To learn more about ON Semiconductor, please visit our website at www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor’s system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.
NPN Darlington Transistor

This device is designed for applications requiring extremely high current gain at currents to 1.0 A. Sourced from Process 05. See MPSA14 for characteristics.

Absolute Maximum Ratings* TA = 25°C unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CEO}$</td>
<td>Collector-Emitter Voltage</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>$V_{CBO}$</td>
<td>Collector-Base Voltage</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>$V_{EBO}$</td>
<td>Emitter-Base Voltage</td>
<td>12</td>
<td>V</td>
</tr>
<tr>
<td>$I_C$</td>
<td>Collector Current - Continuous</td>
<td>1.2</td>
<td>A</td>
</tr>
<tr>
<td>$T_J, T_{stg}$</td>
<td>Operating and Storage Junction Temperature Range</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics TA = 25°C unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_D$</td>
<td>Total Device Dissipation</td>
<td>6.25</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td>Derate above 25°C</td>
<td>5.0</td>
<td>mW/°C</td>
</tr>
<tr>
<td>$R_{JIC}$</td>
<td>Thermal Resistance, Junction to Case</td>
<td>83.3</td>
<td>°C/W</td>
</tr>
<tr>
<td>$R_{JJA}$</td>
<td>Thermal Resistance, Junction to Ambient</td>
<td>200</td>
<td>°C/W</td>
</tr>
</tbody>
</table>
### Electrical Characteristics

TA = 25°C unless otherwise noted

#### OFF CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{BRCEO}$</td>
<td>Collector-Emitter Breakdown Voltage*</td>
<td>$I_C = 10 , mA, I_B = 0$</td>
<td>40</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{BRCEO}$</td>
<td>Collector-Base Breakdown Voltage</td>
<td>$I_C = 100 , \mu A, I_B = 0$</td>
<td>40</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{BRCEO}$</td>
<td>Emitter-Base Breakdown Voltage</td>
<td>$I_E = 10 , \mu A, I_C = 0$</td>
<td>12</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$I_{CEO}$</td>
<td>Collector Cutoff Current</td>
<td>$V_{CE} = 30 , V, I_E = 0$</td>
<td>50</td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>$I_{CEO}$</td>
<td>Collector Cutoff Current</td>
<td>$V_{CE} = 25 , V, I_B = 0$</td>
<td>1.0</td>
<td></td>
<td>(\mu A)</td>
</tr>
<tr>
<td>$I_{EBO}$</td>
<td>Emitter Cutoff Current</td>
<td>$V_{EB} = 10 , V, I_C = 0$</td>
<td>50</td>
<td></td>
<td>nA</td>
</tr>
</tbody>
</table>

#### ON CHARACTERISTICS*

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$h_{FE}$</td>
<td>DC Current Gain</td>
<td>$V_{CE} = 5.0 , V, I_C = 10 , mA$</td>
<td>20,000</td>
<td>30,000</td>
<td>200,000</td>
</tr>
<tr>
<td>$V_{CE(sat)}$</td>
<td>Collector-Emitter Saturation Voltage</td>
<td>$I_C = 50 , mA, I_B = 0.5 , mA$</td>
<td>1.2</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{BE(sat)}$</td>
<td>Base-Emitter Saturation Voltage</td>
<td>$I_C = 500 , mA, I_E = 0.5 , mA$</td>
<td>1.5</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{BE(on)}$</td>
<td>Base-Emmiter On Voltage</td>
<td>$I_C = 50 , mA, V_{CE} = 5.0 , V$</td>
<td>2.0</td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

#### SMALL SIGNAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_{ob}$</td>
<td>Output Capacitance</td>
<td>$V_{CB} = 10 , V, I_E = 0, f = 1.0 , MHz$</td>
<td>7.0</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>$C_{ib}$</td>
<td>Input Capacitance</td>
<td>$V_{EB} = 1.0 , V, I_C = 0, f = 1.0 , MHz$</td>
<td>15</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>$h_{fe}$</td>
<td>Small-Signal Current Gain</td>
<td>$I_C = 10 , mA, V_{CE} = 5.0 , V, f = 1.0 , kHz$</td>
<td>20,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$h_{ie}$</td>
<td>Input Impedance</td>
<td>$I_C = 10 , mA, V_{CE} = 5.0 , V, f = 1.0 , kHz$</td>
<td>100</td>
<td>2,000</td>
<td>k(\Omega)</td>
</tr>
<tr>
<td>$h_{oe}$</td>
<td>Output Admittance</td>
<td>$f = 1.0 , kHz$</td>
<td>1,000</td>
<td></td>
<td>(\mu)mho</td>
</tr>
<tr>
<td>$NF$</td>
<td>Noise Figure</td>
<td>$I_C = 1.0 , mA, V_{CE} = 5.0 , V, R_s = 100 , k\Omega, f = 10 , kHz \text{ to } 15.7 , kHz$</td>
<td>10</td>
<td></td>
<td>dB</td>
</tr>
</tbody>
</table>

*Pulse Test: Pulse Width ≤ 300 \(\mu s\), Duty Cycle ≤ 2.0%
TO-92 Tape and Reel Data

TO-92 Packaging
Configuration: Figure 1.0

TO-92 Tape and Reel Data

TO-92 TNR/AMMO PACKING INFORMATION

Packing Style Quantity EOL code

- Reel A 2,000 D8Z
- Reel E 2,000 D2Z
- Ammo M 2,000 D1Z
- Ammo P 2,000 D5Z

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

BULK OPTION
See Bulk Packing Information Table

- EOL CODE DESCRIPTION LEADCLIP DIMENSION QUANTITY
  - J18Z TO-18 OPTION STD NO LEAD CLIP 2.0 K / BOX
  - J5SZ TO-5 OPTION STD NO LEAD CLIP 1.5 K / BOX
  - NO EOL CODE TO-92 STANDARD STRAIGHT FOR: PKG 92, 94 (NON PROELECTRON SERIES) NO LEADCLIP 2.0 K / BOX
  - L34Z TO-92 STANDARD STRAIGHT FOR: PKG 92, 94 PROELECTRON SERIES BCXXX, BFXXX, BSRXXX, 97, 98 NO LEADCLIP 2.0 K / BOX

FSCINT Label sample

F63TNR Label sample

(TO-92) BULK PACKING INFORMATION

- LOT: CBVK741B019
- NSID: PN222N
- D/C1: D9842
- SPEC REV: B2
- SPEC: QTY: 10000
- QA REV: FAIRCHILD SEMICONDUCTOR CORPORATION

AMMO PACK OPTION
See Fig 3.0 for 2 Ammo Pack Options

- 5 Ammo boxes per Intermediate Box
- 63TNR Label
- Customized Label

375mm x 267mm x 375mm Intermediate Box

BULK OPTION
See Bulk Packing Information Table

- 154mm x 102mm x 51mm Immediate Box
- 5 EO70 boxes per std option

- 530mm x 130mm x 83mm Intermediate box
- FSCINT Label
- Customized Label

- 10,000 units maximum per intermediate box for std option

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March 2001, Rev. B1
TO-92 Reeling Style
Configuration: Figure 2.0

Machine Option “A” (H)

Style “A”, D26Z, D70Z (s/h)

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

Machine Option “E” (J)

Style “E”, D27Z, D71Z (s/h)

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

TO-92 Radial Ammo Packaging
Configuration: Figure 3.0

ORDER STYLE
D74Z (M)

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

ORDER STYLE
D75Z (P)

FIRST WIRE OFF IS COLLECTOR (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

TO-92 Reel
Configuration: Figure 5.0

User Direction of Feed

### TO-92 Tape and Reel Data, continued

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

#### TO-92 Reel
Configuration: Figure 5.0

---

**ITEM DESCRIPTION** | **SYMBOL** | **DIMENSION**
--- | --- | ---
Base of Package to Lead Bend | b | 0.038 (max)
Component Height | H6 | 0.925 (+/- 0.025)
Lead Clinch Height | HO | 0.630 (+/- 0.020)
Component Base Height | H1 | 0.746 (+/- 0.020)
Component Alignment ( side/side) | Pd | 0.040 (max)
Component Alignment ( front/back) | H6 | 0.031 (max)
Component Pitch | P | 0.090 (+/- 0.020)
Feed Hole Pitch | PO | 0.031 (max)
Hole Center to First Lead | P1 | 0.150 (+/-0.005, -0.010)
Hole Center to Component Center | P2 | 0.247 (+/- 0.007)
Lead Spread | P1-P2 | 0.104 (+/- 0.010)
Lead Thickness | d | 0.016 (+/-0.002, -0.003)
Cut Lead Length | L | 0.420 (max)
Taped Lead Length | L1 | 0.200 (+/-0.025, -0.052)
Taped Lead Thickness | t1 | 0.032 (+/- 0.006)
Carrier Tape Thickness | t1 | 0.021 (+/- 0.006)
Carrier Tape Width | W | 0.705 (+/-0.020, -0.013)
Hold - down Tape Width | WO | 0.255 (+/- 0.012)
Hold - down - Tape Position | W1 | 0.035 (max)
Feed Hole Position | W2 | 0.030 (+/- 0.025)
Specified Hole Diameter | DO | 0.157 (+/-0.008, -0.007)
Lead Spring Out | S | 0.004 (max)

Note: All dimensions are inches.

---

**ITEM DESCRIPTION** | **SYMBOL** | **MINIMUM** | **MAXIMUM**
--- | --- | --- | ---
Reel Diameter | D1 | 13.975 | 14.025
Axial Hole Diameter (Standard) | D2 | 1.160 | 1.300
Axial Hole Diameter (Small Hole) | D2 | 0.600 | 0.700
Core Diameter | D3 | 3.100 | 3.300
Hub Recess Inner Diameter | D4 | 2.700 | 3.100
Hub Recess Depth | W1 | 0.370 | 0.570
Flange to Flange Inner Width | W2 | 1.620 | 1.890
Hub to Hub Center Width | W3 | 2.030

Note: All dimensions are inches.

---

July 1999, Rev. A
TO-92 Package Dimensions

TO-92 (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): 0.1977

<table>
<thead>
<tr>
<th>TO-92 (92, 94, 96)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td><strong>B</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Part Weight per unit (gram): 0.1977
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FACT™
FACT Quiet Series™
FAST™
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QT Optoelectronics™
Quiet Series™
SILENT SWITCHER®
SMART START™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8

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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

<table>
<thead>
<tr>
<th>Datasheet Identification</th>
<th>Product Status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advance Information</td>
<td>Formative or In Design</td>
<td>This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.</td>
</tr>
<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>
</tr>
<tr>
<td>No Identification Needed</td>
<td>Full Production</td>
<td>This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.</td>
</tr>
<tr>
<td>Obsolete</td>
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<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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Rev. G