

20A, 500V N-CHANNEL MOSFET

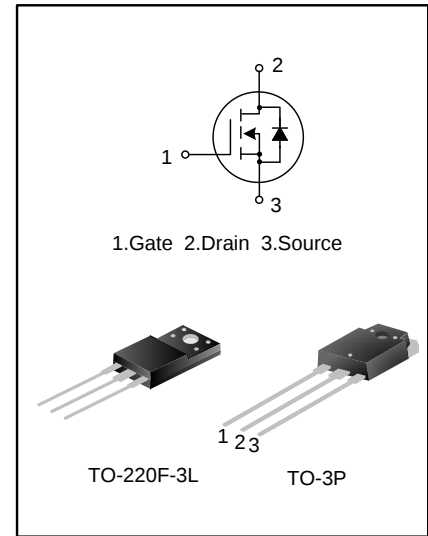
GENERAL DESCRIPTION

SVF20N50F/PN is an N-channel enhancement mode power MOS field effect transistor which is produced using Silan proprietary F-Cell™ structure VDMOS technology. The improved planar stripe cell and the improved guard ring terminal have been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are widely used in AC-DC power suppliers, DC-DC converters and H-bridge PWM motor drivers.

FEATURES

- ◆ 20A,500V, $R_{DS(on)(typ.)}=0.20\Omega@V_{GS}=10V$
- ◆ Low gate charge
- ◆ Low C_{rss}
- ◆ Fast switching
- ◆ Improved dv/dt capability



ORDERING INFORMATION

Part No.	Package	Marking	Material	Packing
SVF20N50F	TO-220F-3L	SVF20N50F	Pb free	Tube
SVF20N50PN	TO-3P	20N50	Pb free	Tube

ABSOLUTE MAXIMUM RATINGS (T_c=25°C unless otherwise noted)

Characteristics	Symbol	Ratings		Unit
		SVF20N50F	SVF20N50PN	
Drain-Source Voltage	V _{DS}	500		V
Gate-Source Voltage	V _{GS}	±30		V
Drain Current	T _C =25°C T _C =100°C	I _D	20.0	A
			12.6	
Drain Current Pulsed	I _{DM}	80.0		A
Power Dissipation(T _C =25°C) -Derate above 25°C	P _D	72	252	W
		0.58	2.02	W/°C
Single Pulsed Avalanche Energy(Note 1)	E _{AS}	1596		mJ
Operation Junction Temperature Range	T _J	-55~+150		°C
Storage Temperature Range	T _{stg}	-55~+150		°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Ratings		Unit
		SVF20N50F	SVF20N50PN	
Thermal Resistance, Junction-to-Case	R _{θJC}	1.74	0.50	°C/W
Thermal Resistance, Junction-to-Ambient	R _{θJA}	62.5	50	°C/W

ELECTRICAL CHARACTERISTICS (T_c=25°C unless otherwise noted)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Drain -Source Breakdown Voltage	B _{VDS}	V _{GS} =0V, I _D =250μA	500	--	--	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =500V, V _{GS} =0V	--	--	1.0	μA
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 =10.0A	--	0.20	0.27	Ω
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz	--	2687.7	--	pF
Output Capacitance	C _{oss}		--	355.0	--	
Reverse Transfer Capacitance	C _{rss}		--	10.3	--	
Turn-on Delay Time	t _{d(on)}	V _{DD} =250V, I _D =20.0A, R _G =10Ω, (Note2,3)	--	27.2	--	ns
Turn-on Rise Time	t _r		--	47.5	--	
Turn-off Delay Time	t _{d(off)}		--	78.7	--	
Turn-off Fall Time	t _f		--	41.1	--	
Total Gate Charge	Q _g	V _{DS} =400V, I _D =20.0A, V _{GS} =10V, (Note 2,3)	--	49.50	--	nC
Gate-Source Charge	Q _{gs}		--	14.28	--	
Gate-Drain Charge	Q _{gd}		--	16.95	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction	--	--	20.0	A
Pulsed Source Current	I_{SM}	Diode in the MOSFET	--	--	80.0	
Diode Forward Voltage	V_{SD}	$I_S=20.0A, V_{GS}=0V$	--	--	1.4	V
Reverse Recovery Time	T_{rr}	$I_S=20.0A, V_{GS}=0V,$	--	570.3	--	ns
Reverse Recovery Charge	Q_{rr}	$di_F/dt=100A/\mu s$ (Note 2)	--	7.35	--	μC

Notes:

1. $L=30mH, I_{AS}=9.9A, V_{DD}=50V, R_G=25\Omega$, starting $T_{BJB}=25^\circ C$;
2. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$;
3. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

Figure 1. On-Region Characteristics

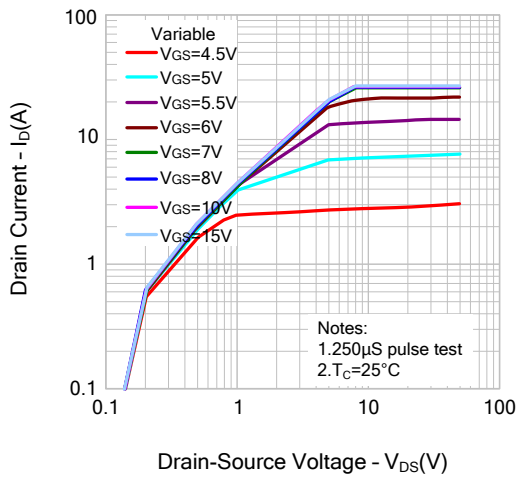


Figure 2. Transfer Characteristics

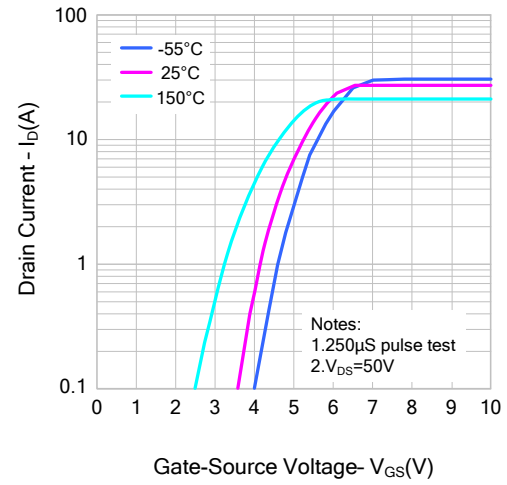


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

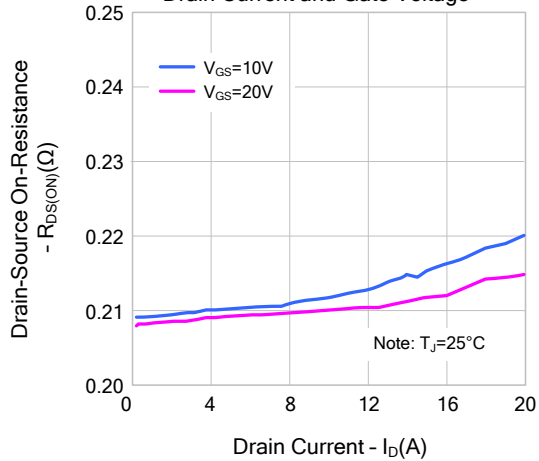


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

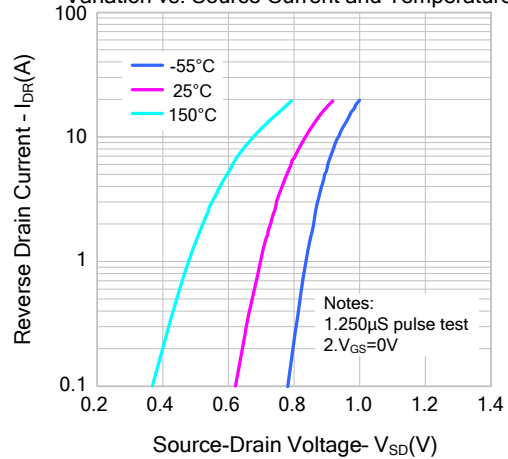


Figure 5. Capacitance Characteristics

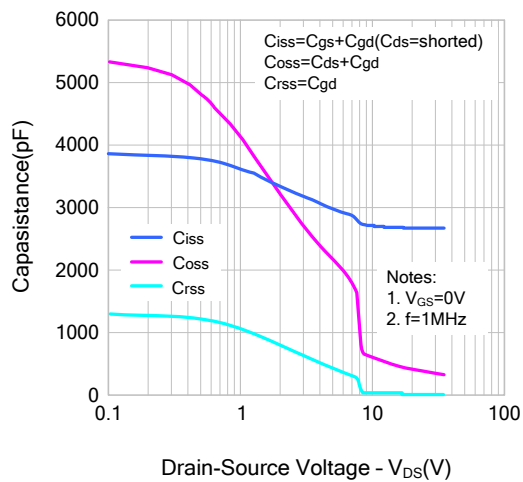
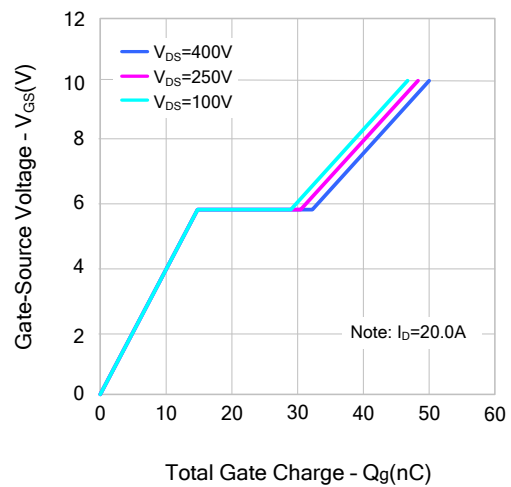


Figure 6. Gate Charge Characteristics



TYPICAL CHARACTERISTICS(continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

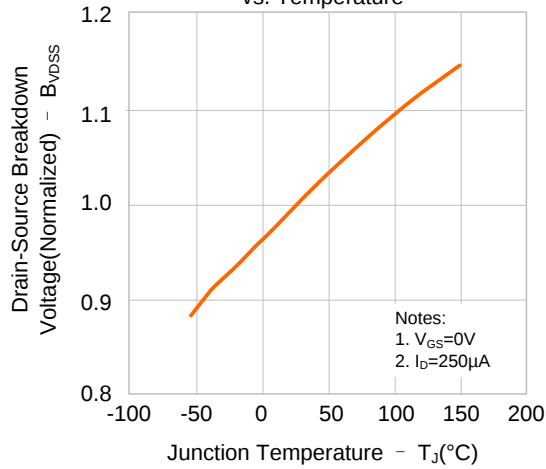


Figure 8. On-resistance Variation vs. Temperature

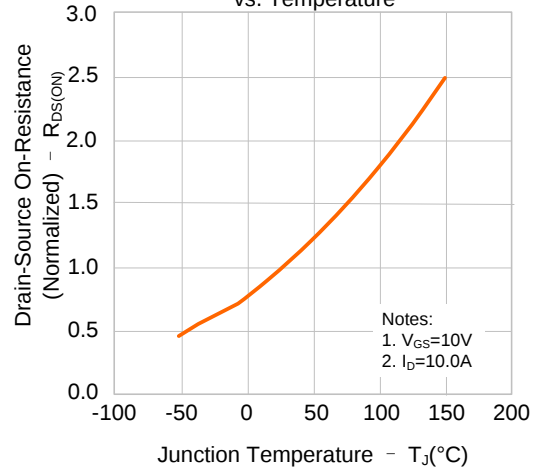


Figure 9-1. Max. Safe Operating Area (SVF20N50F)

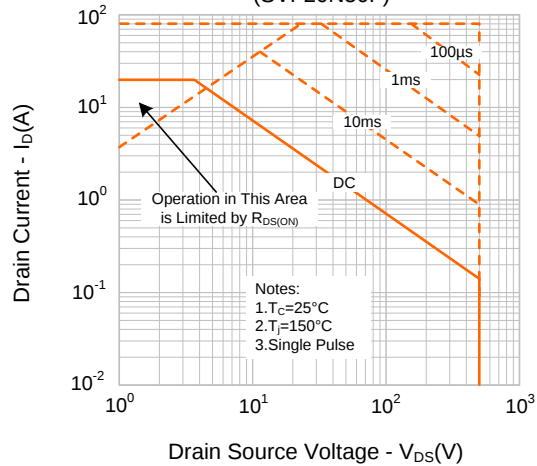


Figure 9-2. Max. Safe Operating Area (SVF20N50PN)

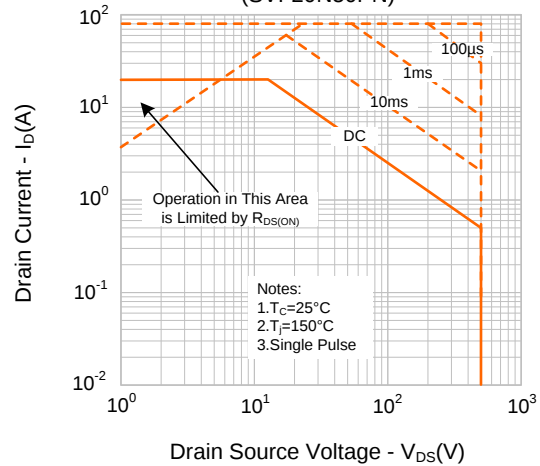
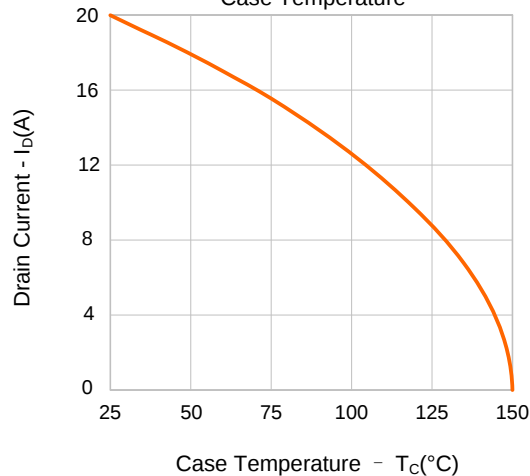
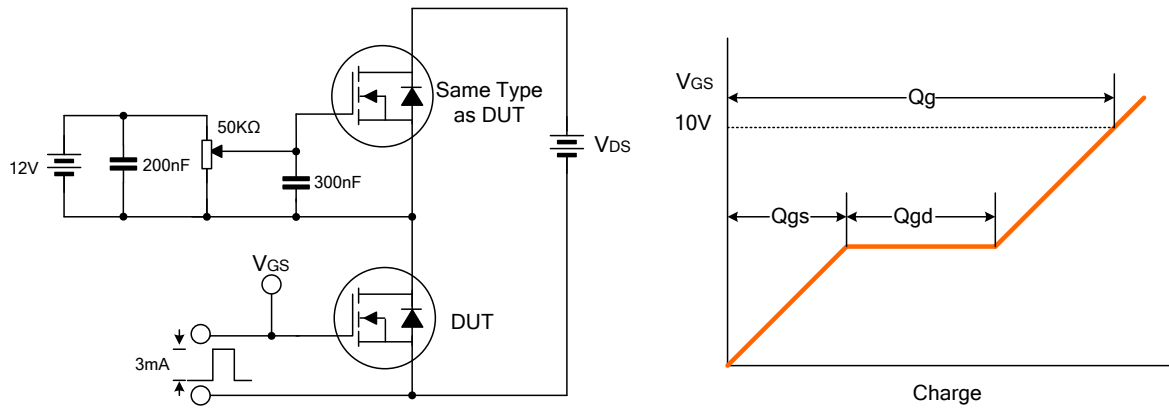


Figure 10. Maximum Drain Current vs. Case Temperature

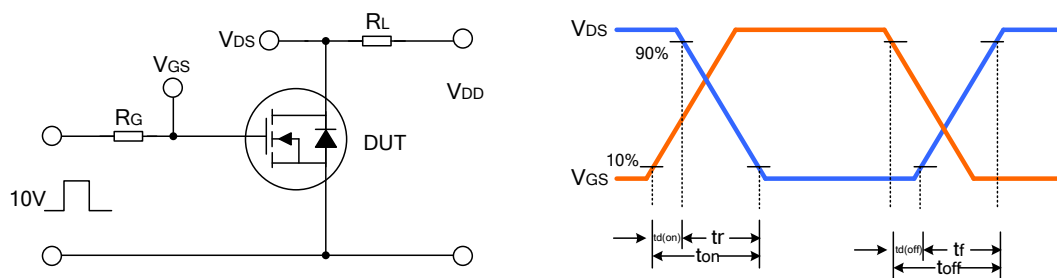


TYPICAL TEST CIRCUIT

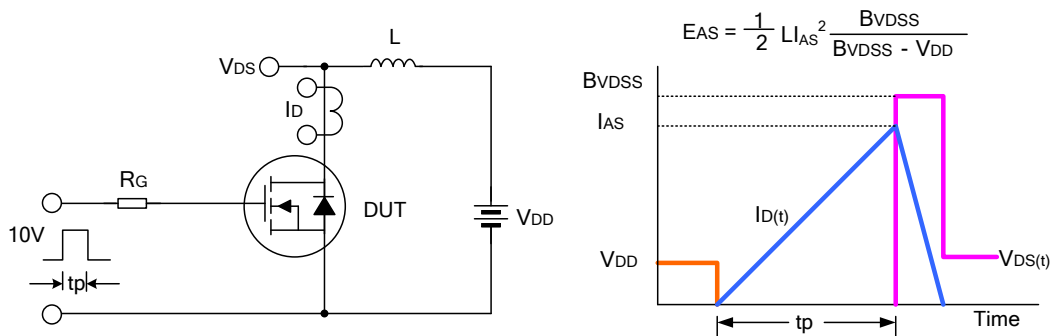
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



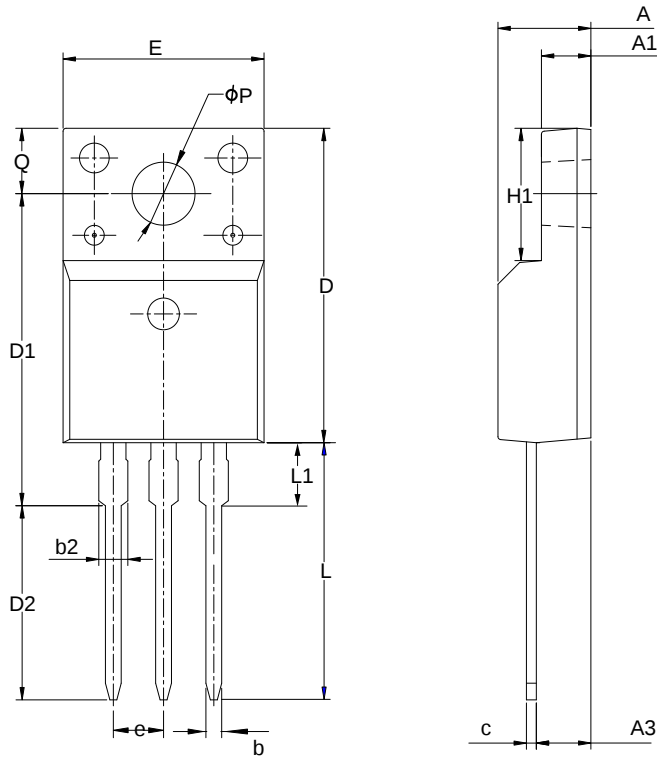
Unclamped Inductive Switching Test Circuit & Waveform



PACKAGE OUTLINE

TO-220F-3L

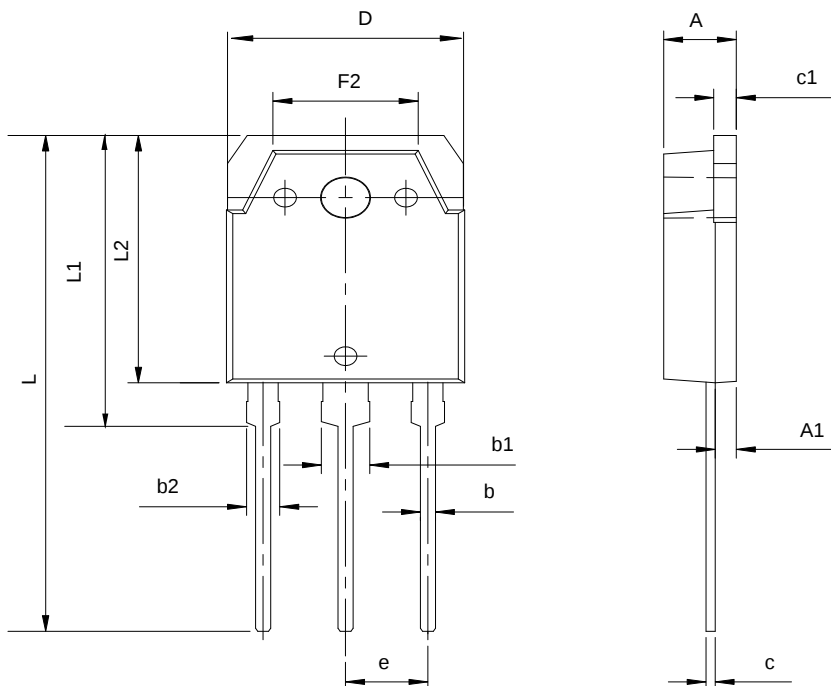
UNIT: mm



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	0.70	0.80	0.90
b2	—	—	1.47
c	0.35	0.50	0.65
D	15.25	15.87	16.25
D1	15.30	15.75	16.30
D2	9.30	9.80	10.30
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	—	—	3.50
ϕP	3.00	3.18	3.40
Q	3.05	3.30	3.55

TO-3P

UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.4	—	5.2
C1	1.2	—	1.8
A1	1.2	—	2
b	0.7	1	1.3
b1	2.7	3	3.3
b2	1.7	2	2.3
D	15	15.5	16
C	0.4	0.6	0.8
F2	8.5	—	10
e	5.45typ		
L1	22.6	—	23.6
L	39	—	41.5
L2	19.5	—	21

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- The instructions are subject to change without notice! Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current.
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- Website: <http://www.silan.com.cn>

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Rev.: 1.6

Revision History:

1. Delete NOMENCLATURE
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Rev.: 1.5

Revision History:

1. Modify the package information of TO-220F-3L
-

Rev.: 1.4

Revision History:

1. Modify the thermal characteristics
-

Rev.: 1.3

Revision History:

1. Modify the ordering information
-

Rev.: 1.2

Revision History:

1. Change the schematic diagram of MOS
-

Rev.: 1.1

Revision History:

1. Add the package of TO-3PN
 2. Modify "ELECTRICAL CHARACTERISTICS" and "TYPICAL CHARACTERISTICS"
-

Rev.: 1.0

Revision History:

1. Initial release
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