April 1995

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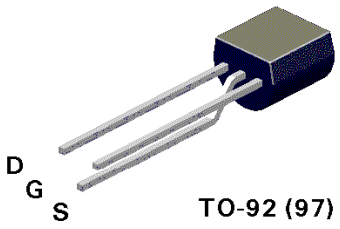
BS270
N-Channel Enhancement Mode Field Effect Transistor

General Description

These N-Channel enhancement mode field effect transistors are produced using Nationals proprietary, high cell density, DMOS technology. These products have been designed to minimize on-state resistance while provide rugged, reliable, and fast switching performance. They can be used in most applications requiring up to 500mA DC. These products are particularly suited for low voltage, low current applications such as small servo motor control, power MOSFET gate drivers, and other switching applications.

Features

- 400mA, 60V. $R_{DS(ON)}$ = 2Ω @ V_{GS} = 10V.
- High density cell design for low $R_{DS(ON)}$.
- Voltage controlled small signal switch.
- Rugged and reliable.
- High saturation current capability.



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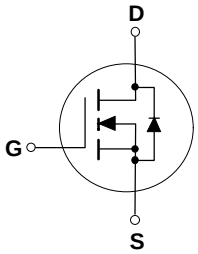

Absolute Maximum Ratings

T_A = 25°C unless otherwise noted

Symbol	Parameter	BS270	Units
V_{DSS}	Drain-Source Voltage	60	V
V_{DGR}	Drain-Gate Voltage ($R_{GS} \leq 1M\Omega$)	60	V
V_{GSS}	Gate-Source Voltage - Continuous	±20	V
	- Non Repetitive (tp < 50µs)	±40	
I_D	Drain Current - Continuous	400	mA
	- Pulsed	2000	
P_D	Maximum Power Dissipation	625	mW
	Derate Above 25°C	5	mW/°C
T_J,T_{STG}	Operating and Storage Temperature Range	-55 to 150	°C
T_L	Maximum Lead Temperature for Soldering Purposes, 1/16" from Case for 10 Seconds	300	°C
THERMAL CHARACTERISTICS			
$R_{\theta JA}$	Thermal Resistacne, Junction-to-Ambient	200	°C/W

Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 10 µA	60			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 60 V, V_{GS} = 0 V			1	µA
		T_J = 125°C			500	µA
I_{GSSF}	Gate - Body Leakage, Forward	V_{GS} = 20 V, V_{DS} = 0 V			10	nA
I_{GSSF}	Gate - Body Leakage, Reverse	V_{GS} = -20 V, V_{DS} = 0 V			-10	nA
ON CHARACTERISTICS (Note 1)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	1	2.1	2.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 500 mA		1.2	2	Ω
		T_J = 125°C		2	3.5	
		V_{GS} = 4.5 V, I_D = 75 mA		1.8	3	
$V_{DS(ON)}$	Drain-Source On-Voltage	V_{GS} = 10 V, I_D = 500 mA		0.6	1	V
		V_{GS} = 4.5 V, I_D = 75 mA		0.14	0.225	
$I_{D(ON)}$	On-State Drain Current	V_{GS} = 10 V, $V_{DS} \geq 2\ V_{DS(on)}$	2000	2700		mA
		V_{GS} = 4.5 V, $V_{DS} \geq 2\ V_{DS(on)}$	400	600		
g_{FS}	Forward Transconductance	$V_{DS} \geq 2\ V_{DS(on)}$, I_D = 200 mA	100	320		mS
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz		20	50	pF
C_{oss}	Output Capacitance			11	25	pF
C_{rss}	Reverse Transfer Capacitance			4	5	pF
SWITCHING CHARACTERISTICS (Note 1)						
t_{on}	Turn-On Time	V_{DD} = 30 V, I_D = 500 m A, V_{GS} = 10 V, R_{GEN} = 25 Ω			10	ns
t_{off}	Turn-Off Time				10	ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Drain-Source Diode Forward Current				400	mA
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current				2000	mA
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 400 mA (Note 1)		0.88	1.2	V

Note:
1. Pulse Test: Pulse Width ≤ 300µs, Duty Cycle ≤ 2.0%.

Typical Electrical Characteristics

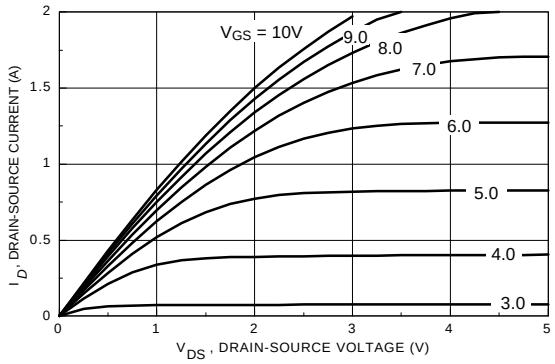

Figure 1. On-Region Characteristics.

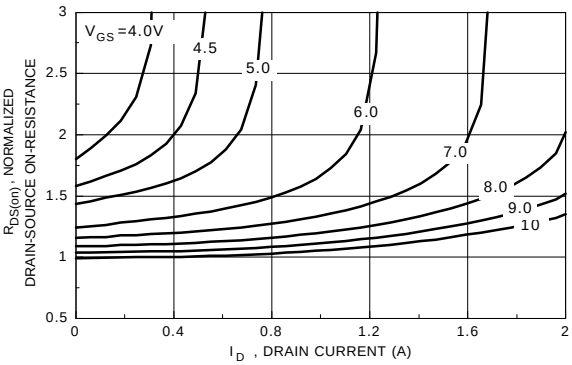

Figure 2. On-Resistance Variation with Gate Voltage and Drain Current.

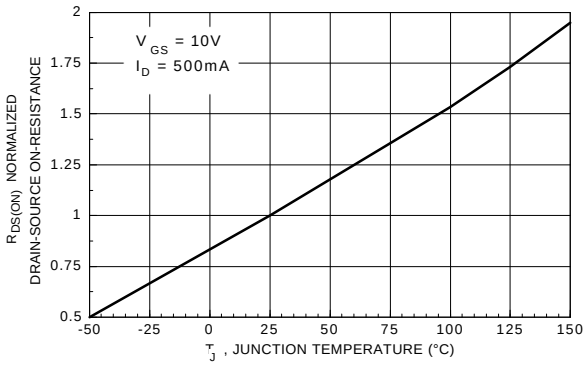

Figure 3. On-Resistance Variation with Temperature.

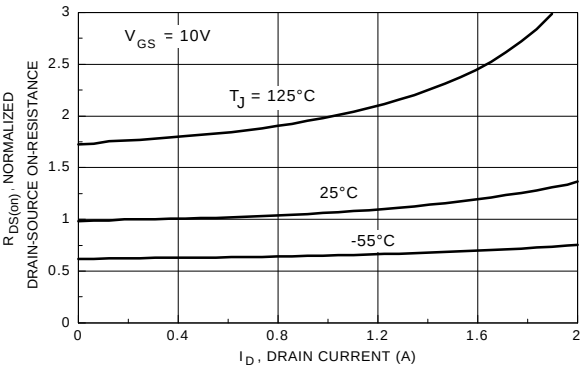

Figure 4. On-Resistance Variation with Drain Current and Temperature.

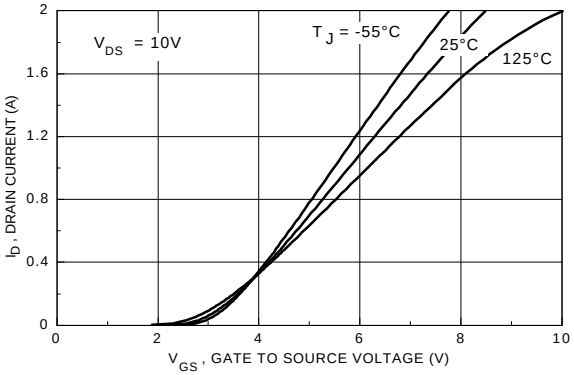

Figure 5. Transfer Characteristics.

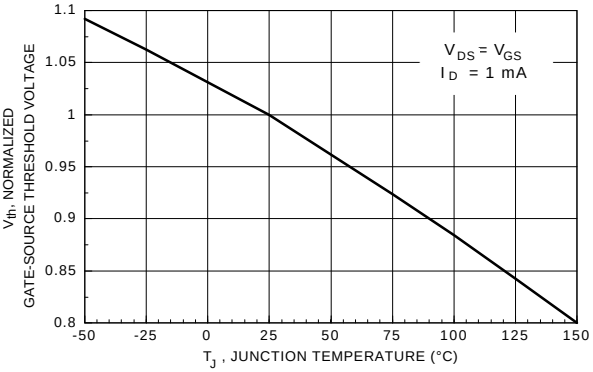

Figure 6. Gate Threshold Variation with Temperature.

Typical Electrical Characteristics (continued)

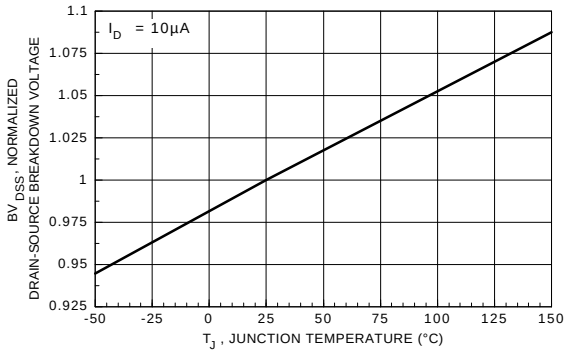

Figure 7. Breakdown Voltage Variation with Temperature.

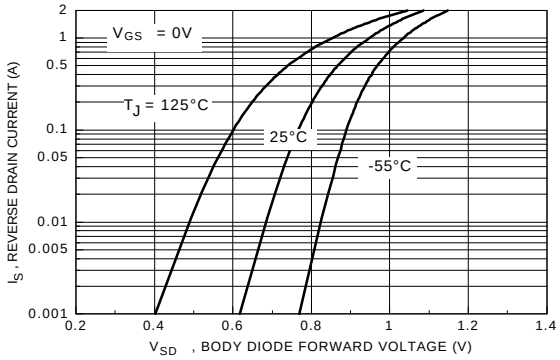

Figure 8. Body Diode Forward Voltage Variation with Current and Temperature.

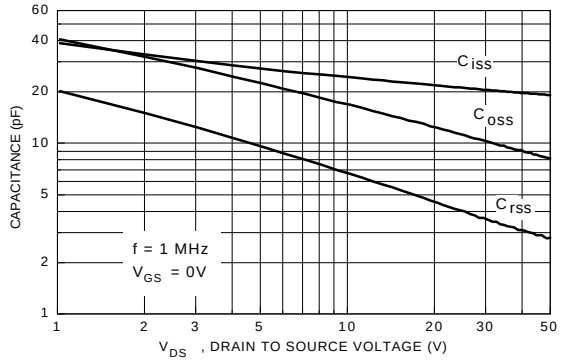

Figure 9. Capacitance Characteristics.

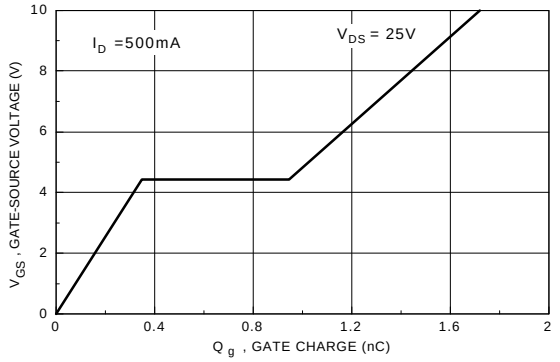

Figure 10. Gate Charge Characteristics.

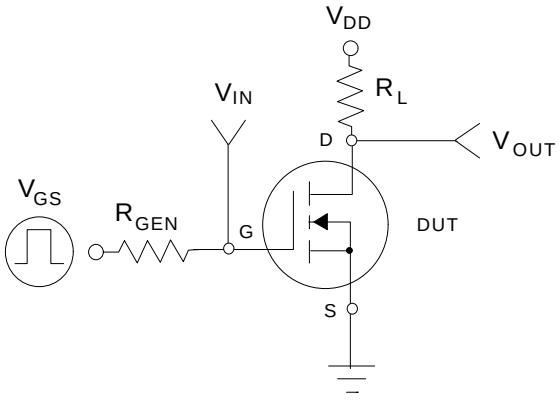

Figure 11. Switching Test Circuit.

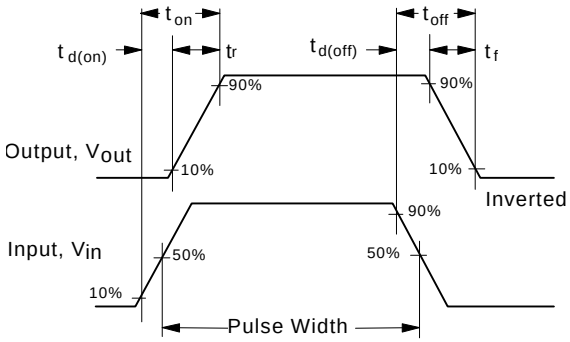

Figure 12. Switching Waveforms.

Typical Electrical Characteristics (continued)

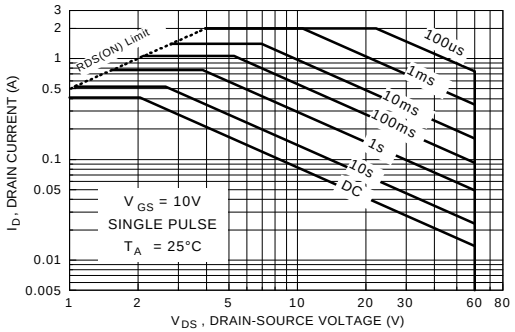

Figure 13. Maximum Safe Operating Area.

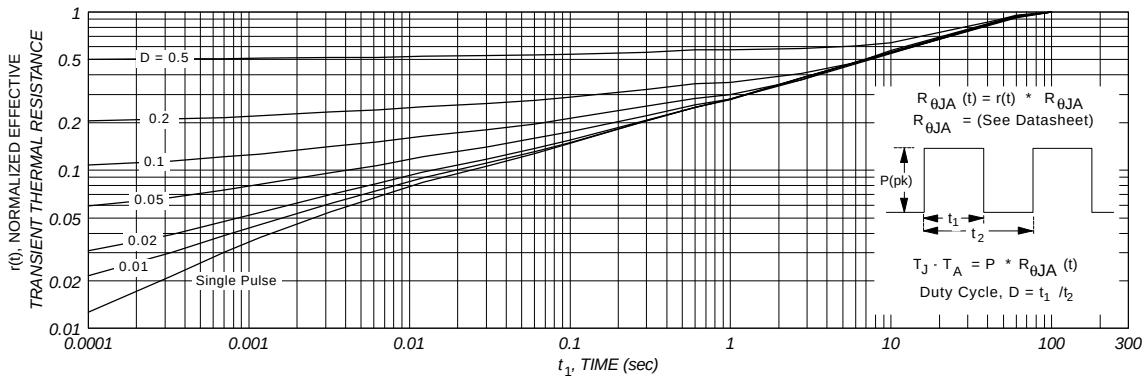

Figure 14. Transient Thermal Response Curve.