

# Field Effect Transistor - N-Channel, Enhancement Mode

## BS270

### General Description

These N-Channel enhancement mode field effect transistors are produced using onsemi's 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 500 mA 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

- 400 mA, 60 V.  $R_{DS(ON)} = 2 \Omega @ V_{GS} = 10 \text{ V}$
- High Density Cell Design for Low  $R_{DS(ON)}$
- Voltage Controlled Small Signal Switch
- Rugged and Reliable
- High Saturation Current Capability
- These are Pb-Free Devices

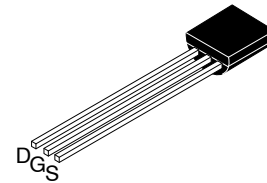
### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage	60	V
$V_{DGR}$	Drain-Gate Voltage ( $R_{GS} \leq 1 \text{ M}\Omega$ )	60	V
$V_{GSS}$	Gate-Source Voltage - Continuous - Non Repetitive ( $t_p < 50 \mu\text{s}$ )	$\pm 20$ $\pm 40$	V
$I_D$	Drain Current - Continuous - Pulsed	400 2000	mA
$P_D$	Maximum Power Dissipation Derate above $25^\circ\text{C}$	625 5	mW mW/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	- 55 to 150	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purposes, 1/16" from Case for 10 Seconds	300	$^\circ\text{C}$

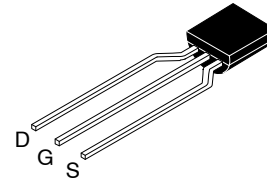
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	200	$^\circ\text{C}/\text{W}$

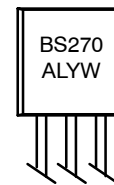


TO-92 3 4.825x4.76  
CASE 135AN

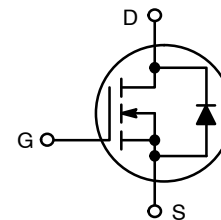


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CASE 135AR

### MARKING DIAGRAM



BS270 = Device Code  
A = Assembly Site  
L = Wafer Lot Number  
YW = Assembly Start Week



### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

# BS270

## ELECTRICAL CHARACTERISTICS ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 10\text{ }\mu\text{A}$	60	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$	-	-	500	$\mu\text{A}$
$I_{GSSF}$	Gate - Body Leakage, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	10	nA
	Gate - Body Leakage, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$	-	-	-10	nA

### ON CHARACTERISTICS (Note 1)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1	2.1	2.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 500\text{ mA}$	-	1.2	2	$\Omega$
		$V_{GS} = 10\text{ V}, I_D = 500\text{ mA}, T_J = 125^\circ\text{C}$	-	2	3.5	
		$V_{GS} = 4.5\text{ V}, I_D = 75\text{ mA}$	-	1.8	3	
$V_{DS(ON)}$	Drain-Source On-Voltage	$V_{GS} = 10\text{ V}, I_D = 500\text{ mA}$	-	0.6	1	V
		$V_{GS} = 4.5\text{ V}, I_D = 75\text{ mA}$	-	0.14	0.225	
$I_{D(ON)}$	On-State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} \geq 2\text{ }V_{DS(on)}$	2000	2700	-	mA
		$V_{GS} = 4.5\text{ V}, V_{DS} \geq 2\text{ }V_{DS(on)}$	400	600	-	
$g_{FS}$	Forward Transconductance	$V_{DS} \geq 2\text{ }V_{DS(on)}, I_D = 200\text{ mA}$	100	320	-	mS

### DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	-	20	50	pF
$C_{oss}$	Output Capacitance		-	11	25	pF
$C_{riss}$	Reverse Transfer Capacitance		-	4	5	pF

### SWITCHING CHARACTERISTICS (Note 1)

$t_{on}$	Turn-On Time	$V_{DD} = 30\text{ V}, I_D = 500\text{ mA},$ $V_{GS} = 10\text{ V}, R_{GEN} = 25\text{ }\Omega$	-	-	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	$V_{GS} = 0\text{ V}, I_S = 400\text{ mA}$ (Note 1)	-	0.88	1.2	V

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

TYPICAL ELECTRICAL CHARACTERISTICS

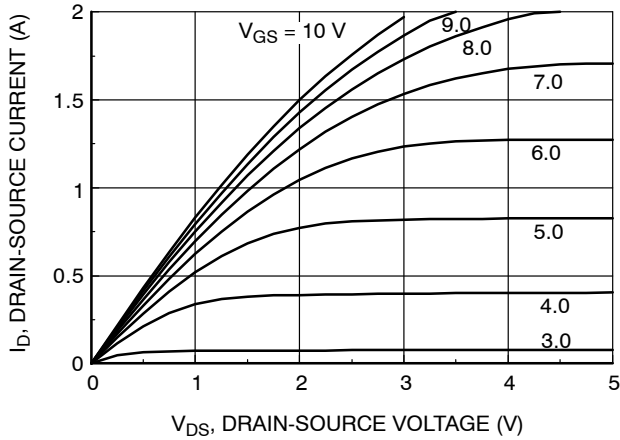


Figure 1. On-Region Characteristics

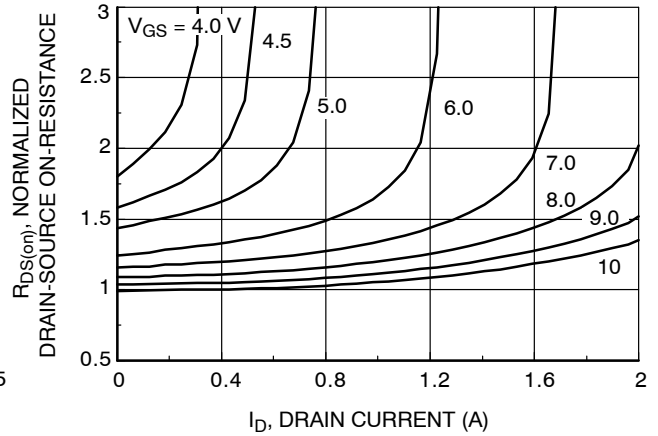


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current

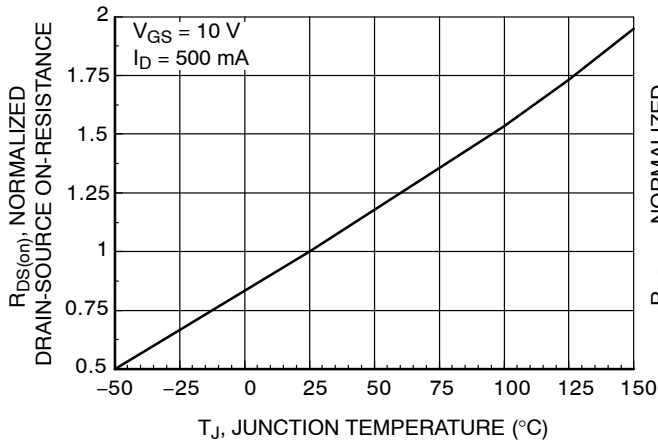


Figure 3. On-Resistance Variation with Temperature

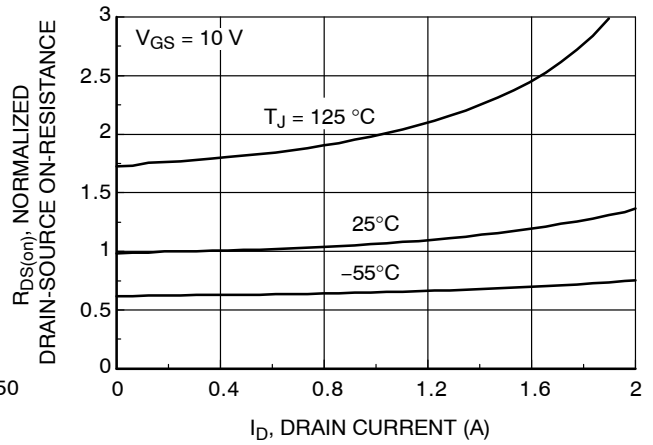


Figure 4. On-Resistance Variation with Drain Current and Temperature

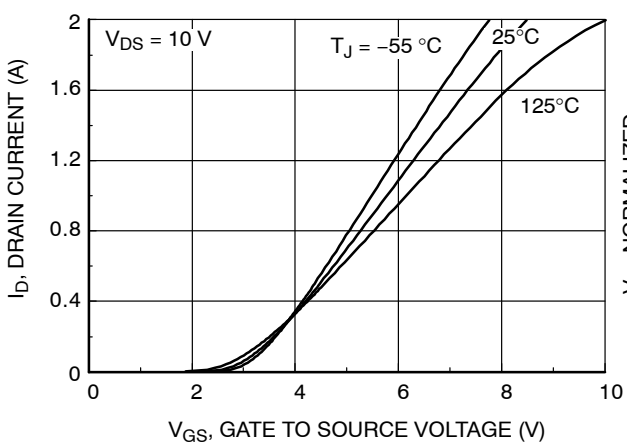


Figure 5. Transfer Characteristics

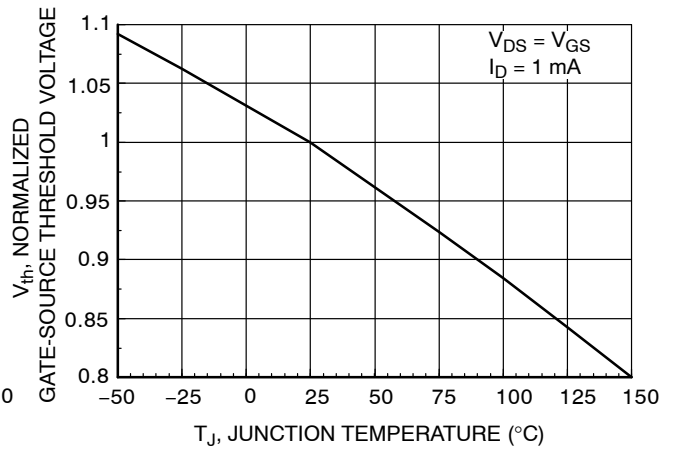


Figure 6. Gate Threshold Variation with Temperature

TYPICAL ELECTRICAL CHARACTERISTICS (continued)

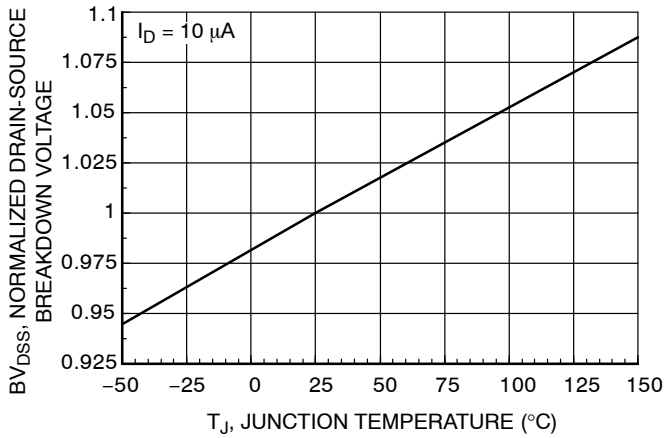


Figure 7. Breakdown Voltage Variation with Temperature

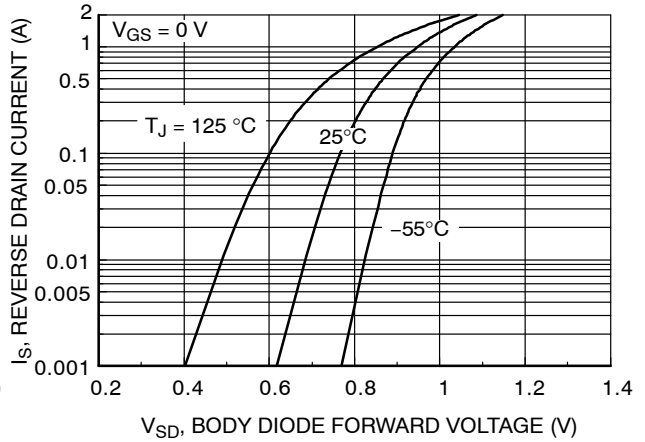


Figure 8. Body Diode Forward Voltage Variation with Current and Temperature

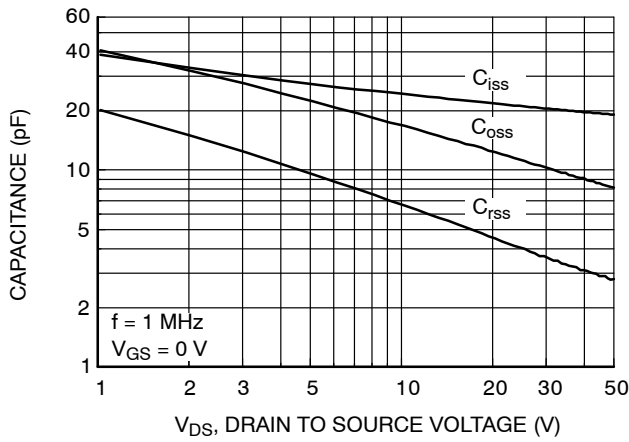


Figure 9. Capacitance Characteristics

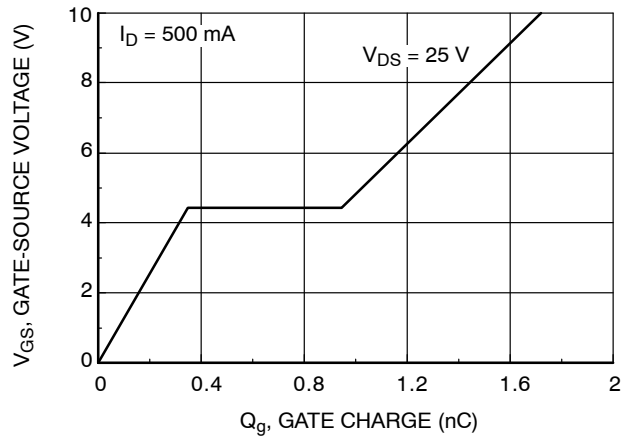


Figure 10. Gate Charge Characteristics

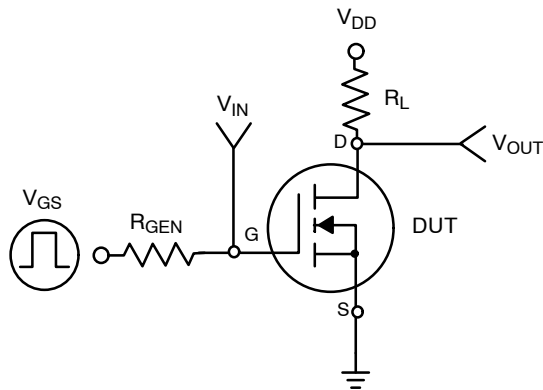


Figure 11. Switching Test Circuit

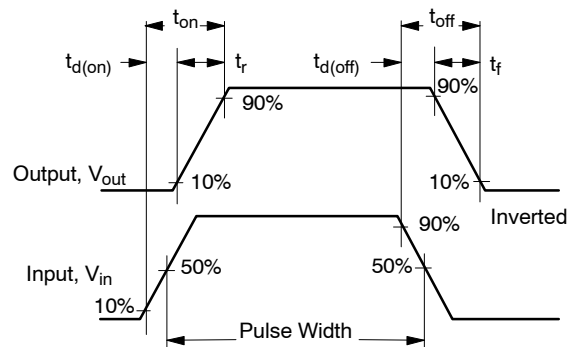


Figure 12. Switching Waveforms

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## TYPICAL ELECTRICAL CHARACTERISTICS (continued)

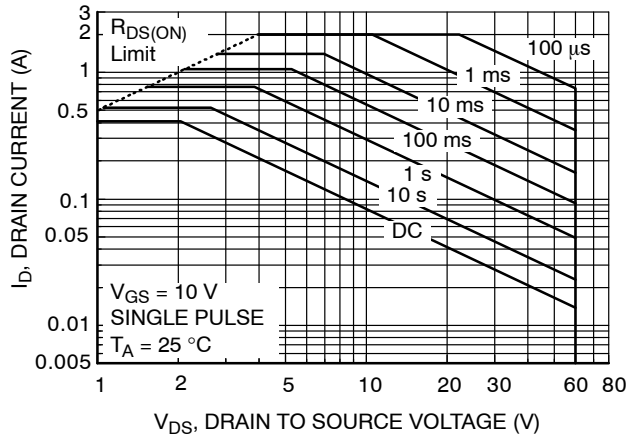


Figure 13. Maximum Safe Operating Area

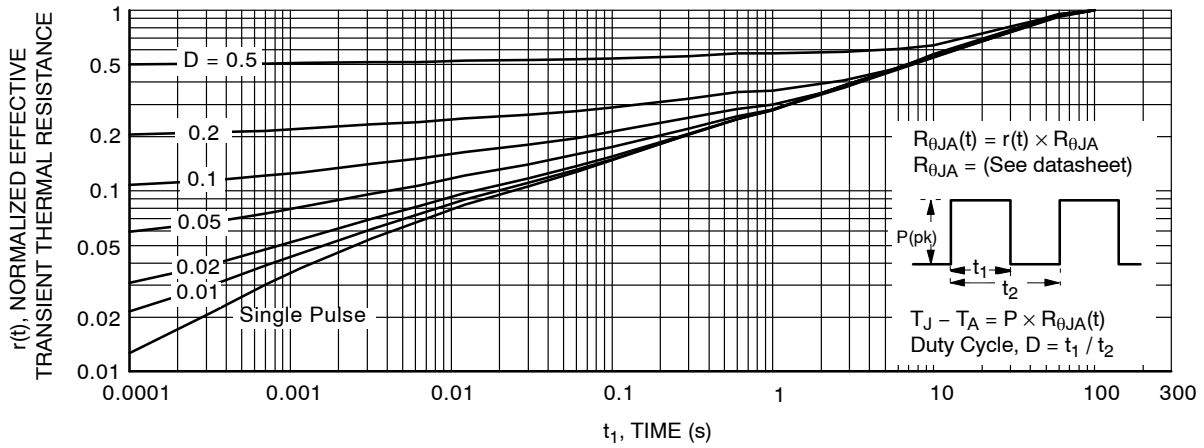


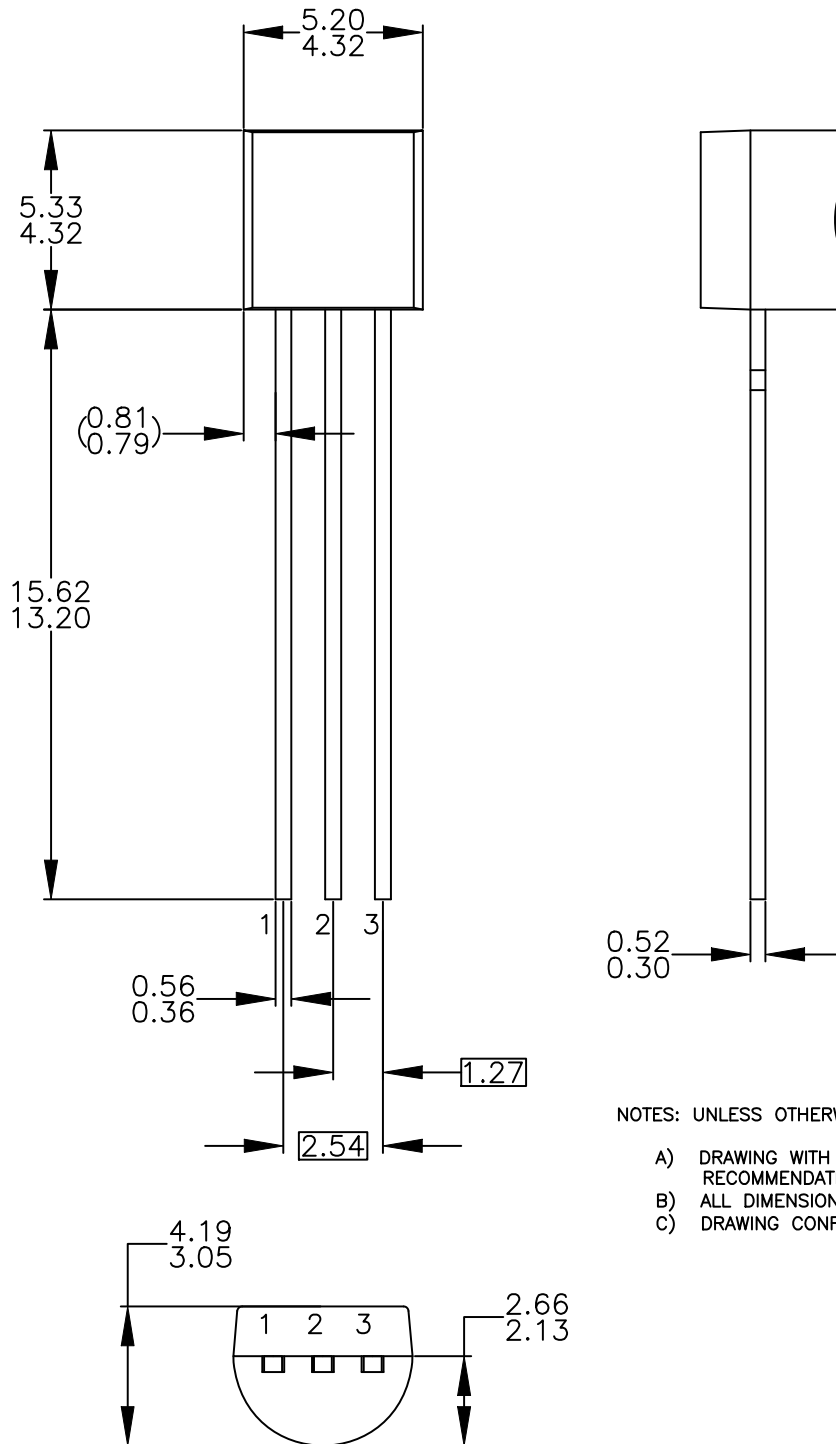
Figure 14. Transient Thermal Response Curve

### ORDERING INFORMATION

Part Number	Package	Shipping
BS270	TO-92, Case 135AN (Pb-Free)	10000 Units / Bulk
BS270-D74Z	TO-92, Case 135AR (Pb-Free)	2000 Units / Fan-Fold

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CASE 135AN  
ISSUE O

DATE 31 JUL 2016



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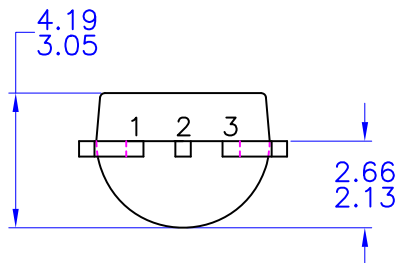
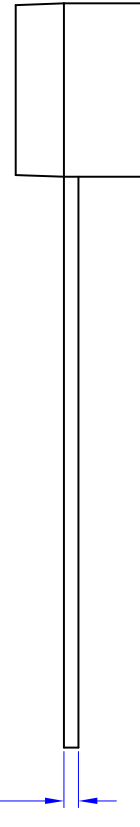
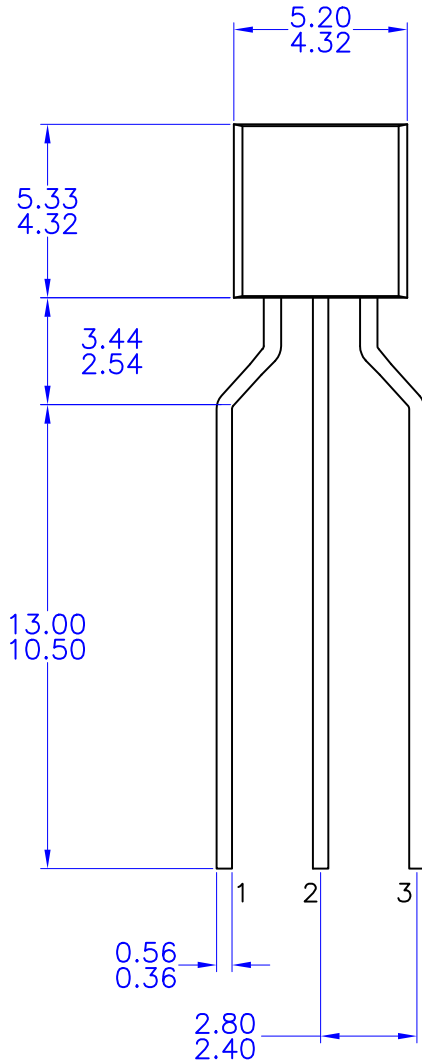
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