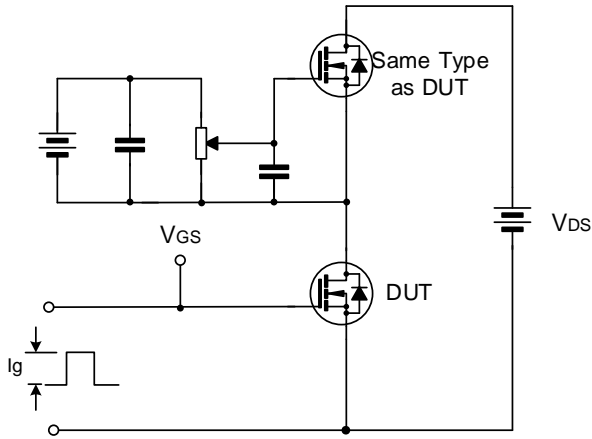


TYPICAL CHARACTERISTICS (CONTINUED)

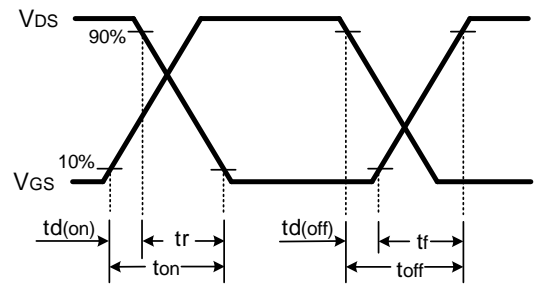
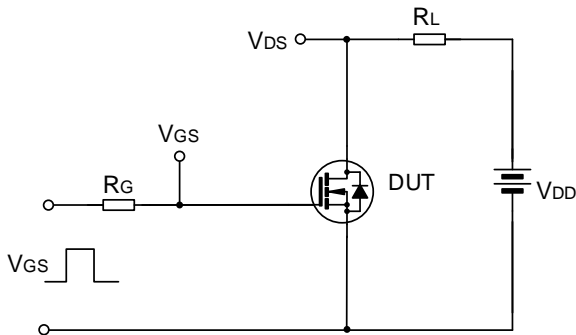


TYPICAL TEST CIRCUIT

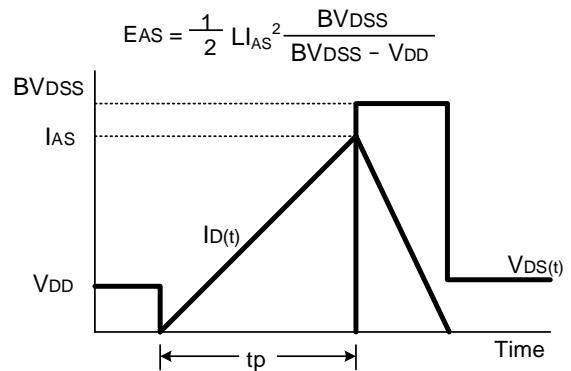
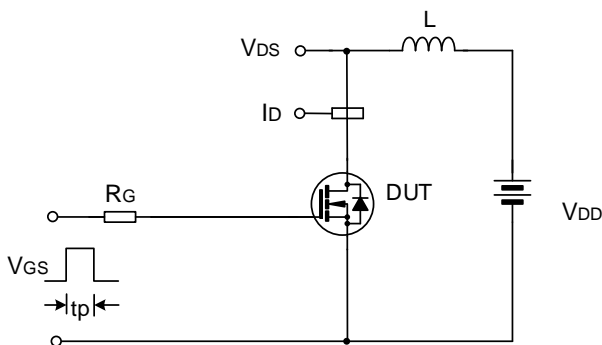
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform

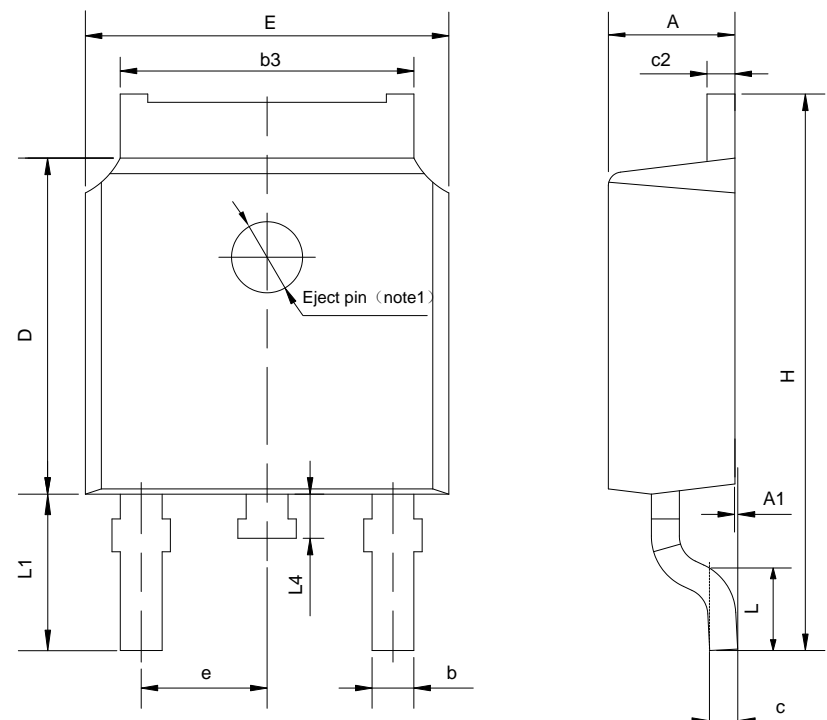


Unclamped Inductive Switching Test Circuit & Waveform



PACKAGE OUTLINE

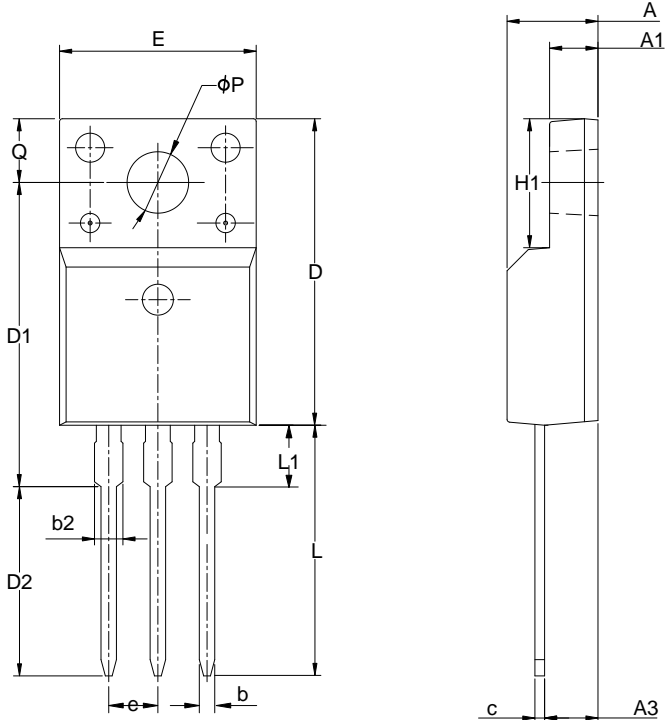
TO-252-2L **UNIT: mm**



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	2.10	2.30	2.50
A1	0	—	0.127
b	0.66	0.76	0.89
b3	5.10	5.33	5.46
c	0.45	—	0.65
c2	0.45	—	0.65
D	5.80	6.10	6.40
E	6.30	6.60	6.90
e	2.30TYP		
H	9.60	10.10	10.60
L	1.40	1.50	1.70
L1	2.90REF		
L4	0.60	0.80	1.00

NOTE1 : There are two conditions for this position:has an eject pin or has no eject pin.

TO-220FJD-3L **UNIT: mm**



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.42	4.70	5.02
A1	2.30	2.54	2.80
A3	2.50	2.76	3.10
b	0.55	0.70	0.85
b2	—	—	1.29
c	0.35	0.50	0.65
D	15.25	15.87	16.25
D1	13.97	14.47	14.97
D2	10.58	11.08	11.58
E	9.73	10.16	10.36
e	2.54BSC		
H1	6.40	6.68	7.00
L	12.48	12.98	13.48
L1	—	—	2.00
φP	3.00	3.18	3.40
Q	3.05	3.30	3.55



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.
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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.: 1.1

Revision History:

1. Add SVS65R960FJDD4(TO-220FJD-3L) package
 2. Update the curve
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Rev.: 1.0

Revision History:

1. First release
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