

EMC2DXV5T1G, EMC3DXV5T1G, EMC4DXV5T1G, EMC5DXV5T1G

Dual Common Base-Collector Bias Resistor Transistors

NPN and PNP Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

The BRT (Bias Resistor Transistor) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. These digital transistors are designed to replace a single device and its external resistor bias network. The BRT eliminates these individual components by integrating them into a single device. In the EMC2DXV5T1G series, two complementary BRT devices are housed in the SOT-553 package which is ideal for low power surface mount applications where board space is at a premium.

Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These are Pb-Free Devices

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q_1 and Q_2 , - minus sign for Q_1 (PNP) omitted)

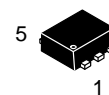
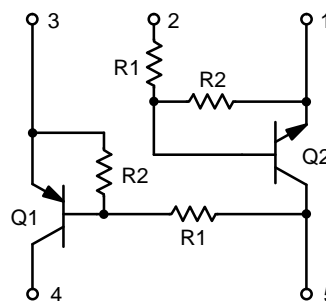
| Rating | Symbol | Value | Unit |
|---------------------------|-----------|-------|------|
| Collector-Base Voltage | V_{CBO} | 50 | Vdc |
| Collector-Emitter Voltage | V_{CEO} | 50 | Vdc |
| Collector Current | I_C | 100 | mAdc |

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.



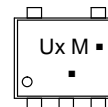
ON Semiconductor®

<http://onsemi.com>



SOT-553
CASE 463B

MARKING DIAGRAM



Ux = Specific Device Code
x = C, 3, E, or 5
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

EMC2DXV5T1G, EMC3DXV5T1G, EMC4DXV5T1G, EMC5DXV5T1G

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|------------------------------|----------------------------|
| ONE JUNCTION HEATED | | | |
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 357 (Note 1) 2.9 (Note 1) | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 350 (Note 1) | $^\circ\text{C/W}$ |
| BOTH JUNCTIONS HEATED | | | |
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 500 (Note 1) 4.0 (Note 1) | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 250 (Note 1) | $^\circ\text{C/W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

1. FR-4 @ Minimum Pad

DEVICE ORDERING INFORMATION, MARKING AND RESISTOR VALUES

| Device | Marking | Transistor 1 – PNP | | Transistor 2 – NPN | | Package | Shipping† |
|-----------------|---------|--------------------|--------|--------------------|--------|----------------------|--------------------|
| | | R1 (K) | R2 (K) | R1 (K) | R2 (K) | | |
| EMC2DXV5T1G | UC | 22 | 22 | 22 | 22 | SOT-553 (Pb-Free) | 4000 / Tape & Reel |
| NSVEMC2DXV5T1G* | UC | 22 | 22 | 22 | 22 | | 4000 / Tape & Reel |
| EMC3DXV5T1G | U3 | 10 | 10 | 10 | 10 | | 4000 / Tape & Reel |
| EMC3DXV5T5G | | | | | | | 8000 / Tape & Reel |
| EMC4DXV5T1G | UE | 10 | 47 | 47 | 47 | | 4000 / Tape & Reel |
| EMC5DXV5T1G | U5 | 4.7 | 10 | 47 | 47 | | 4000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

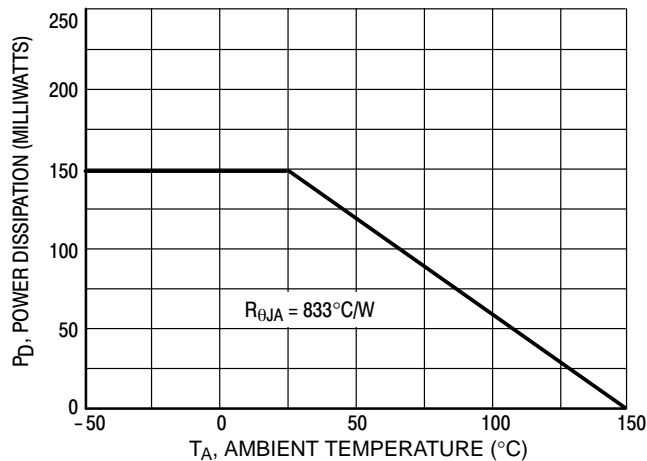


Figure 1. Derating Curve

EMC2DXV5T1G, EMC3DXV5T1G, EMC4DXV5T1G, EMC5DXV5T1G

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|-------------|-----|-----|-----|------|
| Q1 TRANSISTOR: PNP OFF CHARACTERISTICS | | | | | |
| Collector-Base Cutoff Current ($V_{CB} = 50\text{ V}$, $I_E = 0$) | I_{CBO} | – | – | 100 | nAdc |
| Collector-Emitter Cutoff Current ($V_{CB} = 50\text{ V}$, $I_B = 0$) | I_{CEO} | – | – | 500 | nAdc |
| Emitter-Base Cutoff Current ($V_{EB} = 6.0\text{ V}$, $I_C = 0$) | I_{EBO} | – | – | 0.2 | mAdc |
| | EMC2DXV5T1G | – | – | 0.5 | |
| | EMC3DXV5T1G | – | – | 0.2 | |
| | EMC4DXV5T1G | – | – | 1.0 | |
| | EMC5DXV5T1G | – | – | – | |

ON CHARACTERISTICS

| | | | | | |
|--|---------------|------|------|------|------------------|
| Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $I_E = 0$) | $V_{(BR)CBO}$ | 50 | – | – | Vdc |
| Collector-Emitter Breakdown Voltage ($I_C = 2.0\text{ mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | 50 | – | – | Vdc |
| DC Current Gain ($V_{CE} = 10\text{ V}$, $I_C = 5.0\text{ mA}$) | h_{FE} | 60 | 100 | – | |
| | EMC2DXV5T1G | 35 | 60 | – | |
| | EMC3DXV5T1G | 80 | 140 | – | |
| | EMC4DXV5T1G | 20 | 35 | – | |
| | EMC5DXV5T1G | – | – | – | |
| Collector-Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$) | $V_{CE(SAT)}$ | – | – | 0.25 | Vdc |
| Output Voltage (on) ($V_{CC} = 5.0\text{ V}$, $V_B = 2.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OL} | – | – | 0.2 | Vdc |
| Output Voltage (off) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OH} | 4.9 | – | – | Vdc |
| Input Resistor | R_1 | 15.4 | 22 | 28.6 | $\text{k}\Omega$ |
| | EMC2DXV5T1G | 7.0 | 10 | 13 | |
| | EMC3DXV5T1G | 3.3 | 4.7 | 6.1 | |
| | EMC4DXV5T1G | – | – | – | |
| | EMC5DXV5T1G | – | – | – | |
| Resistor Ratio | R_1/R_2 | 0.8 | 1.0 | 1.2 | |
| | EMC2DXV5T1G | 0.8 | 1.0 | 1.2 | |
| | EMC3DXV5T1G | 0.17 | 0.21 | 0.25 | |
| | EMC4DXV5T1G | 0.38 | 0.47 | 0.56 | |
| | EMC5DXV5T1G | – | – | – | |

Q2 TRANSISTOR: NPN OFF CHARACTERISTICS

| | | | | | |
|---|--------------------------|---|---|-----|------|
| Collector-Base Cutoff Current ($V_{CB} = 50\text{ V}$, $I_E = 0$) | I_{CBO} | – | – | 100 | nAdc |
| Collector-Emitter Cutoff Current ($V_{CB} = 50\text{ V}$, $I_B = 0$) | I_{CEO} | – | – | 500 | nAdc |
| Emitter-Base Cutoff Current ($V_{EB} = 6.0\text{ V}$, $I_C = 0$) | I_{EBO} | – | – | 0.2 | mAdc |
| | EMC2DXV5T1G | – | – | 0.5 | |
| | EMC3DXV5T1G | – | – | 0.1 | |
| | EMC4DXV5T1G, EMC5DXV5T1G | – | – | – | |

ON CHARACTERISTICS

| | | | | | |
|--|--------------------------|------|-----|------|------------------|
| Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $I_E = 0$) | $V_{(BR)CBO}$ | 50 | – | – | Vdc |
| Collector-Emitter Breakdown Voltage ($I_C = 2.0\text{ mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | 50 | – | – | Vdc |
| DC Current Gain ($V_{CE} = 10\text{ V}$, $I_C = 5.0\text{ mA}$) | h_{FE} | 60 | 100 | – | |
| | EMC2DXV5T1G | 35 | 60 | – | |
| | EMC3DXV5T1G | 80 | 140 | – | |
| | EMC4DXV5T1G, EMC5DXV5T1G | – | – | – | |
| Collector-Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$) | $V_{CE(SAT)}$ | – | – | 0.25 | Vdc |
| Output Voltage (on) ($V_{CC} = 5.0\text{ V}$, $V_B = 2.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OL} | – | – | 0.2 | Vdc |
| Output Voltage (off) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OH} | 4.9 | – | – | Vdc |
| Input Resistor | R_1 | 15.4 | 22 | 28.6 | $\text{k}\Omega$ |
| | EMC2DXV5T1G | 7.0 | 10 | 13 | |
| | EMC3DXV5T1G | 33 | 47 | 61 | |
| | EMC4DXV5T1G, EMC5DXV5T1G | – | – | – | |
| Resistor Ratio | R_1/R_2 | 0.8 | 1.0 | 1.2 | |
| | EMC2DXV5T1G | 0.8 | 1.0 | 1.2 | |
| | EMC3DXV5T1G | 0.8 | 1.0 | 1.2 | |
| | EMC4DXV5T1G, EMC5DXV5T1G | 0.8 | 1.0 | 1.2 | |

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.

EMC2DXV5T1G, EMC3DXV5T1G, EMC4DXV5T1G, EMC5DXV5T1G

TYPICAL ELECTRICAL CHARACTERISTICS – EMC2DXV5T1 PNP TRANSISTOR

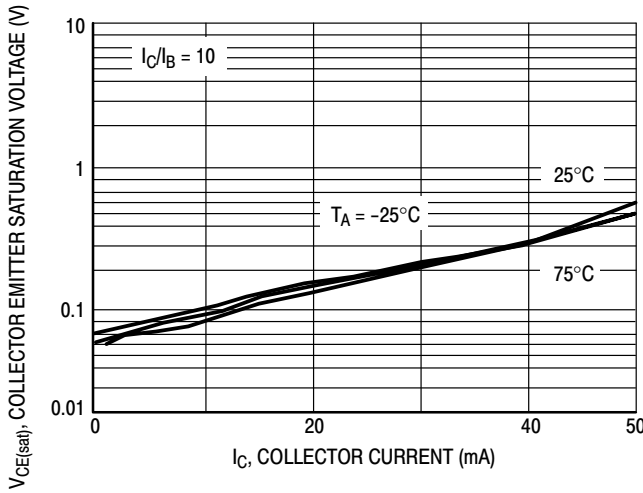


Figure 2. $V_{CE(sat)}$ versus I_C

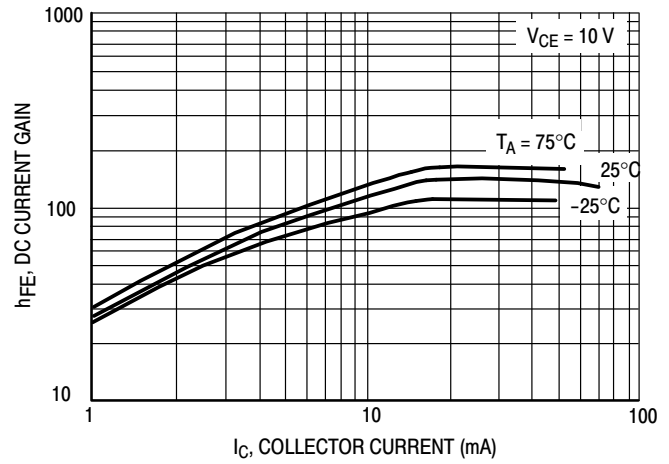


Figure 3. DC Current Gain

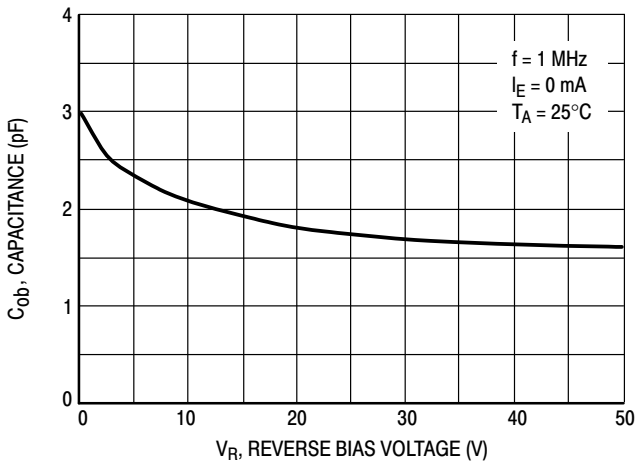


Figure 4. Output Capacitance

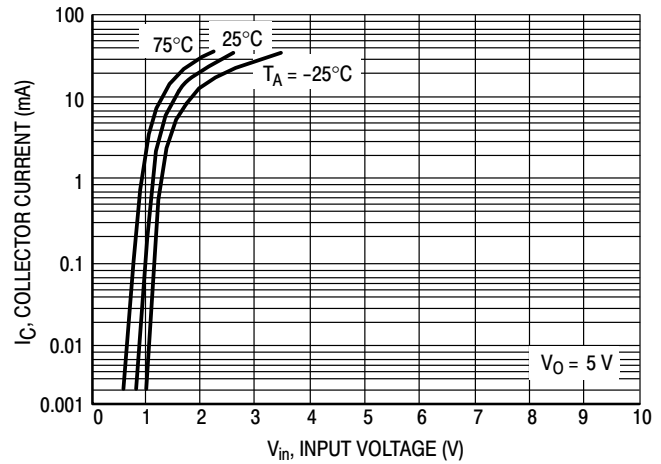


Figure 5. Output Current versus Input Voltage

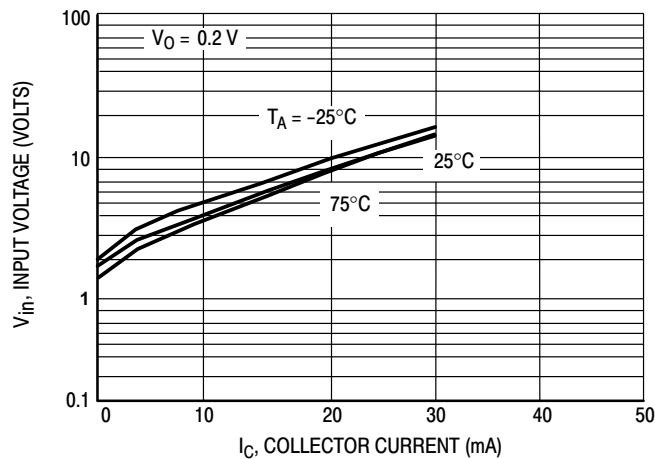


Figure 6. Input Voltage versus Output Current

EMC2DXV5T1G, EMC3DXV5T1G, EMC4DXV5T1G, EMC5DXV5T1G

TYPICAL ELECTRICAL CHARACTERISTICS – EMC2DXV5T1 NPN TRANSISTOR

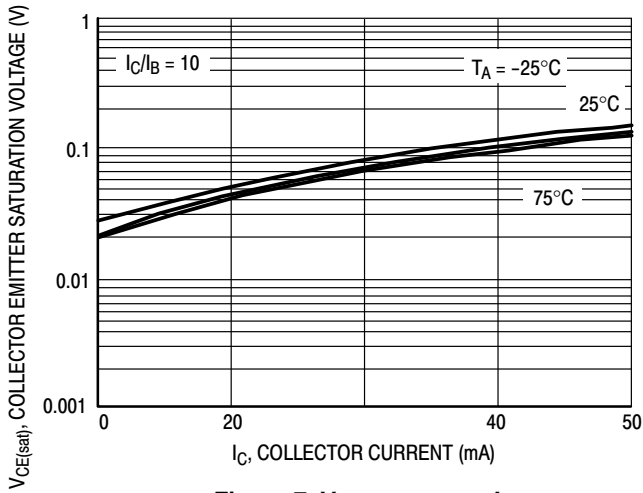


Figure 7. $V_{CE(sat)}$ versus I_C

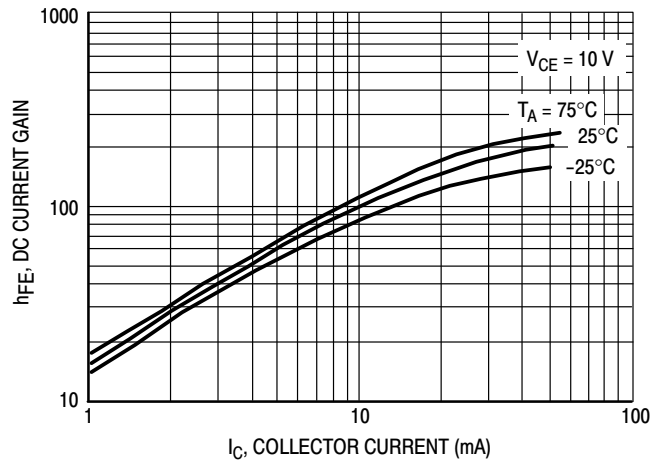


Figure 8. DC Current Gain

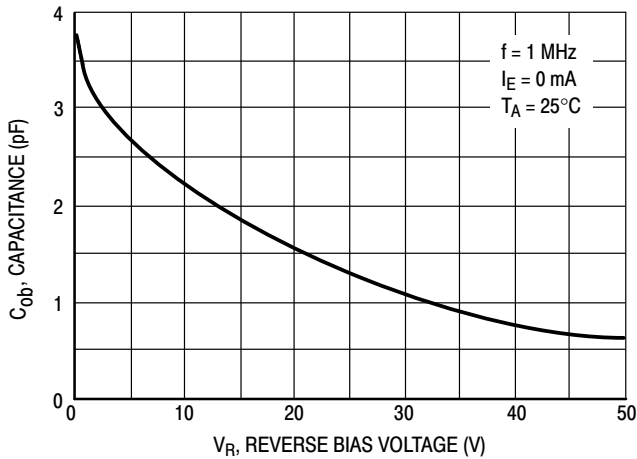


Figure 9. Output Capacitance

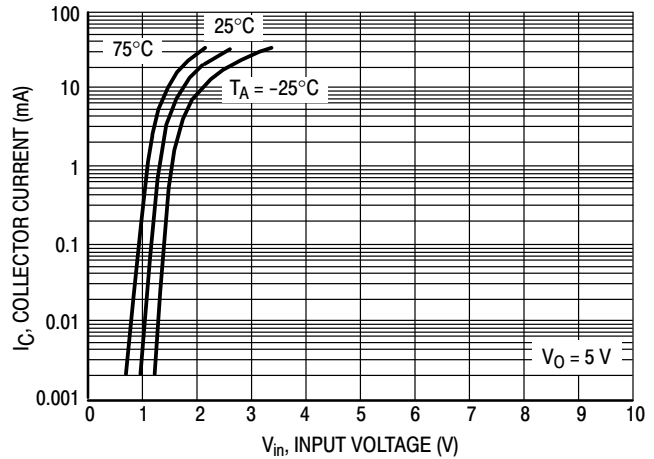


Figure 10. Output Current versus Input Voltage

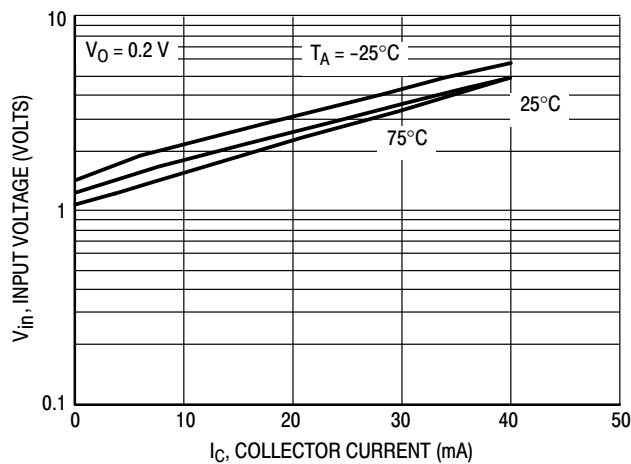


Figure 11. Input Voltage versus Output Current

EMC2DXV5T1G, EMC3DXV5T1G, EMC4DXV5T1G, EMC5DXV5T1G

TYPICAL ELECTRICAL CHARACTERISTICS – EMC3DXV5T1 PNP TRANSISTOR

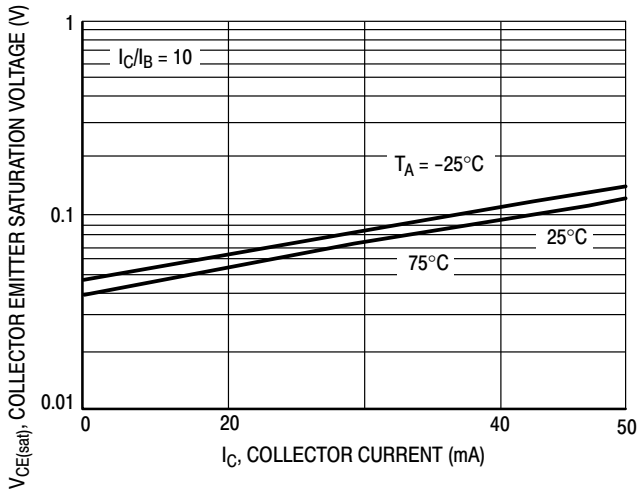


Figure 12. $V_{CE(sat)}$ versus I_C

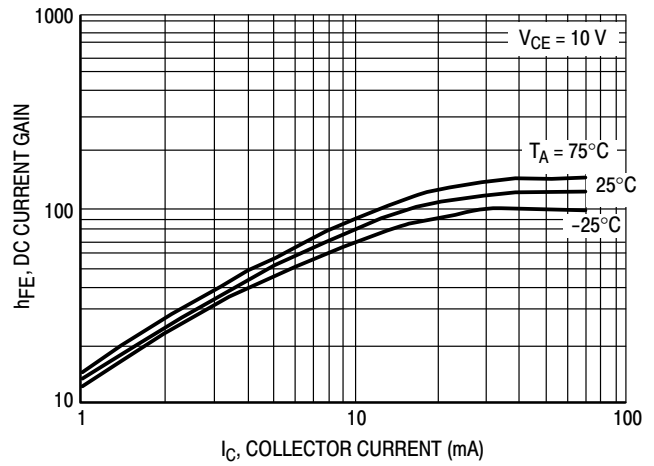


Figure 13. DC Current Gain

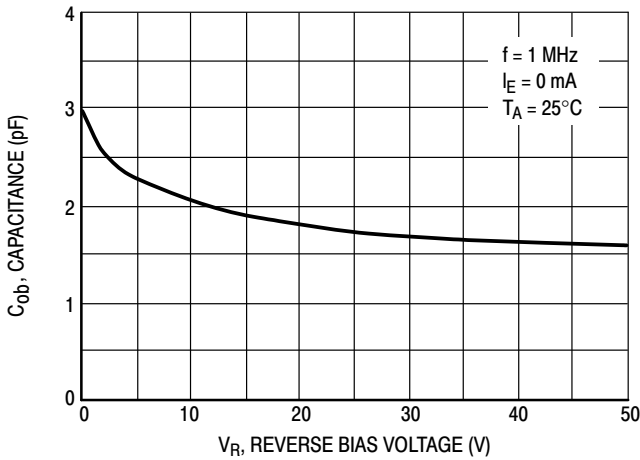


Figure 14. Output Capacitance

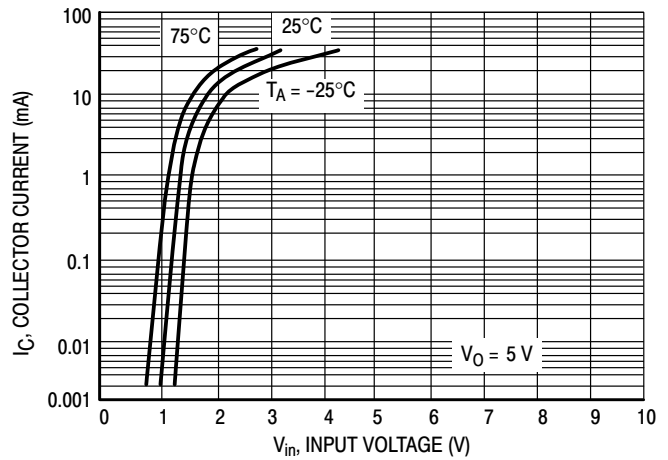


Figure 15. Output Current versus Input Voltage

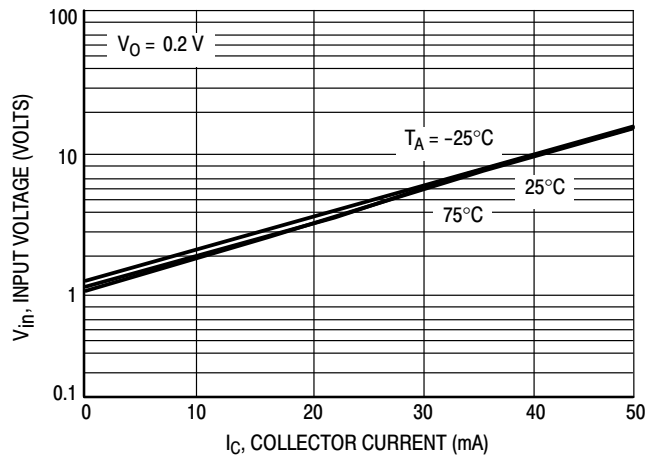


Figure 16. Input Voltage versus Output Current

EMC2DXV5T1G, EMC3DXV5T1G, EMC4DXV5T1G, EMC5DXV5T1G

TYPICAL ELECTRICAL CHARACTERISTICS – EMC3DXV5T1 NPN TRANSISTOR

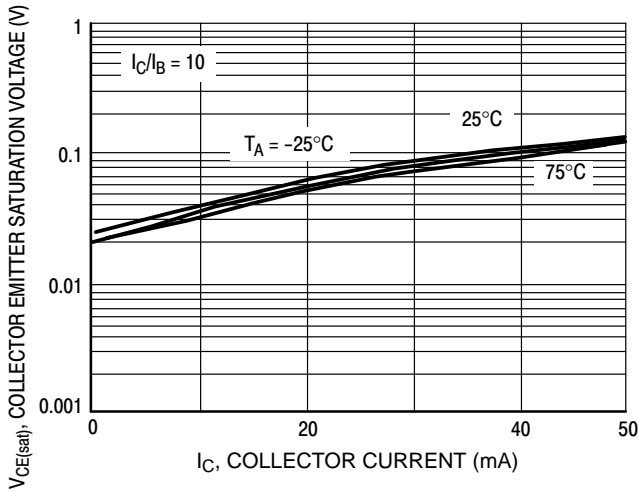


Figure 17. $V_{CE(sat)}$ versus I_C

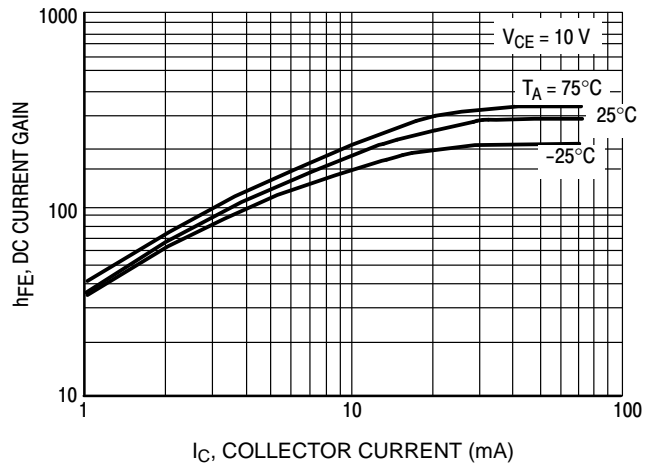


Figure 18. DC Current Gain

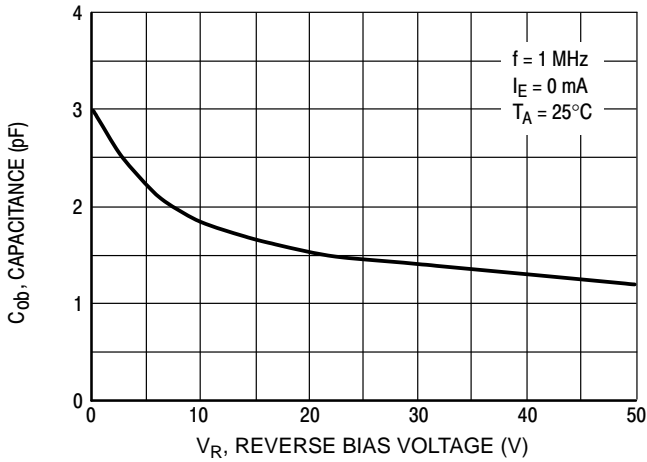


Figure 19. Output Capacitance

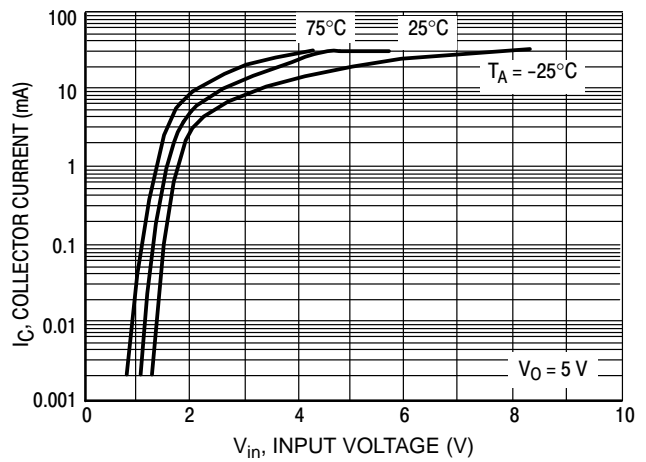


Figure 20. Output Current versus Input Voltage

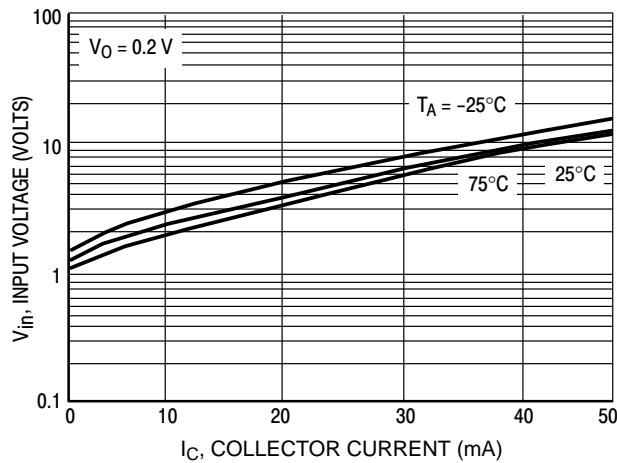


Figure 21. Input Voltage versus Output Current

EMC2DXV5T1G, EMC3DXV5T1G, EMC4DXV5T1G, EMC5DXV5T1G

TYPICAL ELECTRICAL CHARACTERISTICS – EMC4DXV5T1 PNP TRANSISTOR

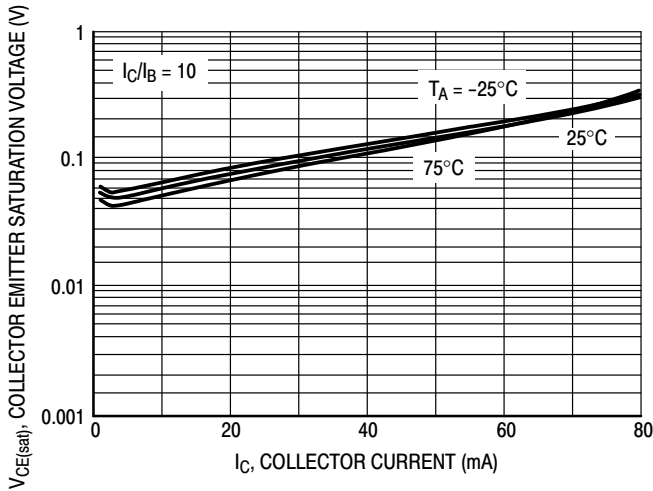


Figure 22. $V_{CE(sat)}$ versus I_C

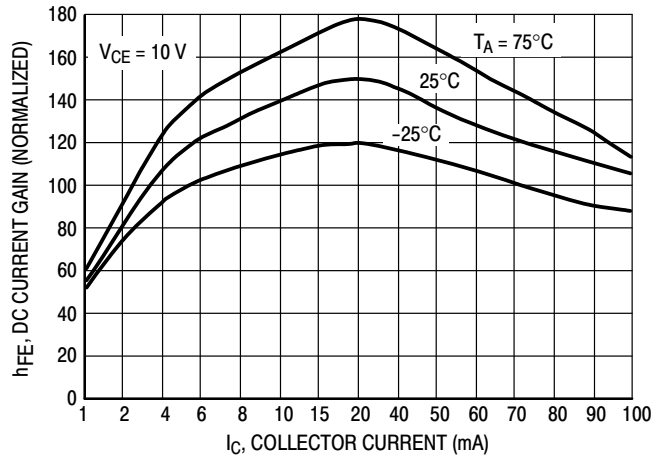


Figure 23. DC Current Gain

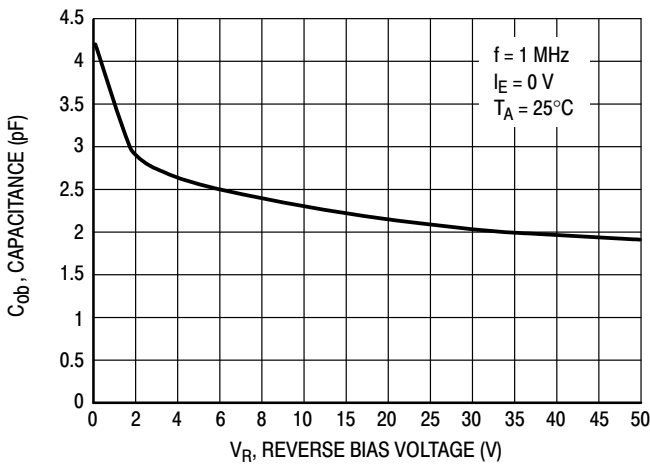


Figure 24. Output Capacitance

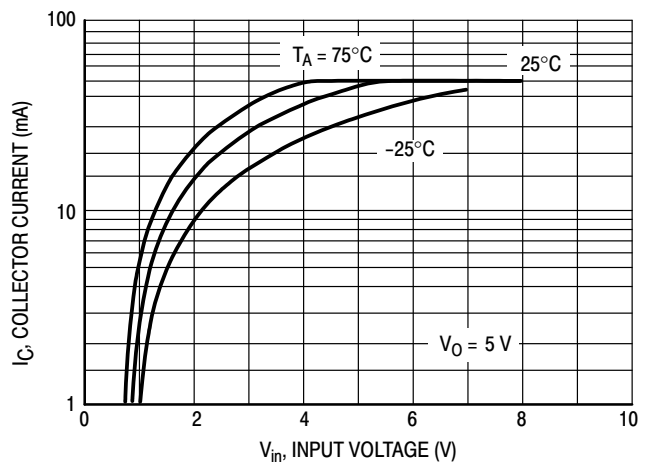


Figure 25. Output Current versus Input Voltage

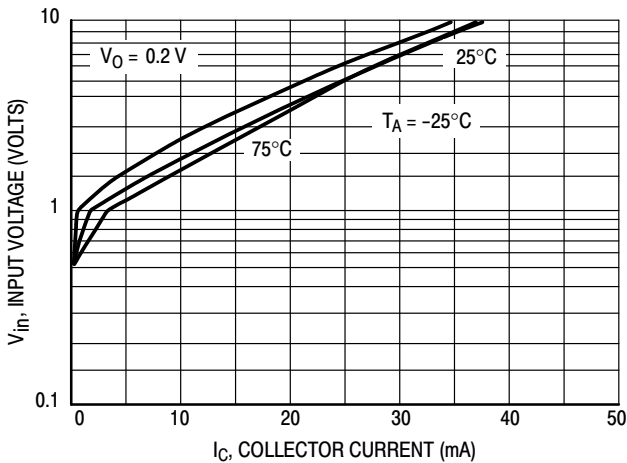


Figure 26. Input Voltage versus Output Current

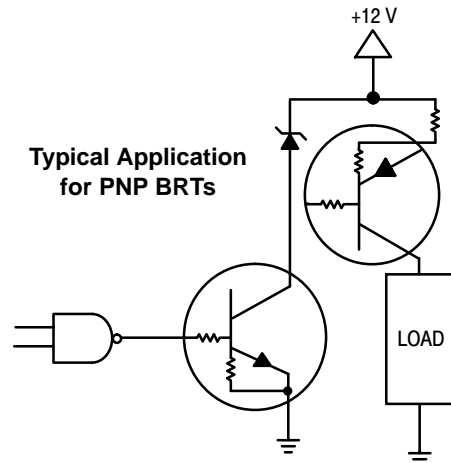


Figure 27. Inexpensive, Unregulated Current Source

EMC2DXV5T1G, EMC3DXV5T1G, EMC4DXV5T1G, EMC5DXV5T1G

TYPICAL ELECTRICAL CHARACTERISTICS – EMC5DXV5T1 PNP TRANSISTOR

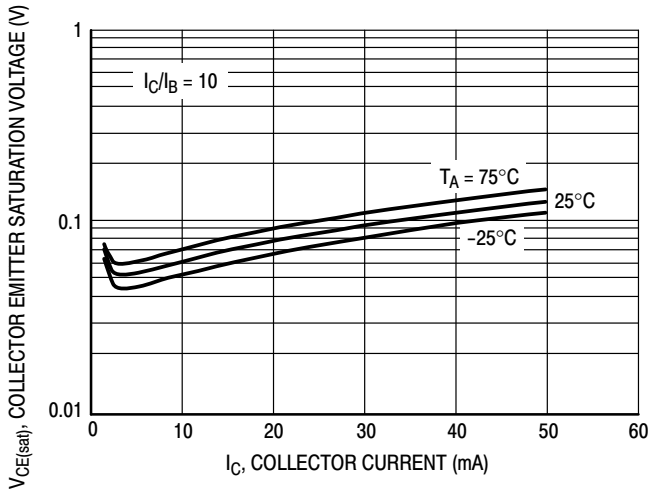


Figure 28. $V_{CE(sat)}$ versus I_C

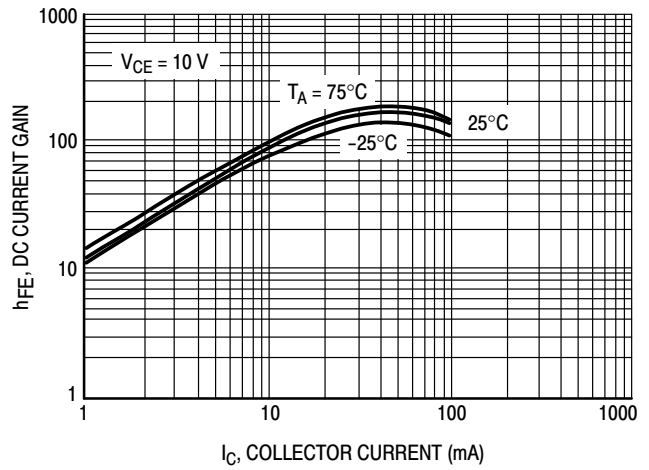


Figure 29. DC Current Gain

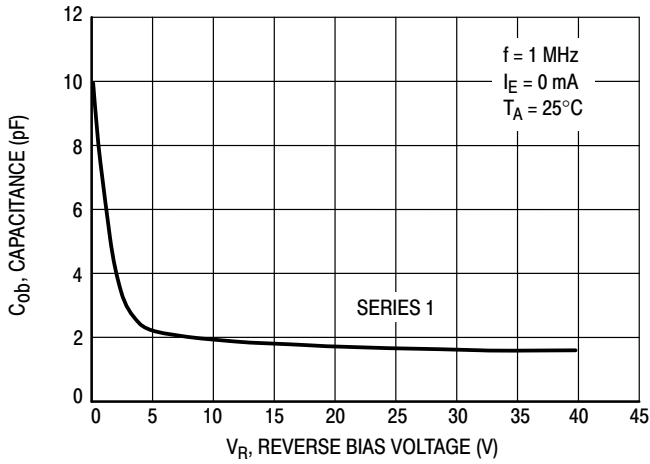


Figure 30. Output Capacitance

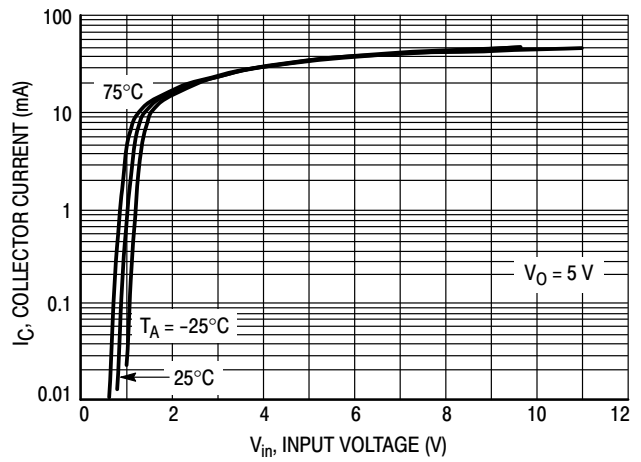


Figure 31. Output Current versus Input Voltage

EMC2DXV5T1G, EMC3DXV5T1G, EMC4DXV5T1G, EMC5DXV5T1G

TYPICAL ELECTRICAL CHARACTERISTICS – EMC4DXV5T1, EMC5DXV5T1 NPN TRANSISTOR

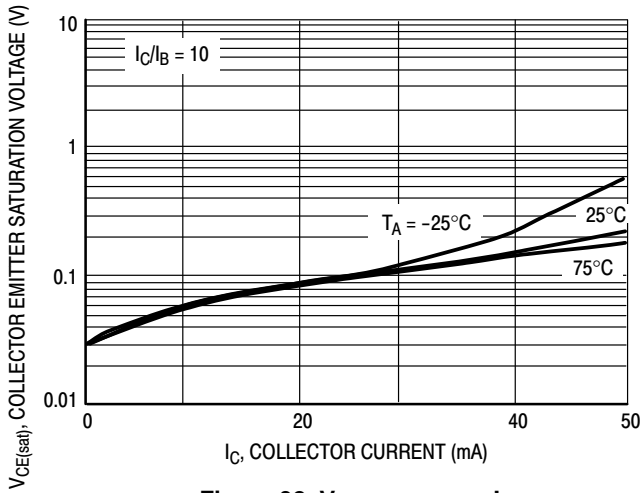


Figure 32. $V_{CE(sat)}$ versus I_C

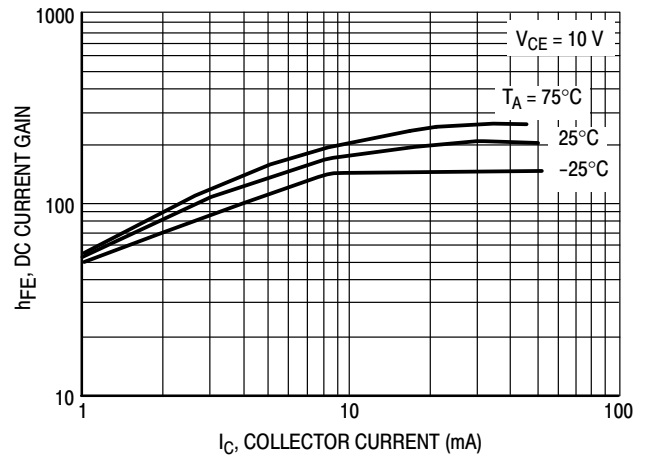


Figure 33. DC Current Gain

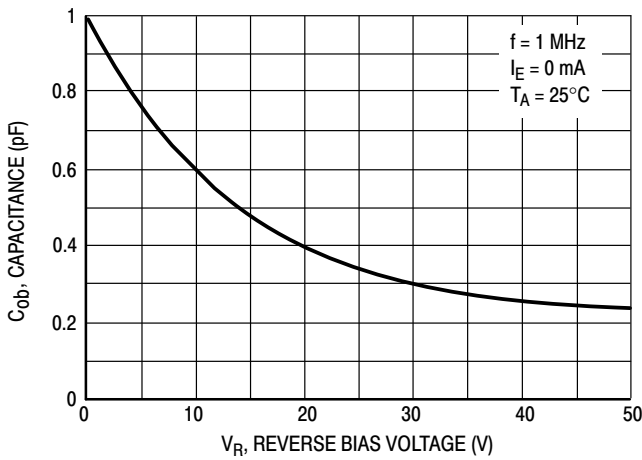


Figure 34. Output Capacitance

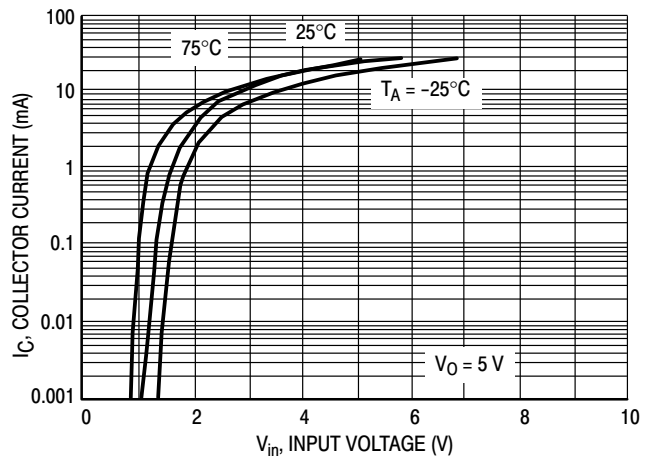


Figure 35. Output Current versus Input Voltage

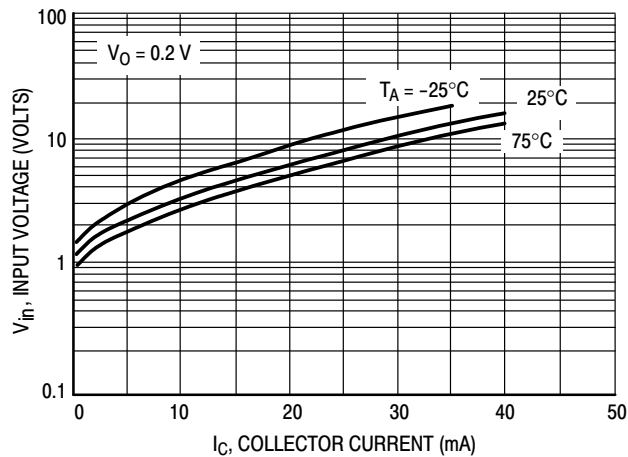


Figure 36. Input Voltage versus Output Current

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 4:1

SOT-553, 5 LEAD CASE 463B ISSUE C

DATE 20 MAR 2013

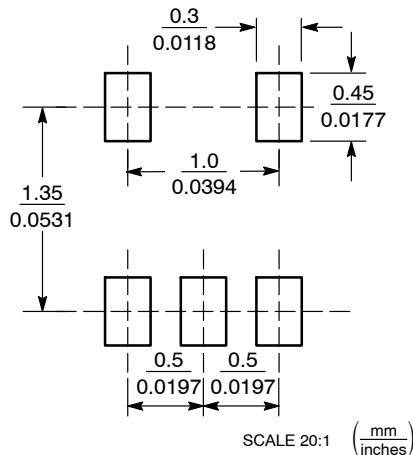


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

| DIM | MILLIMETERS | | | INCHES | | |
|----------------|-------------|------|------|-----------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.50 | 0.55 | 0.60 | 0.020 | 0.022 | 0.024 |
| b | 0.17 | 0.22 | 0.27 | 0.007 | 0.009 | 0.011 |
| c | 0.08 | 0.13 | 0.18 | 0.003 | 0.005 | 0.007 |
| D | 1.55 | 1.60 | 1.65 | 0.061 | 0.063 | 0.065 |
| E | 1.15 | 1.20 | 1.25 | 0.045 | 0.047 | 0.049 |
| e | 0.50 BSC | | | 0.020 BSC | | |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| H _E | 1.55 | 1.60 | 1.65 | 0.061 | 0.063 | 0.065 |

RECOMMENDED SOLDERING FOOTPRINT*



SCALE 20:1 (mm/inches)

GENERIC MARKING DIAGRAM*



- XX = Specific Device Code
- M = Date Code
- = Pb-Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

STYLE 1:

- PIN 1. BASE
- 2. EMITTER
- 3. BASE
- 4. COLLECTOR
- 5. COLLECTOR

STYLE 2:

- PIN 1. CATHODE
- 2. COMMON ANODE
- 3. CATHODE 2
- 4. CATHODE 3
- 5. CATHODE 4

STYLE 3:

- PIN 1. ANODE 1
- 2. N/C
- 3. ANODE 2
- 4. CATHODE 2
- 5. CATHODE 1

STYLE 4:

- PIN 1. SOURCE 1
- 2. DRAIN 1/2
- 3. SOURCE 1
- 4. GATE 1
- 5. GATE 2

STYLE 5:

- PIN 1. ANODE
- 2. EMITTER
- 3. BASE
- 4. COLLECTOR
- 5. CATHODE

STYLE 6:

- PIN 1. EMITTER 2
- 2. BASE 2
- 3. EMITTER 1
- 4. COLLECTOR 1
- 5. COLLECTOR 2/BASE 1

STYLE 7:

- PIN 1. BASE
- 2. EMITTER
- 3. BASE
- 4. COLLECTOR
- 5. COLLECTOR

STYLE 8:

- PIN 1. CATHODE
- 2. COLLECTOR
- 3. N/C
- 4. BASE
- 5. EMITTER

STYLE 9:

- PIN 1. ANODE
- 2. CATHODE
- 3. ANODE
- 4. ANODE
- 5. ANODE

| | | |
|------------------|---------------------------|--|
| DOCUMENT NUMBER: | 98AON11127D | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| STATUS: | ON SEMICONDUCTOR STANDARD | |
| NEW STANDARD: | | |
| DESCRIPTION: | SOT-553, 5 LEAD | PAGE 1 OF 2 |

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative