

## COMPLEMENTARY NPN/PNP PRE-BIASED SMALL SIGNAL SOT-563 DUAL SURFACE MOUNT TRANSISTOR

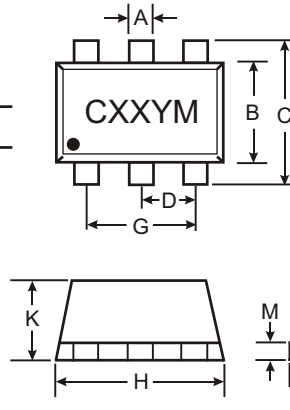
NEW PRODUCT

### Features

- Epitaxial Planar Die Construction
- Built-In Biasing Resistors
- Lead-Free Device

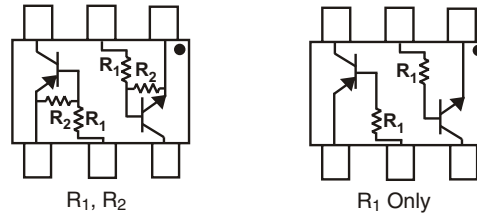
### Mechanical Data

- Case: SOT-563, Molded Plastic
- Case material - UL Flammability Rating 94V-0
- Moisture sensitivity: Level 1 per J-STD-020A
- Terminals: Finish - Matte Tin Solderable per MIL-STD-202, Method 208 (Note 1)
- Terminal Connections: See Diagram
- Weight: 0.005 grams (approx.)



| SOT-563              |      |      |      |
|----------------------|------|------|------|
| Dim                  | Min  | Max  | Typ  |
| A                    | 0.15 | 0.30 | 0.25 |
| B                    | 1.10 | 1.25 | 1.20 |
| C                    | 1.55 | 1.70 | 1.60 |
| D                    | 0.50 |      |      |
| G                    | 0.90 | 1.10 | 1.00 |
| H                    | 1.50 | 1.70 | 1.60 |
| K                    | 0.56 | 0.60 | 0.60 |
| L                    | 0.15 | 0.25 | 0.20 |
| M                    | 0.10 | 0.18 | 0.11 |
| All Dimensions in mm |      |      |      |

| P/N      | R1            | R2            | MARKING |
|----------|---------------|---------------|---------|
| DCX124EH | 22K $\Omega$  | 22K $\Omega$  | C17     |
| DCX144EH | 47K $\Omega$  | 47K $\Omega$  | C20     |
| DCX143EH | 4.7K $\Omega$ | 4.7K $\Omega$ | C08     |
| DCX114YH | 10K $\Omega$  | 47K $\Omega$  | C14     |
| DCX123JH | 2.2K $\Omega$ | 47K $\Omega$  | C06     |
| DCX114EH | 10K $\Omega$  | 10K $\Omega$  | C13     |
| DCX143TH | 4.7K $\Omega$ | -             | C07     |
| DCX114TH | 10K $\Omega$  | -             | C12     |



SCHMATIC DIAGRAM, TOP VIEW

### Maximum Ratings NPN Section @ T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic                                       | Symbol                            | Value  | Unit |
|--|-----------------------------------|--|------|
| Supply Voltage                                       | V <sub>CC</sub>                   | 50   | V    |
| Input Voltage  | V <sub>IN</sub>                   | DCX124EH -10 to +40<br>DCX144EH -10 to +40<br>DCX143EH -10 to +30<br>DCX114YH -6 to +40<br>DCX123JH -5 to +12<br>DCX114EH -10 to +40<br>DCX143TH -5 V <sub>max</sub><br>DCX114TH -5 V <sub>max</sub> | V    |
| Output Current                                       | I <sub>O</sub>                    | DCX124EH 30<br>DCX144EH 30<br>DCX143EH 100<br>DCX114YH 70<br>DCX123JH 100<br>DCX114EH 50<br>DCX143TH 100<br>DCX114TH 100   | mA   |
| Output Current                                       | I <sub>C</sub> (Max)              | 100  | mA   |
| Power Dissipation (Total)                            | P <sub>d</sub>                    | 150  | mW   |
| Thermal Resistance, Junction to Ambient Air (Note 2) | R <sub>θJA</sub>                  | 833  | °C/W |
| Operating and Storage and Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150  | °C   |

- Note:
1. If lead-bearing terminal plating is required, please contact your Diodes Inc. sales representative for availability and minimum order details.
  2. Mounted on FR4 Board with recommended pad layout at <http://www.diodes.com/datasheets/ap02001.pdf>.

**Maximum Ratings PNP Section** @  $T_A = 25^\circ\text{C}$  unless otherwise specified

| Characteristic   | Symbol         | Value  | Unit             |
|--|----------------|--|------------------|
| Supply Voltage   | $V_{CC}$       | 50   | V                |
| Input Voltage<br>DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH<br>DCX143TH<br>DCX114TH  | $V_{IN}$       | +10 to -40<br>+10 to -40<br>+10 to -30<br>+6 to -40<br>+5 to -12<br>+10 to -40<br>+5 $V_{max}$<br>+5 $V_{max}$ | V                |
| Output Current<br>DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH<br>DCX143TH<br>DCX114TH | $I_O$          | -30<br>-30<br>-100<br>-70<br>-100<br>-50<br>-100<br>-100   | mA               |
| Output Current All   | $I_C$ (Max)    | -100   | mA               |
| Power Dissipation (Total)  | $P_d$          | 150  | mW               |
| Operating and Storage and Temperature Range  | $T_j, T_{STG}$ | -55 to +150  | $^\circ\text{C}$ |

**Electrical Characteristics NPN Section** @  $T_A = 25^\circ\text{C}$  unless otherwise specified

| Characteristic (DDC143TH & DDC114TH only) | Symbol        | Min | Typ | Max | Unit          | Test Condition  |
|---|---------------|-----|-----|-----|---------------|---|
| Collector-Base Breakdown Voltage          | $BV_{CBO}$    | 50  | —   | —   | V             | $I_C = 50\mu\text{A}$   |
| Collector-Emitter Breakdown Voltage       | $BV_{CEO}$    | 50  | —   | —   | V             | $I_C = 1\text{mA}$  |
| Emitter-Base Breakdown Voltage            | $BV_{EBO}$    | 5   | —   | —   | V             | $I_E = 50\mu\text{A}$   |
| Collector Cutoff Current                  | $I_{CBO}$     | —   | —   | 0.5 | $\mu\text{A}$ | $V_{CB} = 50\text{V}$   |
| Emitter Cutoff Current                    | $I_{EBO}$     | —   | —   | 0.5 | $\mu\text{A}$ | $V_{EB} = 4\text{V}$  |
| Collector-Emitter Saturation Voltage      | $V_{CE(sat)}$ | —   | —   | 0.3 | V             | $I_C/I_B = 2.5\text{mA} / 0.25\text{mA}$ DCX143TH<br>$I_C/I_B = 1\text{mA} / 0.1\text{mA}$ DCX114TH |
| DC Current Transfer Ratio                 | $h_{FE}$      | 100 | 250 | 600 | —             | $I_C = 1\text{mA}, V_{CE} = 5\text{V}$  |
| Gain-Bandwidth Product*                   | $f_T$         | —   | 250 | —   | MHz           | $V_{CE} = 10\text{V}, I_E = -5\text{mA}, f = 100\text{MHz}$   |

| Characteristic  | Symbol       | Min                              | Typ | Max  | Unit          | Test Condition   |
|---|--------------|----------------------------------|-----|--|---------------|--|
| Input Voltage<br>DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH   | $V_{I(off)}$ | 0.5                              | 1.1 | —  | V             | $V_{CC} = 5\text{V}, I_O = 100\mu\text{A}$   |
|   |              | 0.5                              | 1.1 | —  |               |  |
| Input Voltage<br>DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH   | $V_{I(on)}$  | —                                | 1.9 | 3.0  | V             | $V_O = 0.3\text{V}, I_O = 5\text{mA}$<br>$V_O = 0.3\text{V}, I_O = 2\text{mA}$<br>$V_O = 0.3\text{V}, I_O = 20\text{mA}$<br>$V_O = 0.3\text{V}, I_O = 1\text{mA}$<br>$V_O = 0.3\text{V}, I_O = 5\text{mA}$<br>$V_O = 0.3\text{V}, I_O = 10\text{mA}$     |
|   |              | —                                | 1.9 | 3.0  |               |  |
| Output Voltage<br>DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH  | $V_{O(on)}$  | —                                | 0.1 | 0.3  | V             | $I_O/I_I = 10\text{mA} / 0.5\text{mA}$<br>$I_O/I_I = 10\text{mA} / 0.5\text{mA}$<br>$I_O/I_I = 10\text{mA} / 0.5\text{mA}$<br>$I_O/I_I = 5\text{mA} / 0.25\text{mA}$<br>$I_O/I_I = 5\text{mA} / 0.25\text{mA}$<br>$I_O/I_I = 10\text{mA} / 0.5\text{mA}$ |
| Input Current<br>DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH   | $I_I$        | —                                | —   | 0.36<br>0.18<br>1.8<br>0.88<br>3.6<br>0.88 | mA            | $V_I = 5\text{V}$  |
| Output Current  | $I_{O(off)}$ | —                                | —   | 0.5  | $\mu\text{A}$ | $V_{CC} = 50\text{V}, V_I = 0\text{V}$   |
| DC Current Gain<br>DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH | $G_I$        | 56<br>68<br>20<br>68<br>80<br>30 | —   | —  | —             | $V_O = 5\text{V}, I_O = 5\text{mA}$<br>$V_O = 5\text{V}, I_O = 5\text{mA}$<br>$V_O = 5\text{V}, I_O = 10\text{mA}$<br>$V_O = 5\text{V}, I_O = 10\text{mA}$<br>$V_O = 5\text{V}, I_O = 10\text{mA}$<br>$V_O = 5\text{V}, I_O = 5\text{mA}$                |

\* Transistor - For Reference Only

**Electrical Characteristics PNP Section** @  $T_A = 25^\circ\text{C}$  unless otherwise specified

| Characteristic (DCX143TH & DCX114TH only) | Symbol        | Min | Typ | Max  | Unit          | Test Condition  |
|---|---------------|-----|-----|------|---------------|---|
| Collector-Base Breakdown Voltage          | $BV_{CBO}$    | -50 | —   | —    | V             | $I_C = -50\mu\text{A}$  |
| Collector-Emitter Breakdown Voltage       | $BV_{CEO}$    | -50 | —   | —    | V             | $I_C = -1\text{mA}$   |
| Emitter-Base Breakdown Voltage            | $BV_{EBO}$    | -5  | —   | —    | V             | $I_E = -50\mu\text{A}$  |
| Collector Cutoff Current                  | $I_{CBO}$     | —   | —   | -0.5 | $\mu\text{A}$ | $V_{CB} = -50\text{V}$  |
| Emitter Cutoff Current                    | $I_{EBO}$     | —   | —   | -0.5 | $\mu\text{A}$ | $V_{EB} = -4\text{V}$   |
| Collector-Emitter Saturation Voltage      | $V_{CE(sat)}$ | —   | —   | -0.3 | V             | $I_C/I_B = 2.5\text{mA} / 0.25\text{mA}$ DCX143TH<br>$I_C/I_B = 1\text{mA} / 0.1\text{mA}$ DCX114TH |
| DC Current Transfer Ratio                 | $h_{FE}$      | 100 | 250 | 600  | —             | $I_C = -1\text{mA}, V_{CE} = -5\text{V}$  |
| Gain-Bandwidth Product*                   | $f_T$         | —   | 250 | —    | MHz           | $V_{CE} = -10\text{V}, I_E = 5\text{mA}, f = 100\text{MHz}$   |

| Characteristic          |  | Symbol       | Min  | Typ                                    | Max  | Unit          | Test Condition   |
|-------------------------|--|--------------|--|--|--|---------------|--|
| Input Voltage           | DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH | $V_{I(off)}$ | -0.5<br>-0.5<br>-0.5<br>-0.3<br>-0.5<br>-0.5 | -1.1<br>-1.1<br>-1.1<br>—<br>—<br>-1.1 | —  | —             | $V_{CC} = -5\text{V}, I_O = -100\mu\text{A}$   |
|                         | DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH | $V_{I(on)}$  | —  | -1.9<br>-1.9<br>-1.9<br>—<br>—<br>-1.9 | -3.0<br>-3.0<br>-3.0<br>-1.4<br>-1.1<br>-3.0     | V             | $V_O = -0.3\text{V}, I_O = -5\text{mA}$<br>$V_O = -0.3\text{V}, I_O = -2\text{mA}$<br>$V_O = -0.3\text{V}, I_O = -20\text{mA}$<br>$V_O = -0.3\text{V}, I_O = -1\text{mA}$<br>$V_O = -0.3\text{V}, I_O = -5\text{mA}$<br>$V_O = -0.3\text{V}, I_O = -10\text{mA}$     |
| Output Voltage          | DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH | $V_{O(on)}$  | —  | -0.1                                   | -0.3   | V             | $I_O/I_I = -10\text{mA} / -0.5\text{mA}$<br>$I_O/I_I = -10\text{mA} / -0.5\text{mA}$<br>$I_O/I_I = -10\text{mA} / -0.5\text{mA}$<br>$I_O/I_I = -5\text{mA} / -0.25\text{mA}$<br>$I_O/I_I = -5\text{mA} / -0.25\text{mA}$<br>$I_O/I_I = -10\text{mA} / -0.5\text{mA}$ |
| Input Current           | DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH | $I_I$        | —  | —                                      | -0.36<br>-0.18<br>-1.8<br>-0.88<br>-3.6<br>-0.88 | mA            | $V_I = -5\text{V}$   |
| Output Current          |  | $I_{O(off)}$ | —  | —                                      | -0.5   | $\mu\text{A}$ | $V_{CC} = 50\text{V}, V_I = 0\text{V}$   |
| DC Current Gain         | DCX124EH<br>DCX144EH<br>DCX143EH<br>DCX114YH<br>DCX123JH<br>DCX114EH | $G_I$        | 56<br>68<br>20<br>68<br>80<br>30             | —                                      | —  | —             | $V_O = -5\text{V}, I_O = -5\text{mA}$<br>$V_O = -5\text{V}, I_O = -5\text{mA}$<br>$V_O = -5\text{V}, I_O = -10\text{mA}$<br>$V_O = -5\text{V}, I_O = -10\text{mA}$<br>$V_O = -5\text{V}, I_O = -10\text{mA}$<br>$V_O = -5\text{V}, I_O = -5\text{mA}$                |
| Gain-Bandwidth Product* |  | $f_T$        | —  | 250                                    | —  | MHz           | $V_{CE} = -10\text{V}, I_E = -5\text{mA}, f = 100\text{MHz}$   |

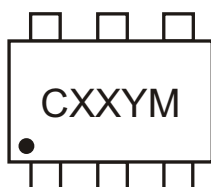
\* Transistor - For Reference Only

**Ordering Information** (Note 3)

| Device     | Packaging | Shipping         |
|------------|-----------|------------------|
| DCX124EH-7 | SOT-563   | 3000/Tape & Reel |
| DCX144EH-7 | SOT-563   | 3000/Tape & Reel |
| DCX143EH-7 | SOT-563   | 3000/Tape & Reel |
| DCX114YH-7 | SOT-563   | 3000/Tape & Reel |
| DCX123JH-7 | SOT-563   | 3000/Tape & Reel |
| DCX114EH-7 | SOT-563   | 3000/Tape & Reel |
| DCX143TH-7 | SOT-563   | 3000/Tape & Reel |
| DCX114TH-7 | SOT-563   | 3000/Tape & Reel |

Notes: 3. For Packaging Details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

**Marking Information**



CXX = Product Type Marking Code (See Page 1)  
 YM = Date Code Marking  
 Y = Year ex: P = 2003  
 M = Month ex: 9 = September

Date Code Key

| Year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|------|------|------|------|------|------|------|------|
| Code | P    | R    | S    | T    | U    | V    | W    |

| Month | Jan | Feb | March | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3     | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |

**TYPICAL CURVES - DCX143EH NPN SECTION**

**NEW PRODUCT**

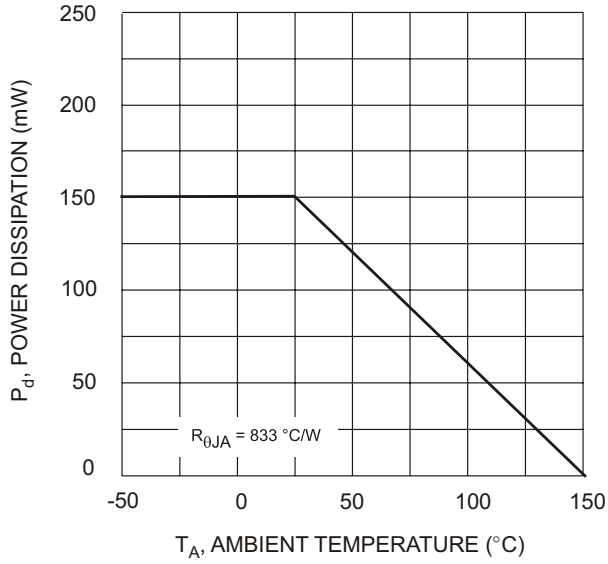


Fig. 1 Derating Curve - Total

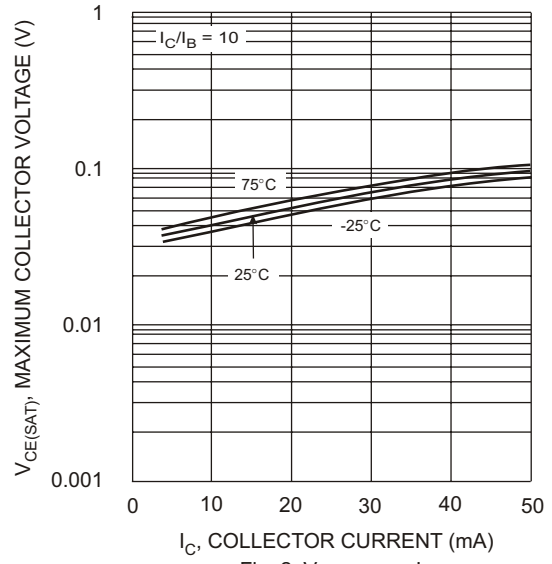


Fig. 2  $V_{CE(SAT)}$  vs.  $I_C$

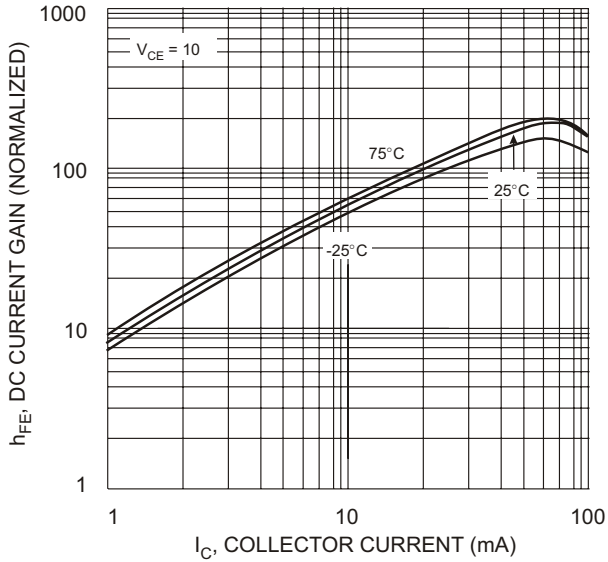


Fig. 3 DC CURRENT GAIN

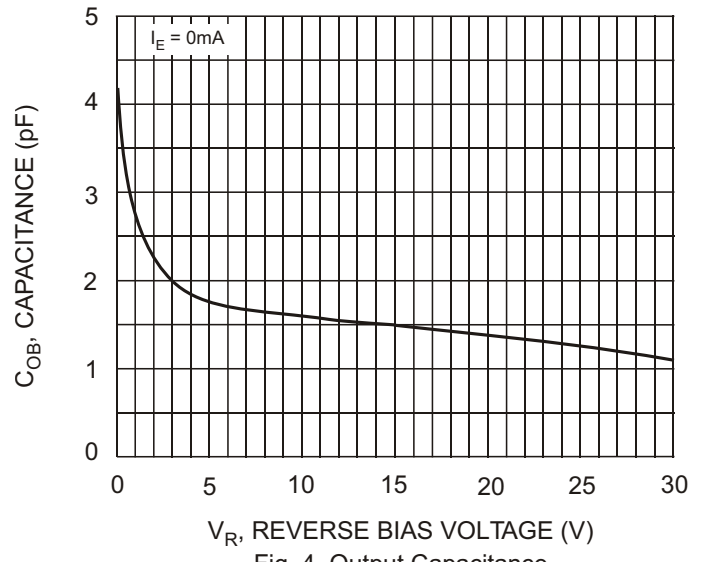


Fig. 4 Output Capacitance

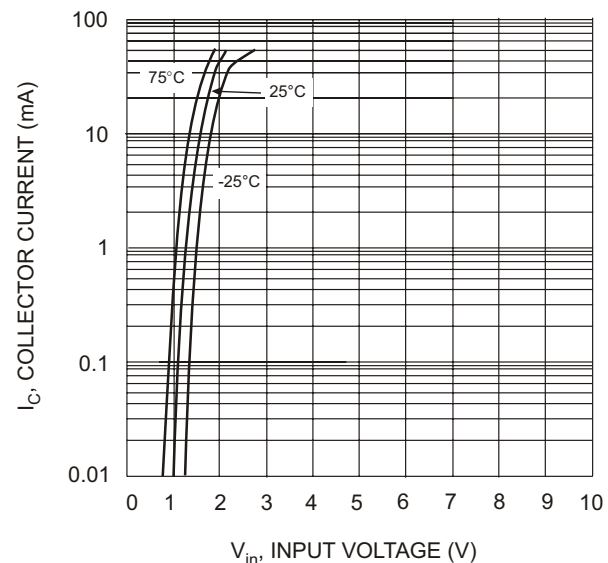


Fig. 5 Collector Current Vs. Input Voltage

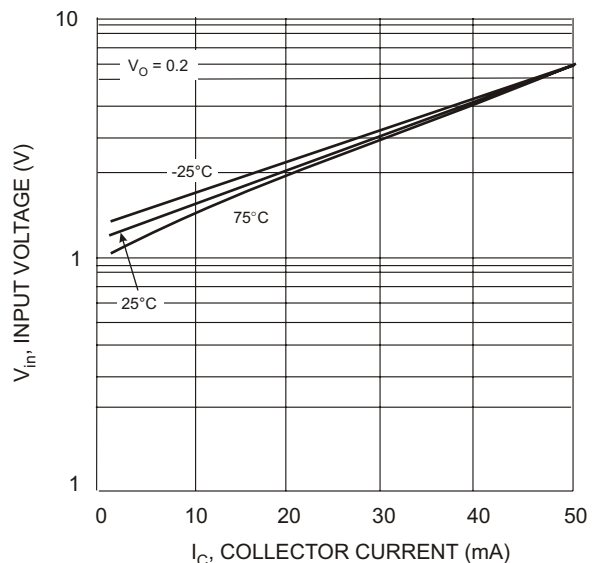


Fig. 6 Input Voltage vs. Collector Current

**TYPICAL CURVES - DCX143EH PNP SECTION**

**NEW PRODUCT**

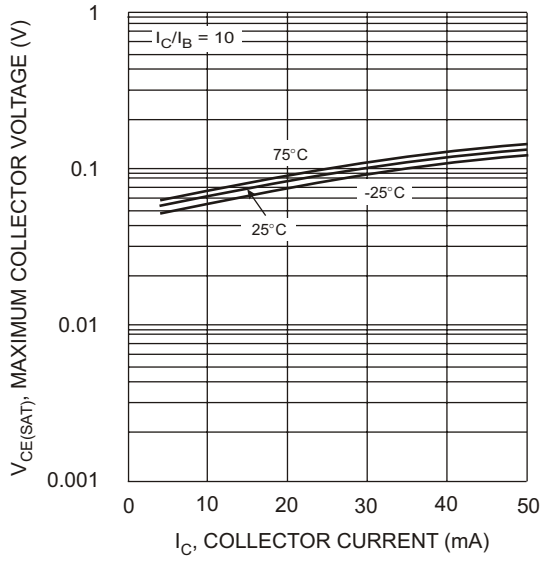


Fig. 7  $V_{CE(SAT)}$  vs.  $I_C$

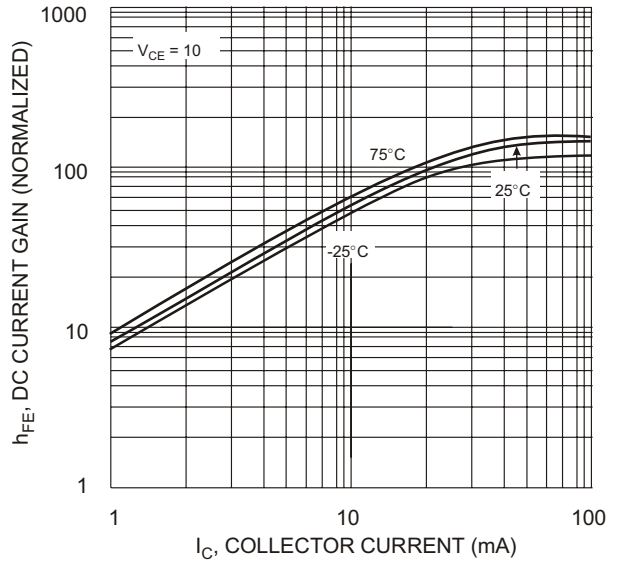


Fig. 8 DC Current Gain

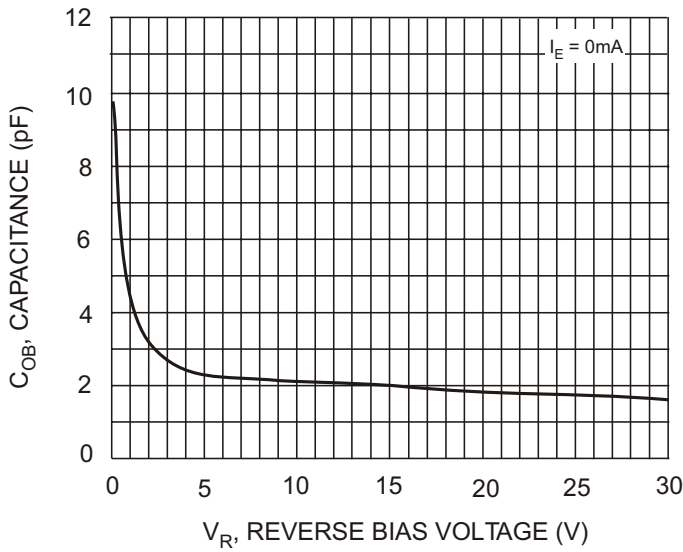


Fig. 9 Output Capacitance

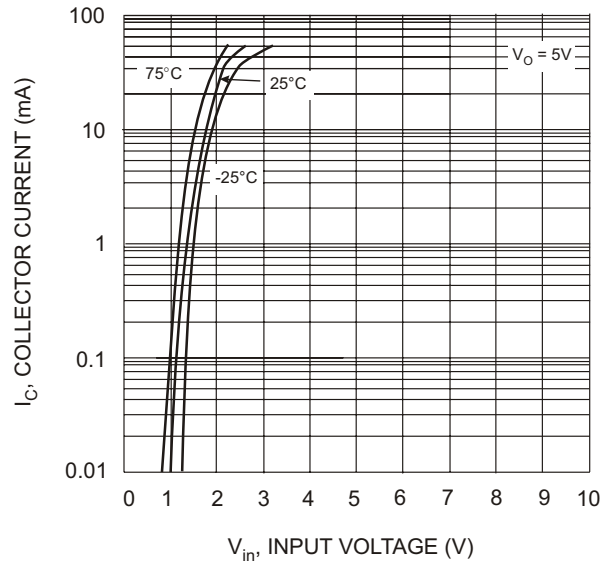


Fig. 10 Collector Current Vs. Input Voltage

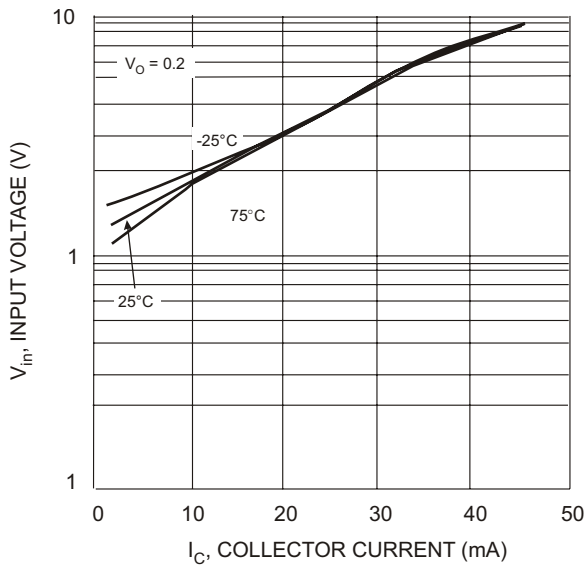


Fig. 11 Input Voltage vs. Collector Current