



# SPN9971 N-Channel Enhancement Mode MOSFET

## DESCRIPTION

The SPN9971 is the N-Channel logic enhancement mode power field effect transistors are produced using high cell density , DMOS trench technology. The SPN9971 has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $R_{DS(ON)}$  and fast switching speed.

## FEATURES

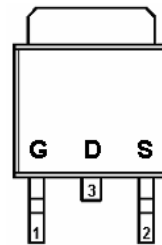
- ◆ 60V/16A,  $R_{DS(ON)}= 40m\Omega@V_{GS}=10V$
- ◆ 60V/12A,  $R_{DS(ON)}= 45m\Omega@V_{GS}=4.5V$
- ◆ Super high density cell design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ TO-252, TO-251 package design

## APPLICATIONS

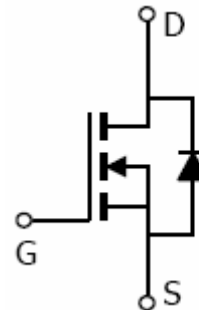
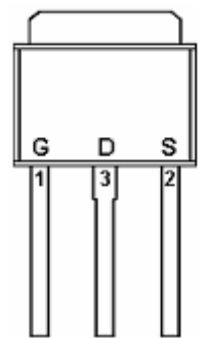
- Power Management in Note book
- Powered System
- DC/DC Converter
- Load Switch

## PIN CONFIGURATION

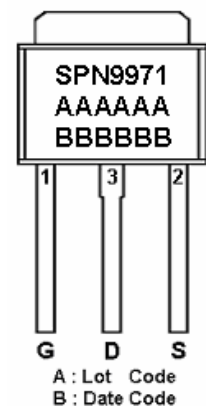
TO-252



TO-251



## PART MARKING





# SPN9971

## N-Channel Enhancement Mode MOSFET

### PIN DESCRIPTION

Pin	Symbol	Description
1	G	Gate
2	S	Source
3	D	Drain

### ORDERING INFORMATION

Part Number	Package	Part Marking
SPN9971T252RGB	TO-252	SPN9971
SPN9971T251TGB	TO-251	SPN9971

※ SPN9971T252RGB : Tape Reel ; Pb – Free ; Halogen - Free

※ SPN9971T251RGB : Tube ; Pb – Free ; Halogen - Free

### ABSOLUTE MAXIMUM RATINGS

(TA=25°C Unless otherwise noted)

Parameter	Symbol	Typical	Unit	
Drain-Source Voltage	V <sub>DSS</sub>	60	V	
Gate –Source Voltage	V <sub>GSS</sub>	±20	V	
Continuous Drain Current	I <sub>D</sub>	TA=25°C	25	A
		TA=100°C	16	
Pulsed Drain Current	I <sub>DM</sub>	80	A	
Avalanche Current	I <sub>AS</sub>	25	A	
Power Dissipation	P <sub>D</sub>	TA=25°C TO-252-2L	40	W
		TO-251	55	
Operating Junction Temperature	T <sub>J</sub>	150	°C	
Storage Temperature Range	T <sub>STG</sub>	-55/150	°C	
Thermal Resistance-Junction to Ambient	R <sub>θJA</sub>	100	°C/W	



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## N-Channel Enhancement Mode MOSFET

### ELECTRICAL CHARACTERISTICS

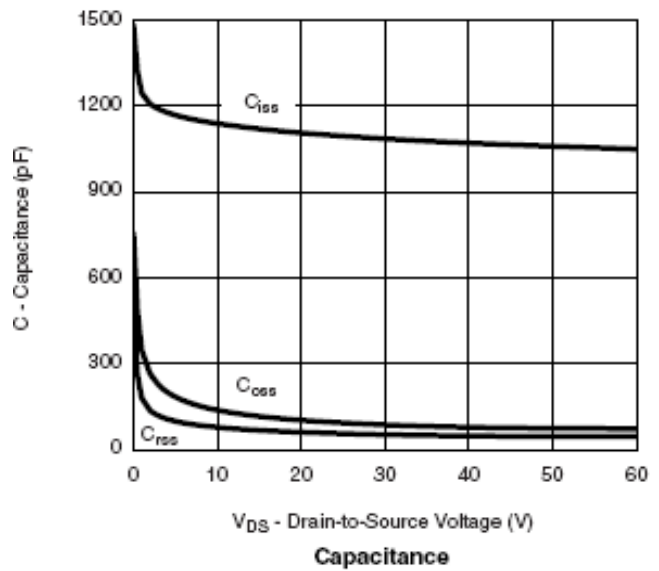
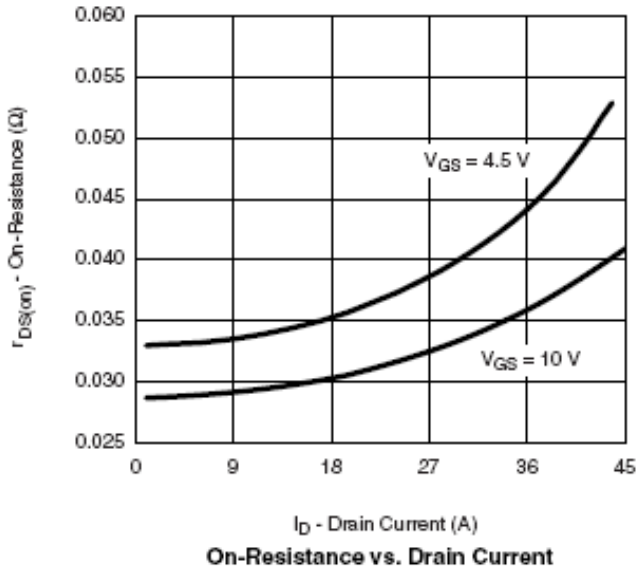
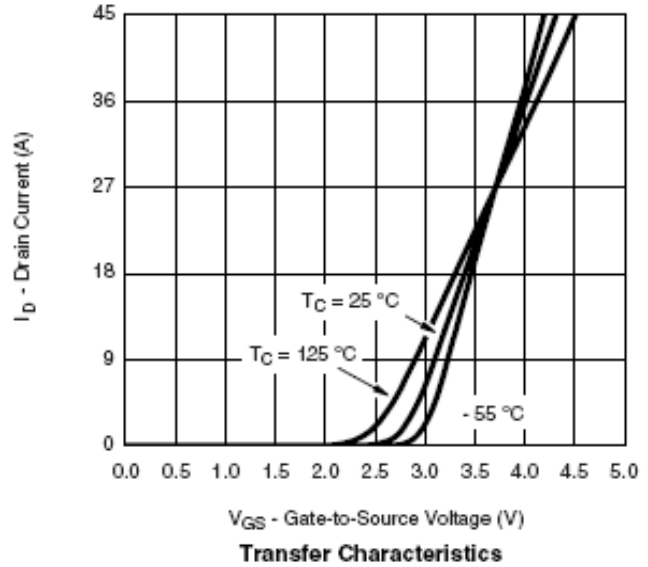
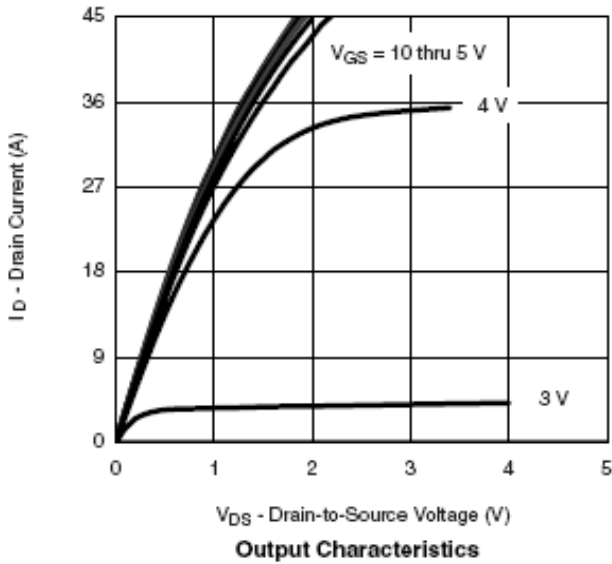
(TA=25°C Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.8		2.0	
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$			1	uA
		$V_{DS}=60V, V_{GS}=0V$ $T_J=85^\circ C$			5	
On-State Drain Current	$I_{D(on)}$	$V_{DS} \geq 5V, V_{GS} = 10V$	30			A
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D=16A$		0.038	0.040	$\Omega$
		$V_{GS}=4.5V, I_D=12A$		0.042	0.045	
Forward Transconductance	$g_{fs}$	$V_{DS}=15V, I_D=5.3A$		24		S
Diode Forward Voltage	$V_{SD}$	$I_S=2.0A, V_{GS} = 0V$		0.8	1.2	V
<b>Dynamic</b>						
Total Gate Charge	$Q_g$	$V_{DS}=30V, V_{GS}=5V$ $I_D= 5.3A$		10	15	nC
Gate-Source Charge	$Q_{gs}$			3.5		
Gate-Drain Charge	$Q_{gd}$			3.6		
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V$ $f=1MHz$		890		pF
Output Capacitance	$C_{oss}$			85		
Reverse Transfer Capacitance	$C_{rss}$			48		
Turn-On Time	$t_{d(on)}$	$V_{DD}=30V, R_L=6.8\Omega$ $I_D=4.4A, V_{GEN}=10V$ $R_G=1\Omega$		10	15	nS
	$t_r$			12	20	
Turn-Off Time	$t_{d(off)}$			25	35	
	$t_f$			10	15	



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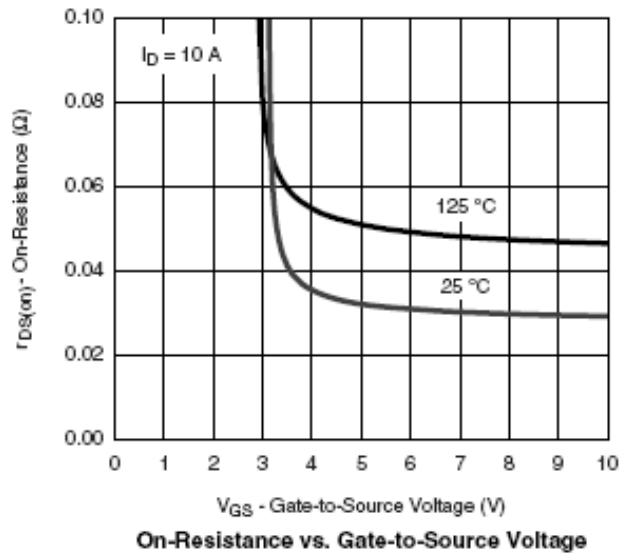
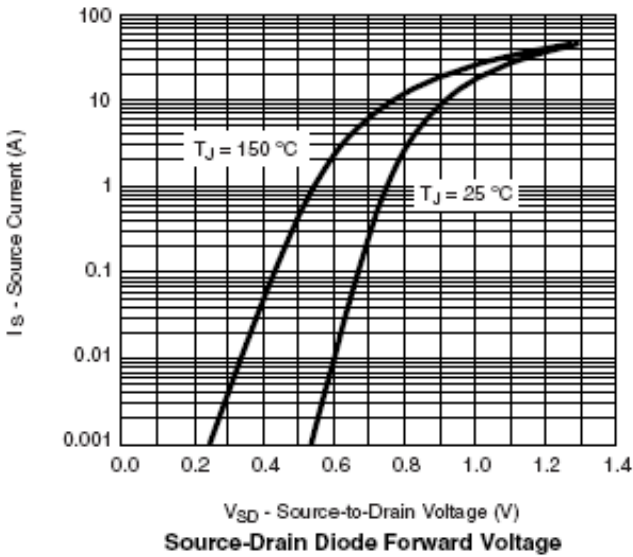
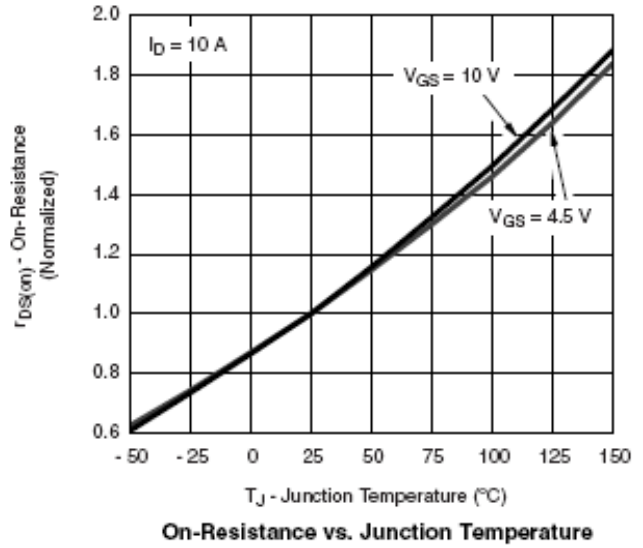
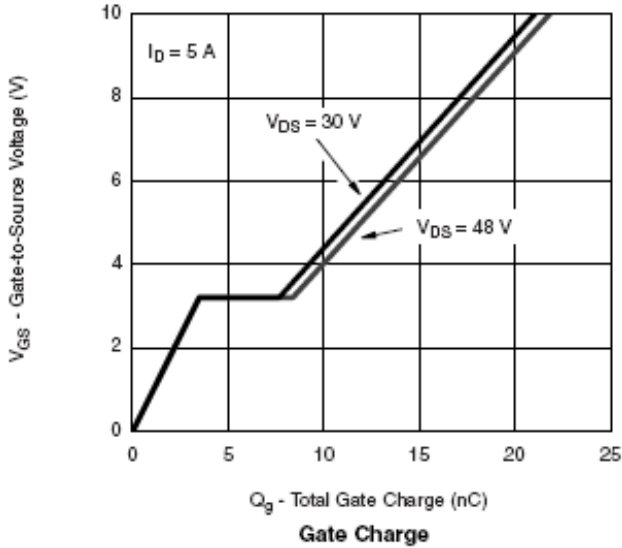
## TYPICAL CHARACTERISTICS





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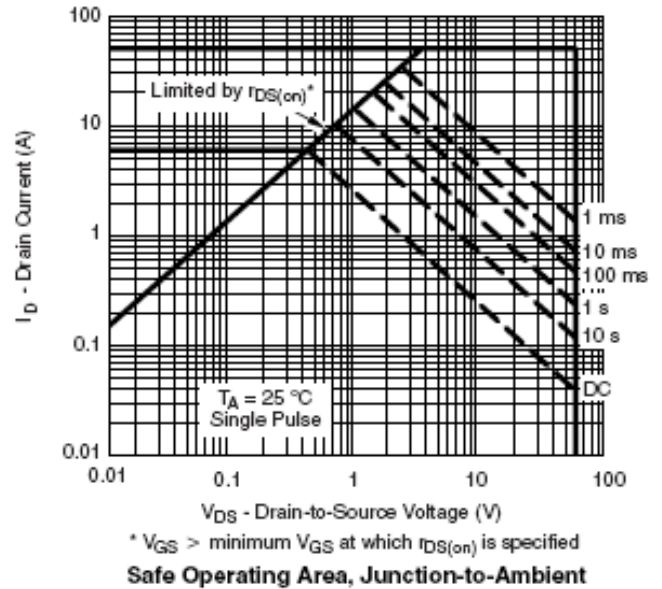
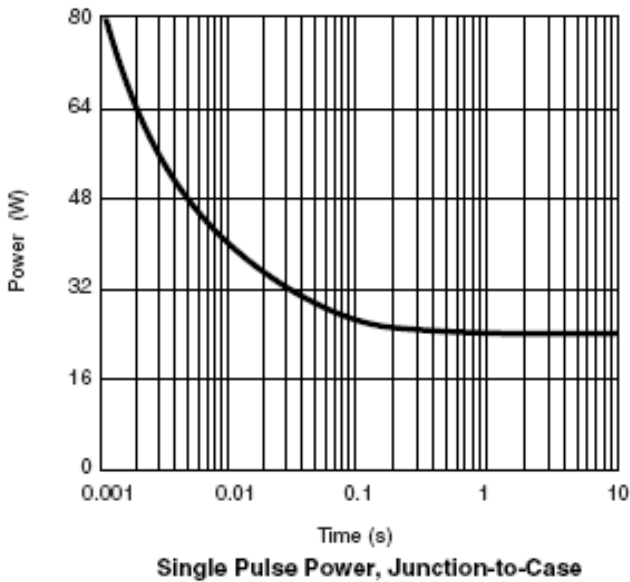
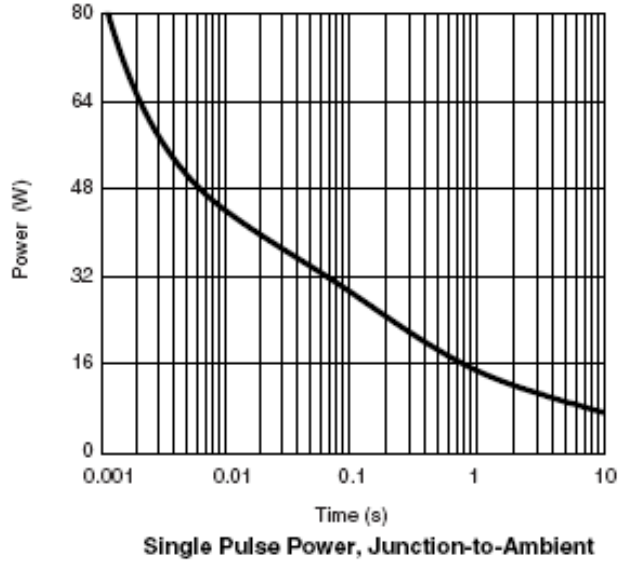
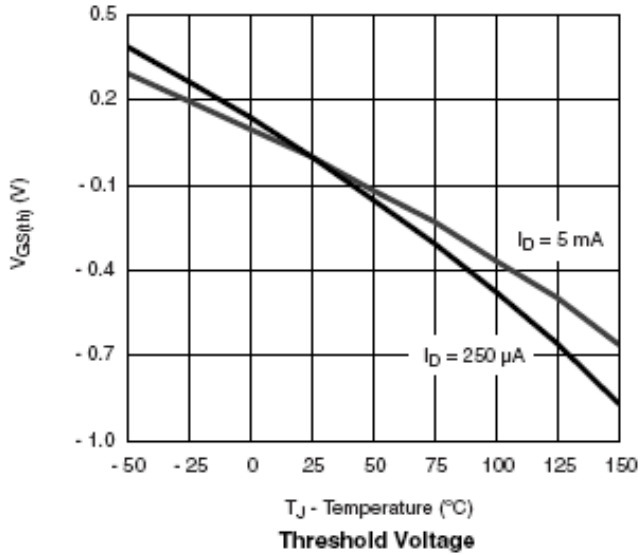
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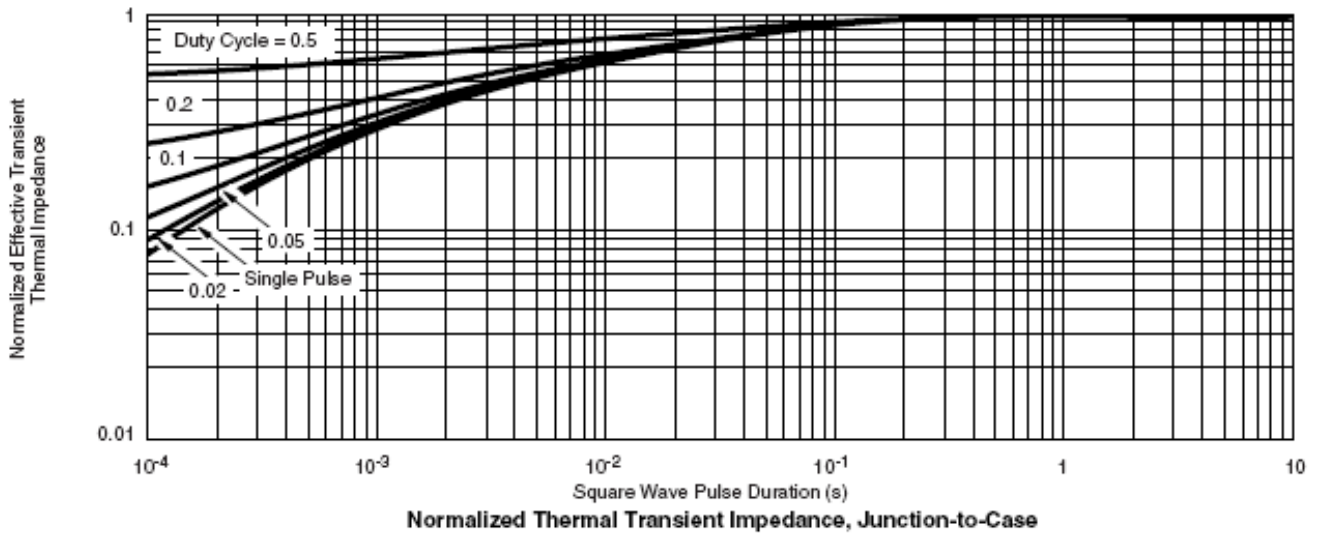
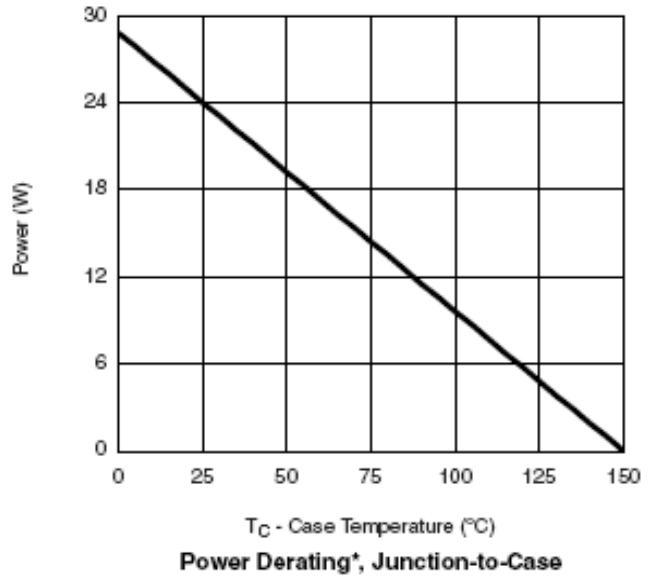
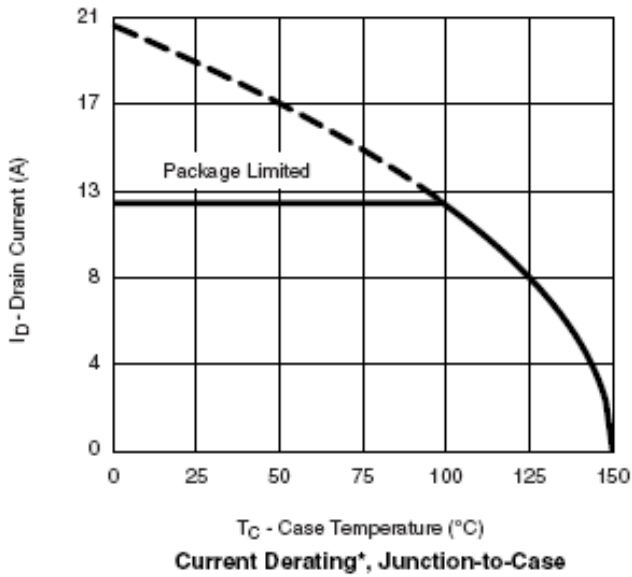
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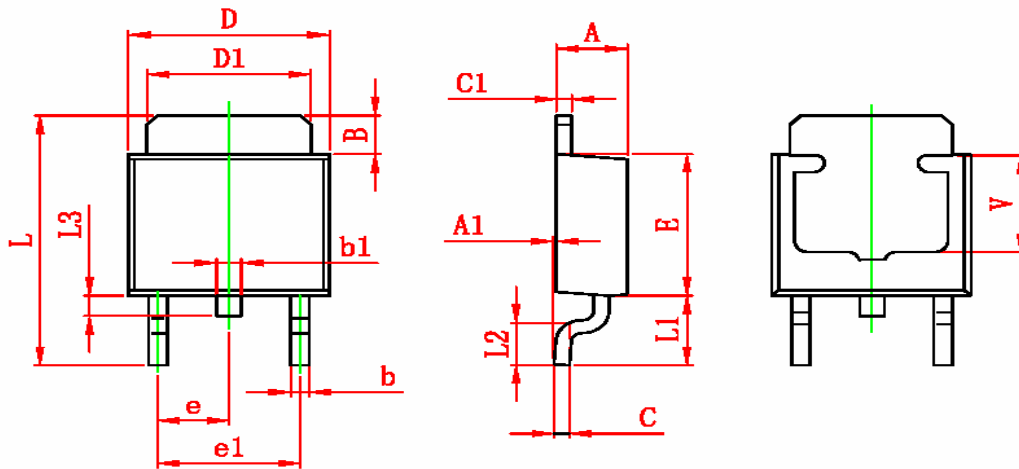
## TYPICAL CHARACTERISTICS





# SPN9971 N-Channel Enhancement Mode MOSFET

## TO-252 PACKAGE OUTLINE



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP		0.091 TYP	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
L3	0.350	0.650	0.014	0.026
V	3.80 REF		0.150 REF	

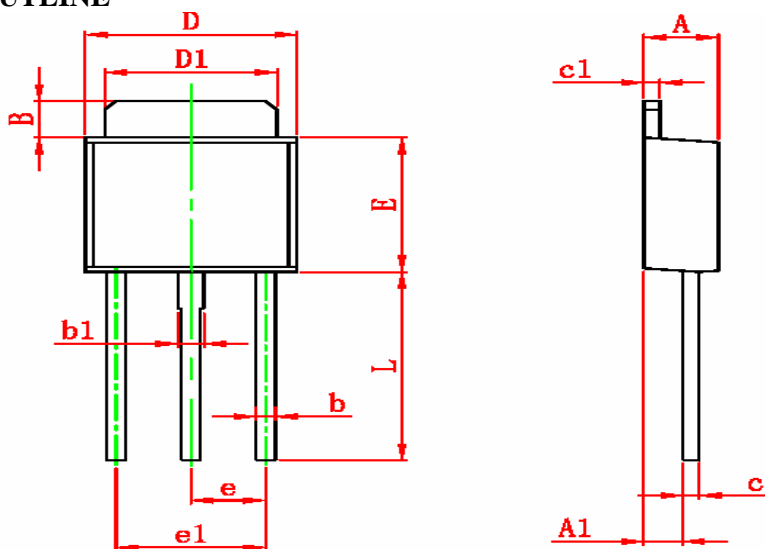




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## N-Channel Enhancement Mode MOSFET

### TO-251 PACKAGE OUTLINE



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	1.020	1.270	0.040	0.050
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP		0.091 TYP	
e1	4.500	4.700	0.177	0.185
L	7.500	7.900	0.295	0.311



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