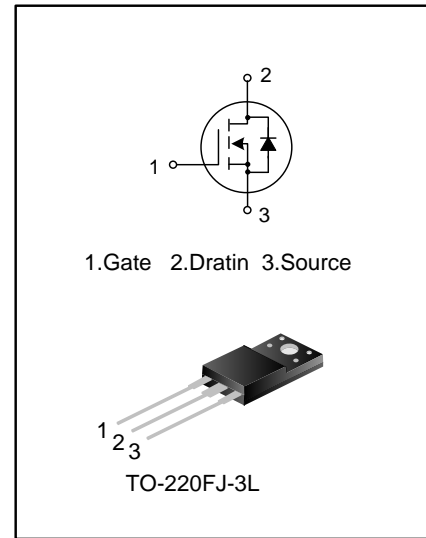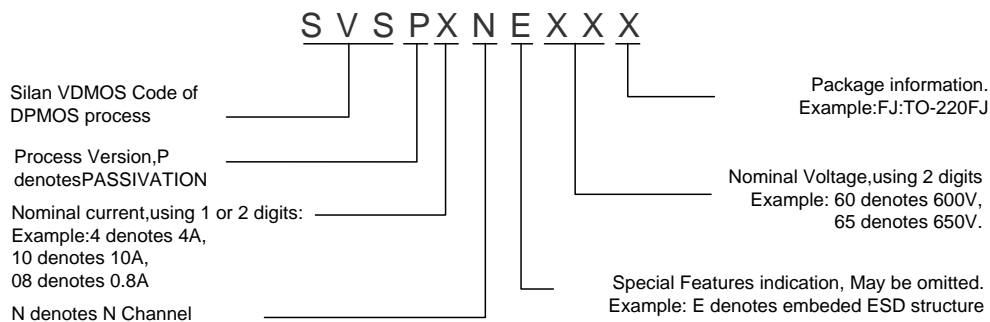# 20A, 600V DP MOS POWER TRANSISTOR

GENERAL DESCRIPTION

SVSP20N60FJ is an N-channel enhancement mode high voltage power MOSFETs produced using Silan's DP 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, for example. it is suitable for hard and soft switching topologies.

FEATURES

- ◆ 20A, 600V, $R_{DS(on)(typ.)}$=0.16Ω@V_{GS}=10V
- ◆ New revolutionary high voltage technology
- ◆ Ultra low gate charge
- ◆ Periodic avalanche rated
- ◆ Extreme dv/dt rated
- ◆ High peak current capability

2

1

3

1.Gate 2.Dratin 3.Source

1
2
3

TO-220FJ-3L

NOMENCLATURE

S V S P X N E X X X

Silan VDMOS Code of DPMOS process

Process Version,P denotesPASSIVATION

Nominal current,using 1 or 2 digits:
Example:4 denotes 4A,
10 denotes 10A,
08 denotes 0.8A

N denotes N Channel

Package information.
Example:FJ:TO-220FJ

Nominal Voltage,using 2 digits
Example: 60 denotes 600V,
65 denotes 650V.

Special Features indication, May be omitted.
Example: E denotes embeded ESD structure

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing
SVSP20N60FJ	TO-220FJ-3L	P20N60FJ	Halogen free	Tube

ABSOLUTE MAXIMUM RATINGS (T$_C$=25°C, unless otherwise noted)

Characteristics		Symbol	Ratings	Unit
Drain-Source Voltage		V$_{DS}$	600	V
Gate-Source Voltage		V$_{GS}$	±30	V
Drain Current	T$_C$=25°C	I$_D$	20	A
	T$_C$=100°C		12	
Drain Current Pulsed		I$_{DM}$	80	A
Power Dissipation(T$_C$=25°C)		P$_D$	45	W
-Derate above 25°C			0.36	W/°C
Single Pulsed Avalanche Energy (Note 1)		E$_{AS}$	854	mJ
Reverse diode dv/dt (Note 2)		dv/dt	15	V/ns
MOSFET dv/dt ruggedness (Note 3)		dv/dt	50	V/ns
Operation Junction Temperature Range		T$_J$	-55～+150	°C
Storage Temperature Range		T$_{stg}$	-55～+150	°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R$_{θJC}$	2.78	°C/W
Thermal Resistance, junction-to-Ambient	R$_{θJA}$	62.5	°C/W

ELECTRICAL CHARACTERISTICS (T$_C$=25°C, unless otherwise noted)

Characteristics	Symbol	Test conditions		Min.	Typ.	Max.	Unit
Drain -Source Breakdown Voltage	BV$_{DSS}$	V$_{GS}$=0V, I$_D$=250µA		600	--	--	V
Drain-Source Leakage Current	I$_{DSS}$	V$_{DS}$=600V, V$_{GS}$=0V		--	--	200	nA
Gate-Source Leakage Current	I$_{GSS}$	V$_{GS}$=±30V, 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$_D$=10A	Tj=25°C	--	0.16	0.19	Ω
			Tj=125°C	--	0.30	--	
Gate resistance	R$_g$	f=1.0MHz		--	1.7	--	Ω
Input Capacitance	C$_{iss}$	V$_{DS}$=100V, V$_{GS}$=0V, f=1.0MHz		--	1300	--	pF
Output Capacitance	C$_{oss}$			--	88	--	
Reverse Transfer Capacitance	C$_{rss}$			--	2.67	--	
Turn-on Delay Time	t$_{d(on)}$	V$_{DD}$=300V, V$_{GS}$=10V, R$_G$=25Ω, I$_D$=20A (Note 2,3)		--	18.53	--	ns
Turn-on Rise Time	t$_r$			--	51.03	--	
Turn-off Delay Time	t$_{d(off)}$			--	101.6	--	
Turn-off Fall Time	t$_f$			--	51.6	--	
Total Gate Charge	Q$_g$	V$_{DD}$=480V, V$_{GS}$=10V, I$_D$=20A (Note 2,3)		--	38.9	--	nC
Gate-Source Charge	Q$_{gs}$			--	9.04	--	
Gate-Drain Charge	Q$_{gd}$			--	18.02	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I$_S$	Integral Reverse P-N Junction Diode in the MOSFET	--	--	20	A
Pulsed Source Current	I$_{SM}$		--	--	80	
Diode Forward Voltage	V$_{SD}$	I$_S$=20A,V$_{GS}$=0V	--	--	1.2	V
Reverse Recovery Time	T$_{rr}$	V$_{DD}$=50V, I$_F$=20A, dI$_F$/dt=100A/µs	--	400	--	ns
Reverse Recovery Charge	Q$_{rr}$		--	6.2	--	µC

Notes:

1. L=79mH,I$_{AS}$=4.2A,V$_{DD}$=100V, R$_G$=25Ω, starting temperature T$_J$=25°C;
2. V$_{DS}$=0~400V,I$_{SD}$<=20A, T$_J$=25°C;
3. V$_{DS}$=0~480V;
4. Pulse Test: Pulse width ≤300µs,Duty cycle≤2%;
5. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

Figure 1. On-Region Characteristics

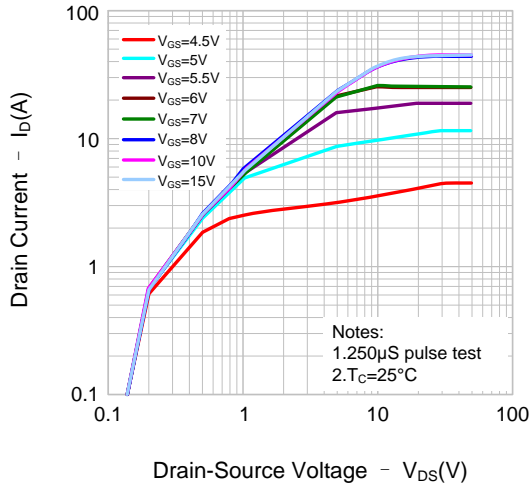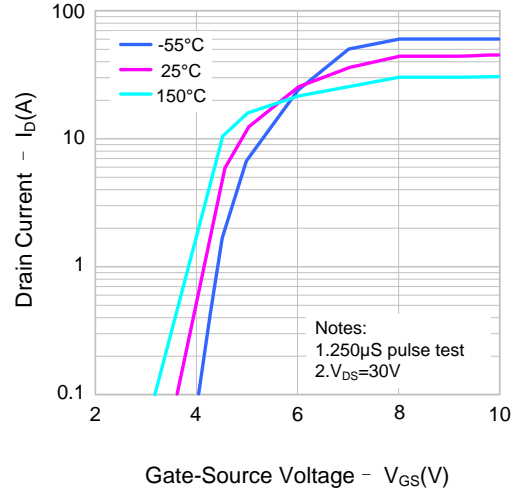Figure 2. Transfer Characteristics
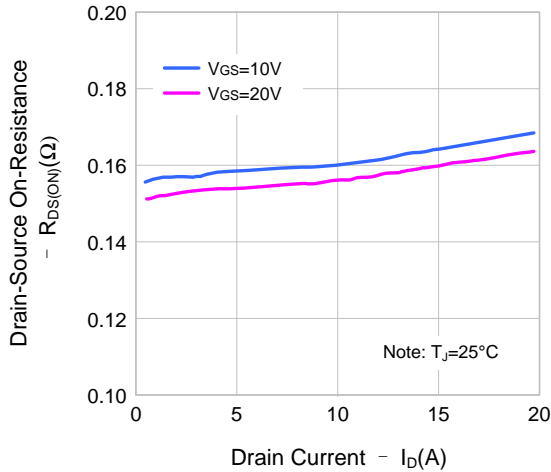
Figure 3. On-Resitance Variation vs. Drain Current

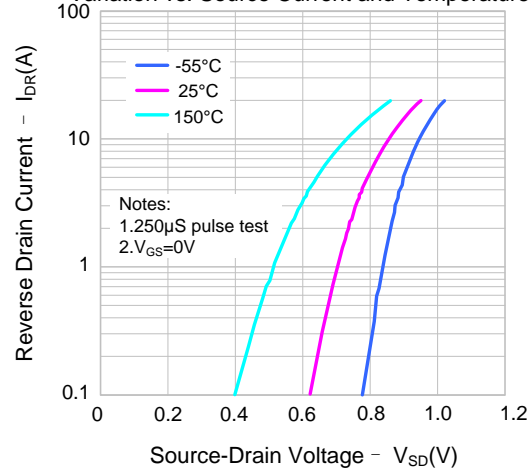Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature
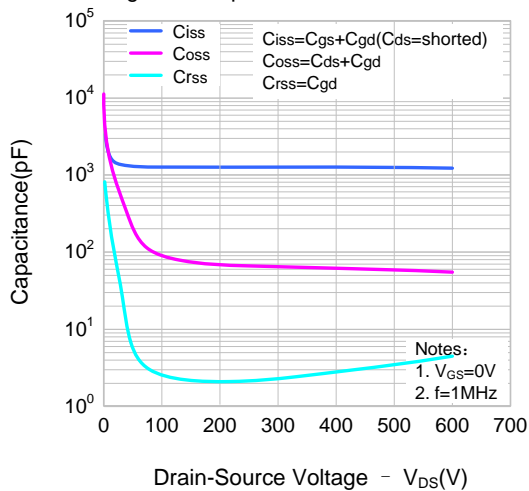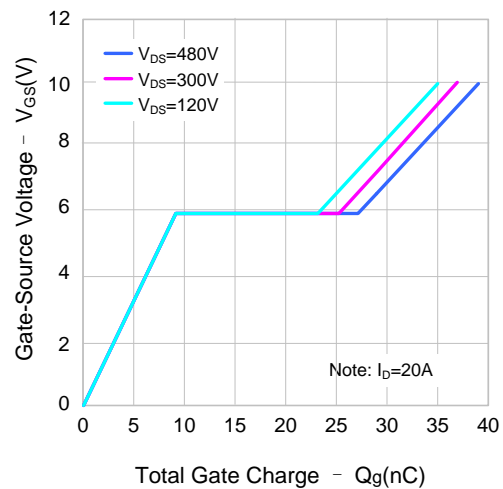
Figure 5. Capacitance Characteristics

Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS(continued)
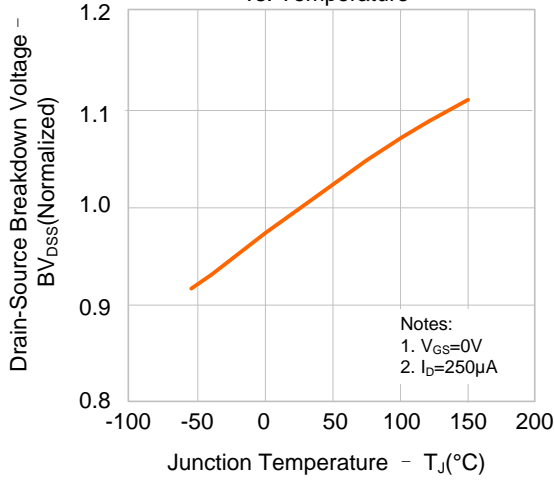
Figure 7. Breakdown Voltage Variation vs. Temperature

Notes:
1. V_{GS}=0V
2. I_D=250μA

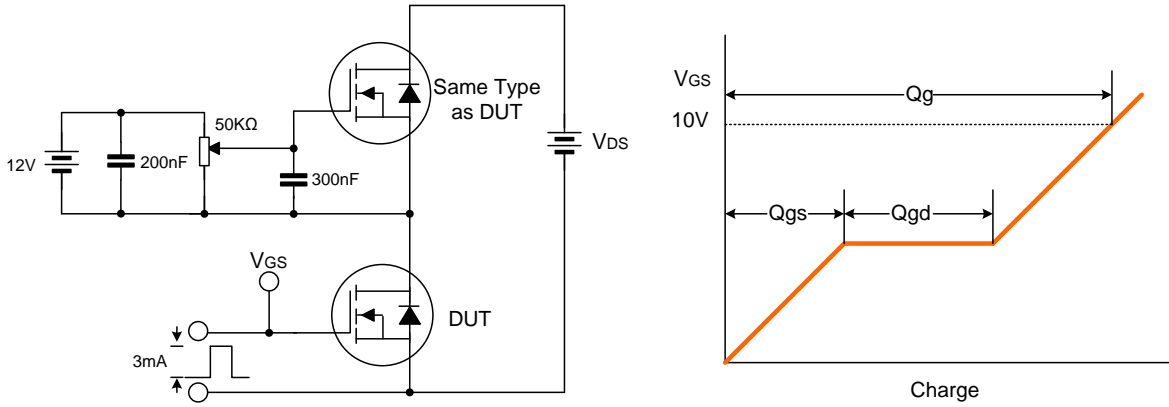Figure 8. On-resistance Variation vs. Temperature

Notes:
1. V_{GS}=10V
2. I_D=10.0A
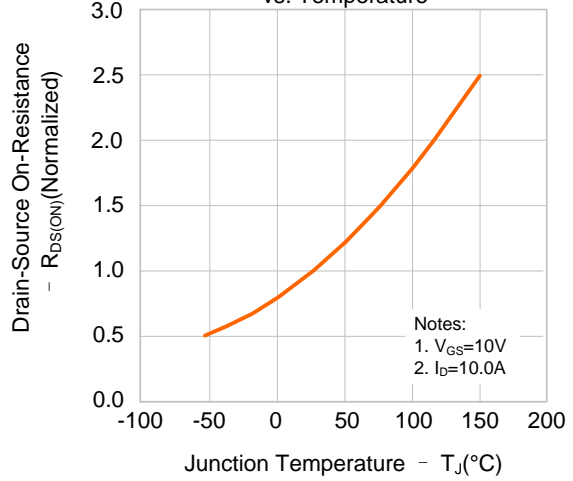
Figure 9. Max. Safe Operating Area

Operation in This Area is Limited by $R_{DS(ON)}$
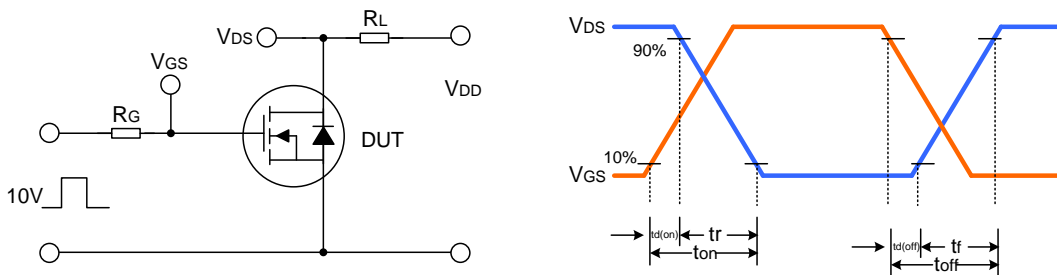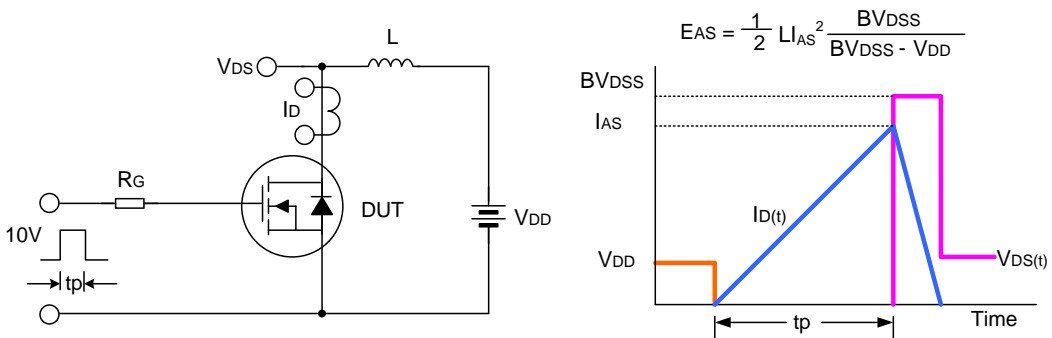
100μs
1ms
10ms
DC

Notes:T_C=25°C
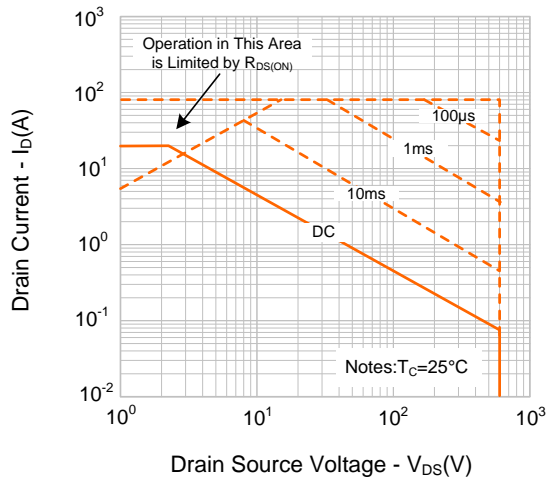
TYPICAL TEST CIRCUIT

Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveform

Unclamped Inductive Switching Test Circuit & Waveform

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

PACKAGE OUTLINE

TO-220FJ-3L   **UNIT: mm**
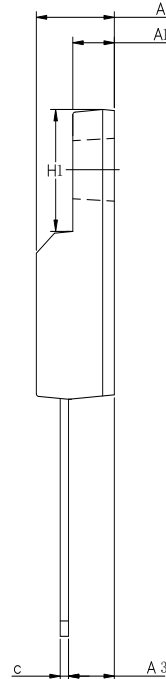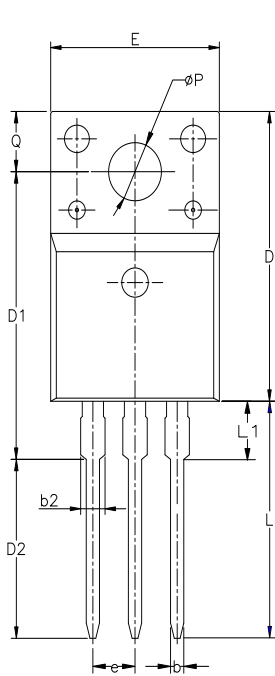
SYMBOL	MIN	NOM	MAX
A	4.42	4.70	5.02
A1	2.30	2.54	2.80
A3	2.50	2.76	3.10
b	0.55	0.70	0.85
b2	—	—	1.29
c	0.35	0.50	0.65
D	15.25	15.87	16.25
D1	13.97	14.47	14.97
D2	10.58	11.08	11.58
E	9.73	10.16	10.36
e		2.54BCS	
H1	6.40	6.68	7.00
L	12.48	12.98	13.48
L1	—	—	2.00
øP	3.00	3.18	3.40
Q	3.05	3.30	3.55

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Rev.: 1.3

Revision History:

1. Update Fig 5
2. Add dv/dt

Rev.: 1.2

Revision History:

1. Modify values of I_{DSS} and V_{SD}

Rev.: 1.1

Revision History:

1. Modify Coss to 88 pf
2. Update Figure 5

Rev.: 1.0

Revision History:

1. First release