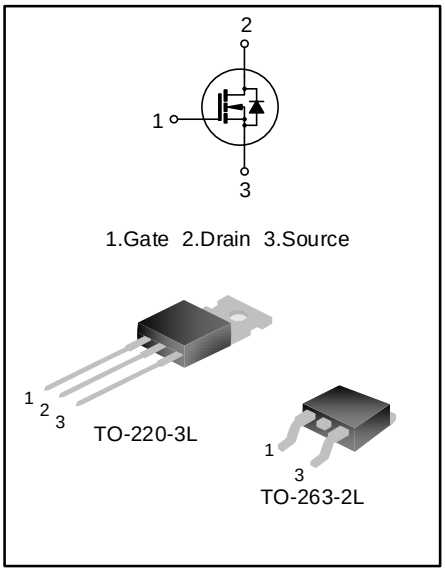
120A, 100V N-CHANNEL MOSFET

DESCRIPTION

SVGP104R5NAT(S) 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.

This device is widely used in power management for UPS and Inverter Systems.



FEATURES

- 120A, 100V, $R_{DS(on)(typ.)}$=3.6mΩ@V_{GS}=10V
- Low gate charge
- Low Crss
- Fast switching
- Extreme dv/dt rated
- 100% avalanche tested
- Pb-free lead plating
- RoHS compliant

KEY PERFORMANCE PARAMETERS

Characteristics	Ratings	Unit
V_{DS}	100	V
$V_{GS(th)}$	2.0~4.0	V
$R_{DS(on),max.}$	4.5	mΩ
I_D	120	A
$Q_{g.typ.}$	114	nC

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SVGP104R5NAT	TO-220-3L	P104R5NAT	Halogen free	Tube
SVGP104R5NAS	TO-263-2L	P104R5NAS	Halogen free	Tube
SVGP104R5NASTR	TO-263-2L	P104R5NAS	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}	--	100	--	--	V
Gate-source Voltage	V_{GS}	--	-20	--	20	V
Drain Current	I_D	T_C=25°C	--	--	120	A
		T_C=100°C	--	--	110	A
Drain Current Pulsed (Note 1)	I_{DM}	T_C=25°C	--	--	480	A
Power Dissipation (Note 2)	P_D	T_C=25°C	--	--	208	W
Single Pulsed Avalanche Energy	E_{AS}	L=0.1mH, V_{DD}=50V, R_G=25Ω, starting temperature T_J=25°C	--	--	450	mJ
Single Pulsed Current	I_{AS}	--	--	--	95	A
Operation Junction Temperature Range	T_J	--	-55	--	150	°C
Storage Temperature Range	T_{stg}	--	-55	--	150	°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Thermal Resistance, Junction-case, Bottom	$R_{\theta JC}$	--	--	--	0.6	°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
Soldering Temperature (SMD)	T_{sold}	Reflow soldering:10±1sec,3times Wave soldering:10^{+2}_{-0} sec,1time	--	--	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	100	--	--	V
Drain-source Leakage Current	I_{DSS}	V_{DS}=100V, V_{GS}=0V, T_J=25°C	--	--	1.0	μA
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	2.0	--	4.0	V
Static Drain-source On State Resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=50A	--	3.6	4.5	mΩ
Gate Resistance	R_g	f=1MHz	--	2.3	--	Ω

Dynamic characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Input Capacitance	C_{iss}	f=1MHz, V_{GS}=0V, V_{DS}=50V	--	6310	--	pF
Output Capacitance	C_{oss}		--	829	--	
Reverse Transfer Capacitance	C_{rss}		--	25	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=50V, V_{GS}=10V, R_G=3Ω, I_D=50A (Notes 3, 4)	--	31	--	ns
Turn-on Rise Time	t_r		--	52	--	
Turn-off Delay Time	$t_{d(off)}$		--	77	--	
Turn-off Fall Time	t_f		--	32	--	
Total Gate Charge	Q_g	V_{DD}=50V, V_{GS}=10V, I_D=20A (Notes 3, 4)	--	107	--	nC
Gate-source Charge	Q_{gs}		--	33	--	
Gate-drain Charge	Q_{gd}		--	30	--	
Gate-plateau Voltage	$V_{plateau}$		--	5.2	--	V

Reverse diode characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Continuous Diode Forward Current	I_S	T_C=25°C, Integral reverse P-N junction diode in the MOSFET	--	--	120	A
Diode Pulse Current	$I_{S,pulse}$		--	--	480	
Diode Forward Voltage	V_{SD}	I_S=50A, V_{GS}=0V	--	--	1.4	V
Reverse Recovery Time	T_{rr}	I_S=50A, V_{GS}=0V, dI_F/dt=100A/μs (Note 3)	--	77	--	ns
Reverse Recovery Charge	Q_{rr}		--	186	--	nC

Notes:

1. Pulse time 5μs;
2. The dissipation power will change with temperature, derating above 25°C: 1.7W/°C;
3. Pulse Test: Pulse width ≤300μs, Duty cycle≤2%;
4. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

Figure 1. Output Characteristics

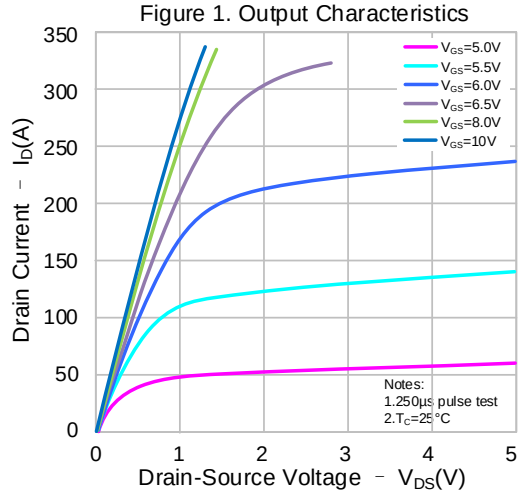


Figure 2. Transfer Characteristics

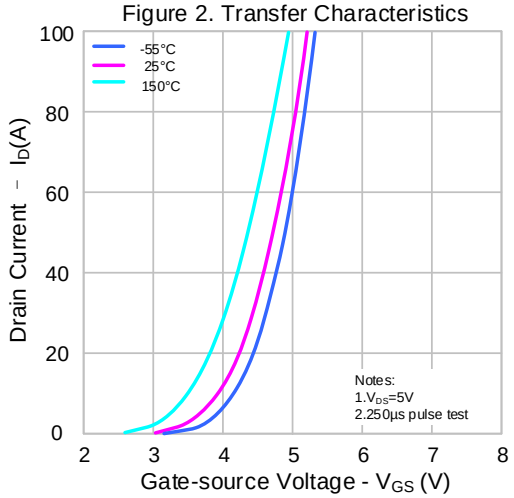


Figure 3. On-resistance vs. Drain Current

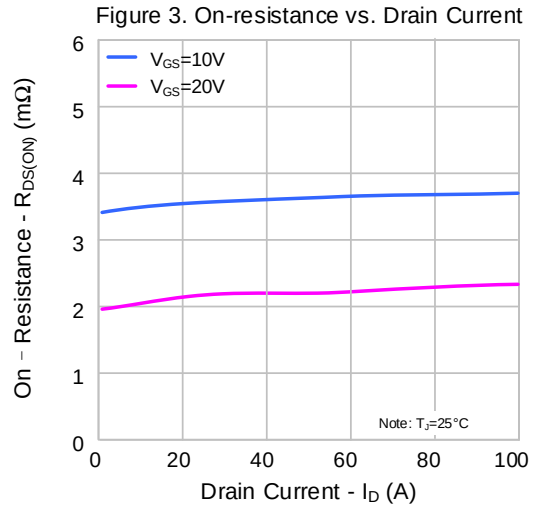


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

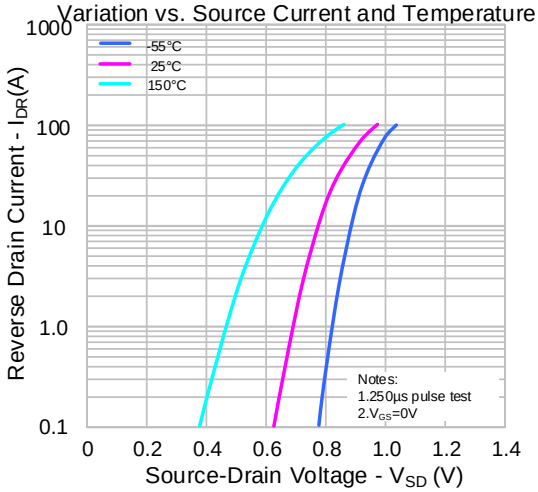


Figure 5. Capacitance Characteristics

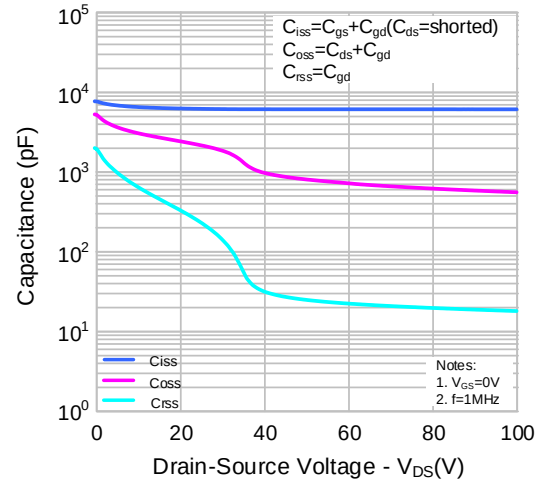
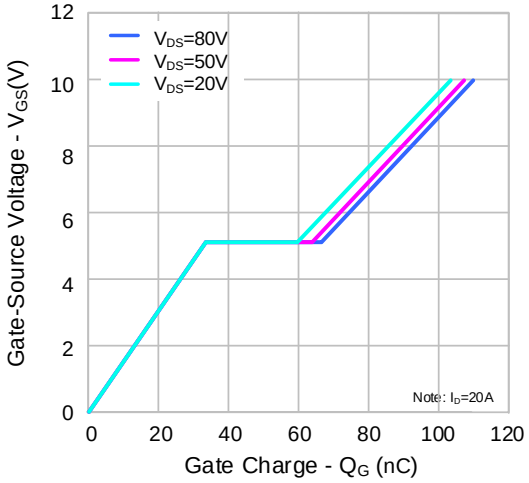


Figure 6. Gate Charge



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 7. Breakdown Voltage Variation vs. Temperature

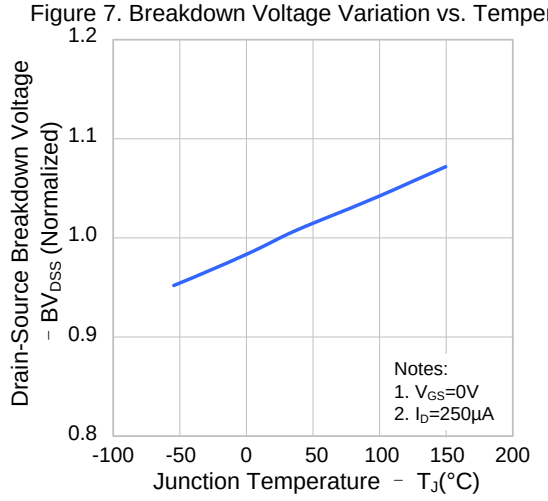


Figure 8. On-resistance Variation vs. Temperature

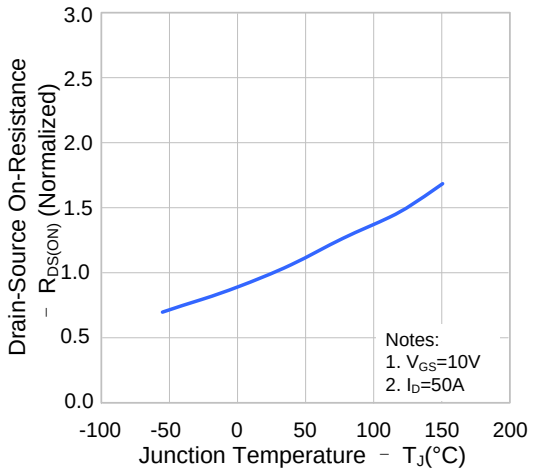
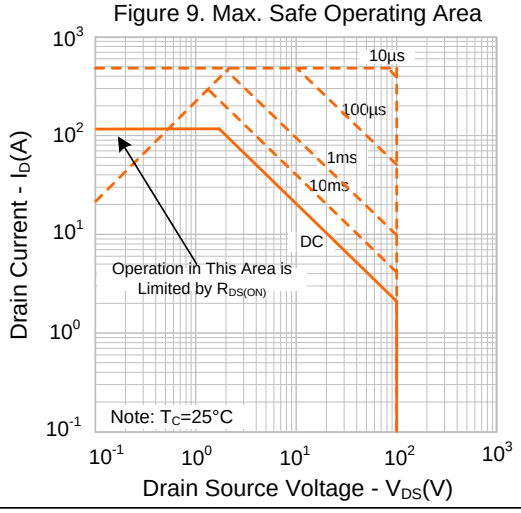
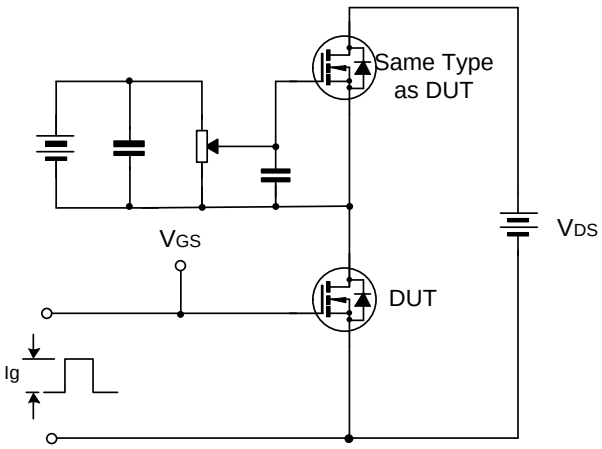


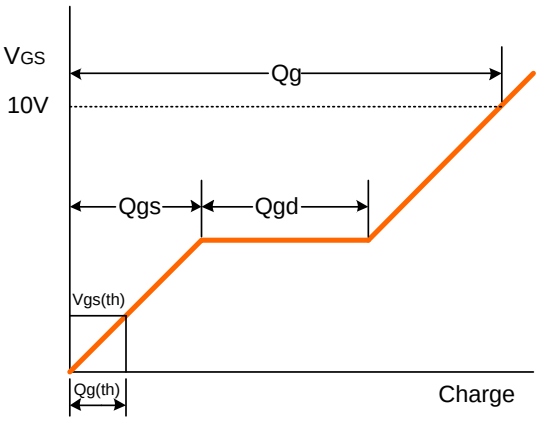
Figure 9. Max. Safe Operating Area



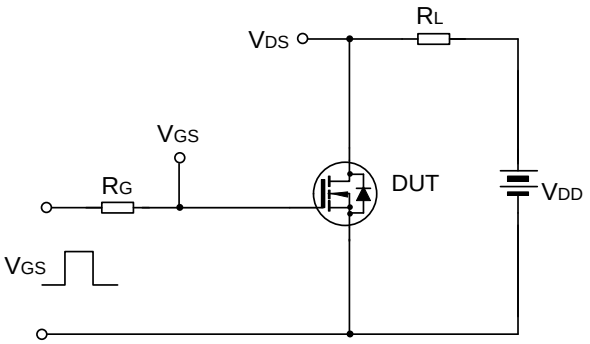
TYPICAL TEST CIRCUIT

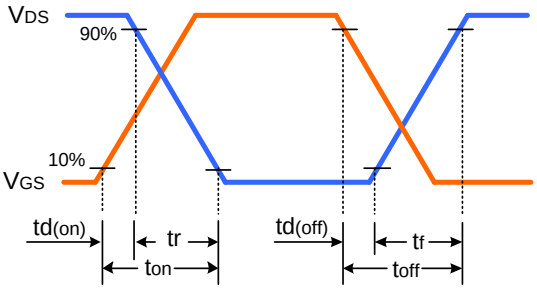
Gate Charge Test Circuit & Waveform



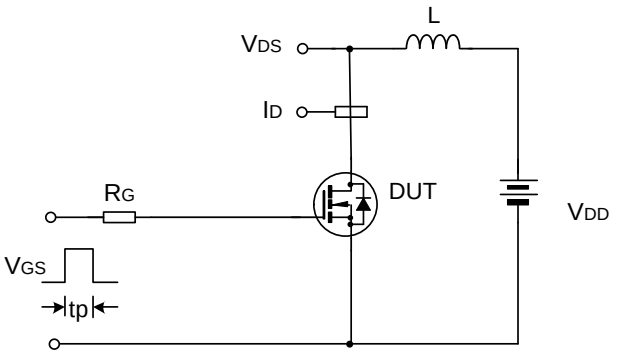


Resistive Switching Test Circuit & Waveform

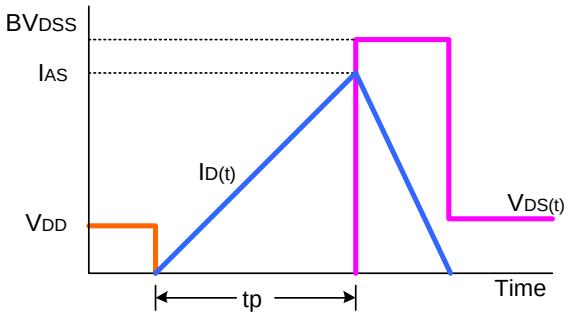




Unclamped Inductive Switching Test Circuit & Waveform

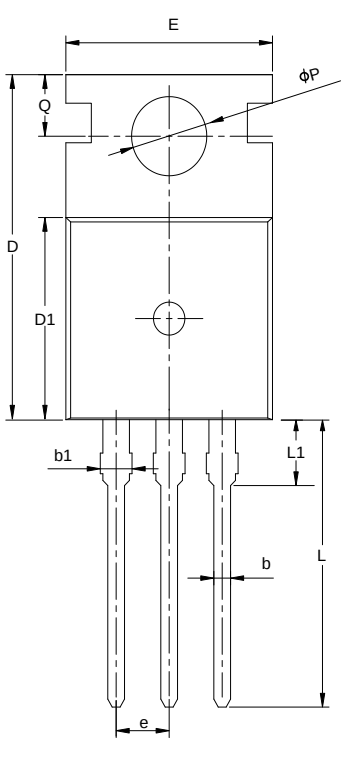


$$E_{AS} = \frac{1}{2} LI_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



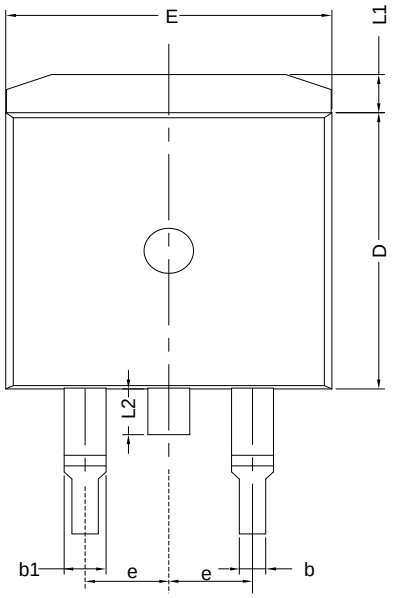
PACKAGE OUTLINE

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



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	1.00	1.30	1.50
A2	1.80	2.40	2.80
b	0.60	0.80	1.00
b1	1.00	—	1.60
c	0.30	—	0.70
D	15.10	15.70	16.10
D1	8.10	9.20	10.00
E	9.60	9.90	10.40
e	2.54BSC		
H1	6.10	6.50	7.00
L	12.60	13.08	13.60
L1	—	—	3.95
ϕP	3.40	3.70	3.90
Q	2.60	—	3.20

TO-263-2L **UNIT: mm**



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.30	4.57	4.72
A1	0	0.10	0.25
b	0.71	0.81	0.91
b1	1.17	—	1.50
c	0.30	—	0.60
c2	1.17	1.27	1.37
D	8.50	—	9.35
E	9.80	—	10.45
e	2.54BSC		
H	14.70	—	15.75
L	2.00	2.30	2.74
L1	1.12	1.27	1.42
L2	—	—	1.75

Important notice:

1. **The instructions are subject to change without notice!**
2. **Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current. Please read the instructions carefully before using our products, including the circuit operation precautions.**
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Rev.: 1.2

Revision History:

1. Add package of SVGP104R5NAS(TO-263-2L)

Rev.: 1.1

Revision History:

1. Update dynamic characteristics
2. Update figure 5 and figure 6

Rev.: 1.0

Revision History:

1. First release