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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 Fairchild's proprietary, high cell density, DMOS technology. These products have been designed to minimize on-state resistance while providing 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, $R_{DS(ON)} = 2\Omega$ @ $V_{DS} = 10V$.
- High density cell design for low $R_{DS(ON)}$.
- Voltage controlled small signal switch.
- Rugged and reliable.
- High saturation current capability.

Absolute Maximum Ratings
$T_A = 25^\circ C$ unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>BS270</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{DS}$</td>
<td>Drain-Source Voltage</td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td>$V_{DSR}$</td>
<td>Drain-Gate Voltage ($R_{DS} \leq 1M\Omega$)</td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td>$V_{GSS}$</td>
<td>Gate-Source Voltage - Continuous</td>
<td>±40</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>- Non Repetitive (tp &lt; 50µs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_D$</td>
<td>Drain Current - Continuous</td>
<td>400</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>- Pulsed</td>
<td>2000</td>
<td>mA</td>
</tr>
<tr>
<td>$P_D$</td>
<td>Maximum Power Dissipation</td>
<td>625</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td>Derate Above 25°C</td>
<td>5</td>
<td>mW/°C</td>
</tr>
<tr>
<td>$T_J,T_{STG}$</td>
<td>Operating and Storage Temperature Range</td>
<td>-55 to 150</td>
<td>°C</td>
</tr>
<tr>
<td>$T_L$</td>
<td>Maximum Lead Temperature for Soldering Purposes, 1/16&quot; from Case for 10 Seconds</td>
<td>300</td>
<td>°C</td>
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THERMAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Thermal Resistance, Junction-to-Ambient</th>
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<tbody>
<tr>
<td>$R_{th}$</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>°C/W</td>
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### Electrical Characteristics *(T<sub>a</sub> = 25°C unless otherwise noted)*

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
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<td><strong>OFF CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BV&lt;sub&gt;DSS&lt;/sub&gt;</td>
<td>Drain-Source Breakdown Voltage</td>
<td>V&lt;sub&gt;GS&lt;/sub&gt; = 0 V, I&lt;sub&gt;b&lt;/sub&gt; = 10 µA</td>
<td>60</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I&lt;sub&gt;DS&lt;/sub&gt;</td>
<td>Zero Gate Voltage Drain Current</td>
<td>V&lt;sub&gt;DS&lt;/sub&gt; = 60 V, V&lt;sub&gt;GS&lt;/sub&gt; = 0 V</td>
<td>100</td>
<td>µA</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ON CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V&lt;sub&gt;GS(th)&lt;/sub&gt;</td>
<td>Gate Threshold Voltage</td>
<td>V&lt;sub&gt;DS&lt;/sub&gt; = V&lt;sub&gt;GS&lt;/sub&gt;, I&lt;sub&gt;D&lt;/sub&gt; = 250 µA</td>
<td>1.2</td>
<td>2.1</td>
<td>2.5</td>
<td>V</td>
</tr>
<tr>
<td>R&lt;sub&gt;DS(ON)&lt;/sub&gt;</td>
<td>Static Drain-Source On-Resistance</td>
<td>V&lt;sub&gt;GS&lt;/sub&gt; = 10 V, I&lt;sub&gt;b&lt;/sub&gt; = 500 mA</td>
<td>0.3</td>
<td>0.35</td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td>V&lt;sub&gt;DS(ON)&lt;/sub&gt;</td>
<td>Drain-Source On-Voltage</td>
<td>V&lt;sub&gt;GS&lt;/sub&gt; = 10 V, I&lt;sub&gt;b&lt;/sub&gt; = 500 mA</td>
<td>0.6</td>
<td>0.7</td>
<td></td>
<td>V</td>
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<tr>
<td>I&lt;sub&gt;DS(ON)&lt;/sub&gt;</td>
<td>On-State Drain Current</td>
<td>V&lt;sub&gt;GS&lt;/sub&gt; = 4.5 V, I&lt;sub&gt;b&lt;/sub&gt; = 75 mA</td>
<td>0.14</td>
<td>0.225</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g&lt;sub&gt;F&lt;/sub&gt;</td>
<td>Forward Transconductance</td>
<td>V&lt;sub&gt;DS&lt;/sub&gt; ≥ 2 V&lt;sub&gt;GS(th)&lt;/sub&gt;, I&lt;sub&gt;DS&lt;/sub&gt; = 100 mA</td>
<td>100</td>
<td>320</td>
<td></td>
<td>mS</td>
</tr>
<tr>
<td><strong>DYNAMIC CHARACTERISTICS</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C&lt;sub&gt;iss&lt;/sub&gt;</td>
<td>Input Capacitance</td>
<td>V&lt;sub&gt;DS&lt;/sub&gt; = 25 V, V&lt;sub&gt;GS&lt;/sub&gt; = 0 V, f = 1.0 MHz</td>
<td></td>
<td>20</td>
<td>50</td>
<td>pF</td>
</tr>
<tr>
<td>C&lt;sub&gt;oss&lt;/sub&gt;</td>
<td>Output Capacitance</td>
<td>f = 1.0 MHz</td>
<td></td>
<td>11</td>
<td>25</td>
<td>pF</td>
</tr>
<tr>
<td>C&lt;sub&gt;rss&lt;/sub&gt;</td>
<td>Reverse Transfer Capacitance</td>
<td></td>
<td></td>
<td>4</td>
<td>5</td>
<td>pF</td>
</tr>
<tr>
<td><strong>SWITCHING CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t&lt;sub&gt;on&lt;/sub&gt;</td>
<td>Turn-On Time</td>
<td>V&lt;sub&gt;DD&lt;/sub&gt; = 30 V, I&lt;sub&gt;b&lt;/sub&gt; = 500 mA, V&lt;sub&gt;GS&lt;/sub&gt; = 10 V, R&lt;sub&gt;GEN&lt;/sub&gt; = 25 Ω</td>
<td></td>
<td>10</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>t&lt;sub&gt;off&lt;/sub&gt;</td>
<td>Turn-Off Time</td>
<td>V&lt;sub&gt;DD&lt;/sub&gt; = 30 V, I&lt;sub&gt;b&lt;/sub&gt; = 500 mA, V&lt;sub&gt;GS&lt;/sub&gt; = 10 V, R&lt;sub&gt;GEN&lt;/sub&gt; = 25 Ω</td>
<td></td>
<td>10</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td><strong>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I&lt;sub&gt;S&lt;/sub&gt;</td>
<td>Maximum Continuous Drain-Source Diode Forward Current</td>
<td></td>
<td></td>
<td>400</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>I&lt;sub&gt;SM&lt;/sub&gt;</td>
<td>Maximum Pulsed Drain-Source Diode Forward Current</td>
<td></td>
<td></td>
<td>2000</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>V&lt;sub&gt;SD&lt;/sub&gt;</td>
<td>Drain-Source Diode Forward Voltage</td>
<td>V&lt;sub&gt;GS&lt;/sub&gt; = 0 V, I&lt;sub&gt;peak&lt;/sub&gt; = 400 mA (Note 1)</td>
<td></td>
<td>0.88</td>
<td>1.2</td>
<td>V</td>
</tr>
</tbody>
</table>

**Notes:**
- 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.
## TO-92 Tape and Reel Data

**TO-92 Packaging**

Configuration: Figure 1.0

### TO-92 Tape and Reel Data

#### AMMO PACK OPTION

See Fig 3.0 for 2 Ammo Pack Options

- **2000 units per EO70 box for std option**
- **FSCINT Label**
- **530mm x 130mm x 83mm Intermediate box**
- Customized Label

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<thead>
<tr>
<th>Packing Style</th>
<th>Quantity</th>
<th>EOL Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reel A</td>
<td>2,000</td>
<td>D82Z</td>
</tr>
<tr>
<td>E</td>
<td>2,000</td>
<td>D72Z</td>
</tr>
<tr>
<td>Ammo M</td>
<td>2,000</td>
<td>D74Z</td>
</tr>
<tr>
<td>P</td>
<td>2,000</td>
<td>D75Z</td>
</tr>
</tbody>
</table>

- **Unit weight**
  - 0.22 gm
  - Real weight with components: 1.04 kg
  - Ammo weight with components: 1.02 kg
  - Max quantity per intermediate box: 10,000 units

#### BULK OPTION

See Bulk Packing Information table

<table>
<thead>
<tr>
<th>EOL Code</th>
<th>Description</th>
<th>Leadclip</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>J18Z</td>
<td>TO-18 OPTION STD</td>
<td>NO-LEAD CLIP</td>
<td>2.0 K / BOX</td>
</tr>
<tr>
<td>J55Z</td>
<td>TO-5 OPTION STD</td>
<td>NO-LEAD CLIP</td>
<td>1.5 K / BOX</td>
</tr>
<tr>
<td>NO EOL</td>
<td>TO-92 STANDARD STRAIGHT FOR: PKG 92, 94 (NON PROELECTRON SERIES), 94</td>
<td>NO-LEAD CLIP</td>
<td>2.0 K / BOX</td>
</tr>
<tr>
<td>L18Z</td>
<td>TO-92 STANDARD STRAIGHT FOR: PKG 94 PROELECTRON SERIES BCXXX, BFXXX, BSXXX, SC, SB</td>
<td>NO-LEAD CLIP</td>
<td>2.0 K / BOX</td>
</tr>
</tbody>
</table>

- **2000 units per EO70 box for std option**
- **114mm x 102mm x 51mm Immediate Box**
- **FSCINT Label**
- **5 EO70 boxes per intermediate Box**
- **Customized Label**

### (TO-92) BULK PACKING INFORMATION

#### TO-92 TAPE AND REEL INFORMATION

- **LOT:** CBVK741B019
- **NSID:** PN2222N
- **D/C1:** D9842
- **SPEC REV:** B2
- **SPEC:** QTY: 10000
- **QA REV:** FAIRCHILD SEMICONDUCTOR CORPORATION

TO-92 Reeling Style

Configuration: Figure 2.0

Machine Option “A” (H)

Style “A”, D26Z, D70Z (s/h)

Machine Option “E” (J)

Style “E”, D27Z, D71Z (s/h)

TO-92 Radial Ammo Packaging

Configuration: Figure 3.0

FIRST WIRE OFF IS EMITTER
ADHESIVE TAPE IS ON THE TOP SIDE
FLAT OF TRANSISTOR IS ON BOTTOM

ORDER STYLE D74Z (M)

FIRST WIRE OFF IS COLLECTOR (ON PKG. 92)
ADHESIVE TAPE IS ON BOTTOM SIDE
FLAT OF TRANSISTOR IS ON TOP

ORDER STYLE D75Z (P)

FIRST WIRE OFF IS EMITTER (ON PKG. 92)
ADHESIVE TAPE IS ON BOTTOM SIDE
FLAT OF TRANSISTOR IS ON TOP
TO-92 Tape and Reel Data, continued

TO-92 Tape and Reel Taping
Dimension Configuration: Figure 4.0

User Direction of Feed

TO-92 Reel
Configuration: Figure 5.0

Note: All dimensions are inches.

July 1999, Rev. A
TO-92 Package Dimensions

TO-92; TO-18 Reverse Lead Form (J35Z Option)  
(FS PKG Code 92, 94, 96)

Scale 1:1 on letter size paper
Dimensions shown below are in:
  inches [millimeters]

Part Weight per unit (gram): 0.22

Note: All package 97 or 98 transistors are leadformed to this configuration prior to bulk shipment. Order L34Z option if in-line leads are preferred on package 97 or 98.

* Standard Option on 97 & 98 package code
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DO\textsuperscript{TM} ME
E\textsuperscript{TM} CMOS
EnSigna\textsuperscript{TM}
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FAST\textsuperscript{®}

FAST\textsuperscript{TM}
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GTO\textsuperscript{TM}
HiSeC\textsuperscript{TM}
ISOPLANAR\textsuperscript{TM}
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OPTOPLANAR\textsuperscript{TM}
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SuperSOT\textsuperscript{TM}-3
SuperSOT\textsuperscript{TM}-6
SuperSOT\textsuperscript{TM}-8

SyncFET\textsuperscript{TM}
TinyLogic\textsuperscript{TM}
UHC\textsuperscript{TM}
VCX\textsuperscript{TM}

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

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<tr>
<th>Datasheet Identification</th>
<th>Product Status</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Advance Information</td>
<td>Formative or</td>
<td>This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.</td>
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<td>In Design</td>
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<tr>
<td>Preliminary</td>
<td>First Production</td>
<td>This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.</td>
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<td>No Identification Needed</td>
<td>Full Production</td>
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<td>Obsolete</td>
<td>Not In Production</td>
<td>This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.</td>
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