

DTC114EM3T5G Series

Digital Transistors (BRT)

NPN Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

This new series of digital transistors is designed to replace a single device and its external resistor bias network. The digital transistor contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. The digital transistor eliminates these individual components by integrating them into a single device. The use of a digital transistor can reduce both system cost and board space. The device is housed in the SOT-723 package which is designed for low power surface mount applications.

Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- The SOT-723 Package can be Soldered using Wave or Reflow.
- Available in 4 mm, 8000 Unit Tape & Reel
- These are Pb-Free Devices

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---------------------------|------------------|-------|------|
| Collector-Base Voltage | V _{CB0} | 50 | Vdc |
| Collector-Emitter Voltage | V _{CEO} | 50 | Vdc |
| Collector Current | I _C | 100 | mAdc |

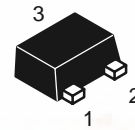
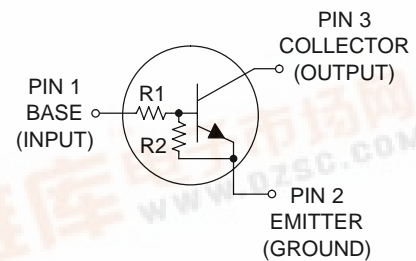
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.



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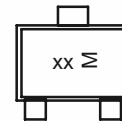
<http://onsemi.com>

NPN SILICON DIGITAL TRANSISTORS



SOT-723
CASE 631AA
STYLE 1

MARKING DIAGRAM



xx = Specific Device Code
(See Marking Table on page 2)
M = Date Code

ORDERING INFORMATION

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

DTC114EM3T5G Series

DEVICE MARKING AND RESISTOR VALUES

| Device | Marking | R1 (K) | R2 (K) | Package | Shipping [†] |
|---------------|---------|--------|--------|----------------------|-----------------------|
| DTC114EM3T5G | 8A | 10 | 10 | SOT-723 (Pb-Free) | 8000/Tape & Reel |
| DTC124EM3T5G | 8B | 22 | 22 | | |
| DTC144EM3T5G | 8C | 47 | 47 | | |
| DTC114YM3T5G | 8D | 10 | 47 | | |
| DTC114TM3T5G | 8E | 10 | ∞ | | |
| DTC143TM3T5G | 8F | 4.7 | ∞ | | |
| DTC123EM3T5G | 8H | 2.2 | 2.2 | | |
| DTC143EM3T5G | 8J | 4.7 | 4.7 | | |
| DTC143ZM3T5G* | 8K | 4.7 | 47 | | |
| DTC124XM3T5G* | 8L | 22 | 47 | | |
| DTC123JM3T5G | 8M | 2.2 | 47 | | |
| DTC115EM3T5G | 8N | 100 | 100 | | |
| DTC144WM3T5G* | 8P | 47 | 22 | | |
| DTC144TM3T5G | 8T | 47 | ∞ | | |

[†]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.

*Available upon request.

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------------------------|-------------|-------------|
| Total Device Dissipation, FR-4 Board (Note 1) @ T _A = 25°C Derate above 25°C | P _D | 260 2.0 | mW mW/°C |
| Thermal Resistance, Junction-to-Ambient (Note 1) | R _{θJA} | 480 | °C/W |
| Total Device Dissipation, FR-4 Board (Note 2) @ T _A = 25°C Derate above 25°C | P _D | 600 4.8 | mW mW/°C |
| Thermal Resistance, Junction-to-Ambient (Note 2) | R _{θJA} | 205 | °C/W |
| Junction and Storage Temperature Range | T _J , T _{stg} | -55 to +150 | °C |

1. FR-4 @ minimum pad.

2. FR-4 @ 1.0 × 1.0 inch pad.

DTC114EM3T5G Series

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

查询"DTC143ZM3T5G"供应商

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|----------------------|-----|-----|------|------|
| OFF CHARACTERISTICS | | | | | |
| Collector–Base Cutoff Current (V _{CB} = 50 V, I _E = 0) | I _{CBO} | – | – | 100 | nAdc |
| Collector–Emitter Cutoff Current (V _{CE} = 50 V, I _B = 0) | I _{CEO} | – | – | 500 | nAdc |
| Emitter–Base Cutoff Current (V _{EB} = 6.0 V, I _C = 0) | I _{EBO} | – | – | 0.5 | mAdc |
| | DTC114EM3T5G | – | – | 0.2 | |
| | DTC124EM3T5G | – | – | 0.1 | |
| | DTC144EM3T5G | – | – | 0.2 | |
| | DTC114YM3T5G | – | – | 0.9 | |
| | DTC114TM3T5G | – | – | 1.9 | |
| | DTC143TM3T5G | – | – | 2.3 | |
| | DTC123EM3T5G | – | – | 1.5 | |
| | DTC143EM3T5G | – | – | 0.18 | |
| | DTC143ZM3T5G | – | – | 0.13 | |
| | DTC124XM3T5G | – | – | 0.2 | |
| | DTC123JM3T5G | – | – | 0.05 | |
| | DTC115EM3T5G | – | – | 0.13 | |
| | DTC144WM3T5G | – | – | 0.2 | |
| | DTC144TM3T5G | – | – | – | |
| Collector–Base Breakdown Voltage (I _C = 10 μA, I _E = 0) | V _{(BR)CBO} | 50 | – | – | Vdc |
| Collector–Emitter Breakdown Voltage (Note 3) (I _C = 2.0 mA, I _B = 0) | V _{(BR)CEO} | 50 | – | – | Vdc |
| ON CHARACTERISTICS (Note 3) | | | | | |
| DC Current Gain (V _{CE} = 10 V, I _C = 5.0 mA) | h _{FE} | 35 | 60 | – | – |
| | DTC114EM3T5G | 60 | 100 | – | |
| | DTC124EM3T5G | 80 | 140 | – | |
| | DTC144EM3T5G | 80 | 140 | – | |
| | DTC114YM3T5G | 160 | 350 | – | |
| | DTC114TM3T5G | 160 | 350 | – | |
| | DTC143TM3T5G | 8.0 | 15 | – | |
| | DTC123EM3T5G | 15 | 30 | – | |
| | DTC143EM3T5G | 80 | 200 | – | |
| | DTC143ZM3T5G | 80 | 150 | – | |
| | DTC124XM3T5G | 80 | 140 | – | |
| | DTC123JM3T5G | 80 | 150 | – | |
| | DTC115EM3T5G | 80 | 140 | – | |
| | DTC144WM3T5G | 160 | 350 | – | |
| | DTC144TM3T5G | – | – | – | |
| Collector–Emitter Saturation Voltage (I _C = 10 mA, I _B = 0.3 mA) (I _C = 10 mA, I _B = 5 mA) DTC123EM3T5G (I _C = 10 mA, I _B = 1 mA) DTC143TM3T5G/DTC114TM3T5G/ DTC143EM3T5G/DTC143ZM3T5G/ DTC124XM3T5G/DTC144TM3T5G | V _{CE(sat)} | – | – | 0.25 | Vdc |
| Output Voltage (on) (V _{CC} = 5.0 V, V _B = 2.5 V, R _L = 1.0 kΩ) | V _{OL} | – | – | 0.2 | Vdc |
| | DTC114EM3T5G | – | – | 0.2 | |
| | DTC124EM3T5G | – | – | 0.2 | |
| | DTC114YM3T5G | – | – | 0.2 | |
| | DTC114TM3T5G | – | – | 0.2 | |
| | DTC143TM3T5G | – | – | 0.2 | |
| | DTC123EM3T5G | – | – | 0.2 | |
| | DTC143EM3T5G | – | – | 0.2 | |
| | DTC143ZM3T5G | – | – | 0.2 | |
| | DTC124XM3T5G | – | – | 0.2 | |
| | DTC123JM3T5G | – | – | 0.2 | |
| (V _{CC} = 5.0 V, V _B = 3.5 V, R _L = 1.0 kΩ) | DTC144EM3T5G | – | – | 0.2 | |
| | DTC144TM3T5G | – | – | 0.2 | |
| (V _{CC} = 5.0 V, V _B = 5.5 V, R _L = 1.0 kΩ) | DTC115EM3T5G | – | – | 0.2 | |
| (V _{CC} = 5.0 V, V _B = 4.0 V, R _L = 1.0 kΩ) | DTC144WM3T5G | – | – | 0.2 | |

3. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%.

DTC114EM3T5G Series

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit | |
|--|--|--------------------------------|---|--|---|----|
| ON CHARACTERISTICS (Note 4) | | | | | | |
| Output Voltage (off) (V _{CC} = 5.0 V, V _B = 0.5 V, R _L = 1.0 kΩ) (V _{CC} = 5.0 V, V _B = 0.25 V, R _L = 1.0 kΩ) | V _{OH} | 4.9 | – | – | Vdc | |
| Input Resistor | DTC114EM3T5G DTC124EM3T5G DTC144EM3T5G DTC114YM3T5G DTC114TM3T5G DTC143TM3T5G DTC123EM3T5G DTC143EM3T5G DTC143ZM3T5G DTC124XM3T5G DTC123JM3T5G DTC115EM3T5G DTC144WM3T5G DTC144TM3T5G | R1 | 7.0 15.4 32.9 7.0 7.0 3.3 1.5 3.3 3.3 15.4 1.54 70 32.9 32.9 | 10 22 47 10 10 4.7 2.2 4.7 4.7 22 2.2 100 47 47 | 13 28.6 61.1 13 13 6.1 2.9 6.1 6.1 28.6 2.86 130 61.1 61.1 | kΩ |
| Resistor Ratio | DTC114EM3T5G/DTC124EM3T5G/ DTC144EM3T5G/DTC115EM3T5G DTC114YM3T5G DTC143TM3T5G/DTC114TM3T5G/DTC144TM3T5G DTC123EM3T5G/DTC143EM3T5G DTC143ZM3T5G DTC124XM3T5G DTC123JM3T5G DTC144WM3T5G | R ₁ /R ₂ | 0.8 0.17 – 0.8 0.055 0.38 0.038 1.7 | 1.0 0.21 – 1.0 0.1 0.47 0.047 2.1 | 1.2 0.25 – 1.2 0.185 0.56 0.056 2.6 | |

4. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%.

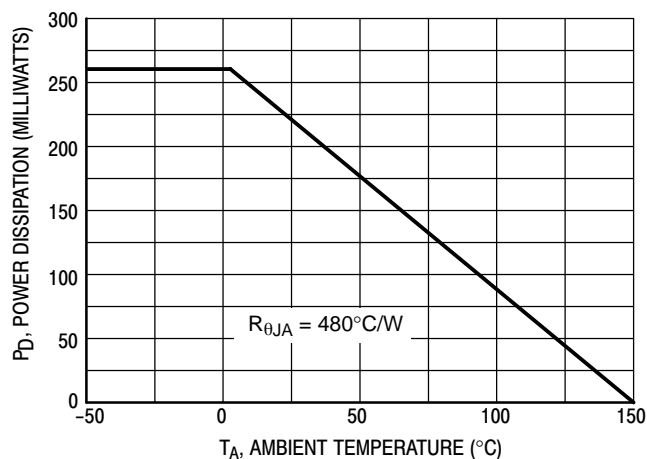


Figure 1. Derating Curve

DTC114EM3T5G Series

TYPICAL ELECTRICAL CHARACTERISTICS – DTC114EM3T5G

[查询"DTC143ZM3T5G"供应商](#)

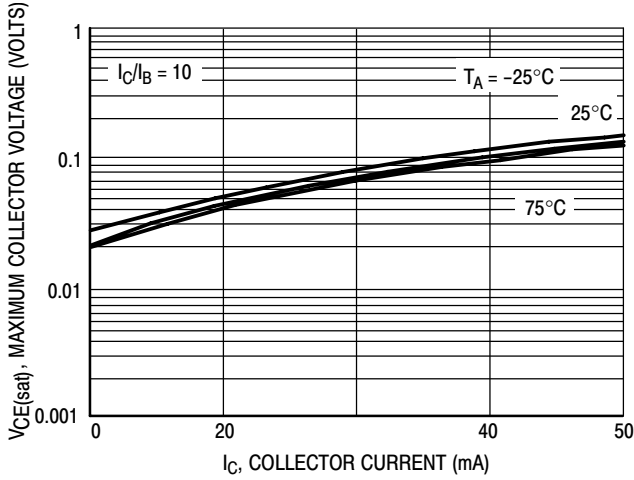


Figure 2. $V_{CE(sat)}$ versus I_C

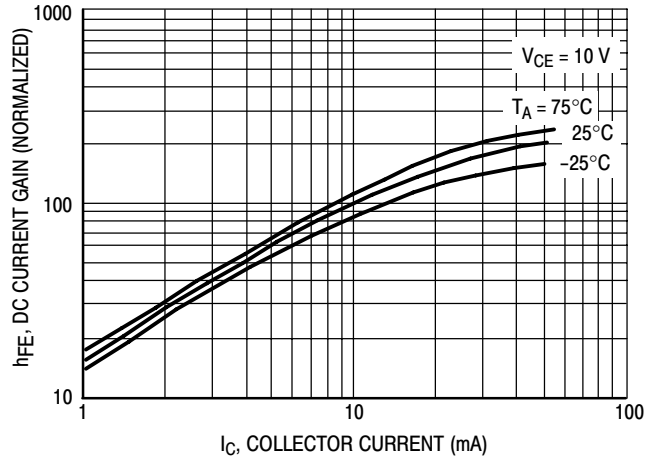


Figure 3. DC Current Gain

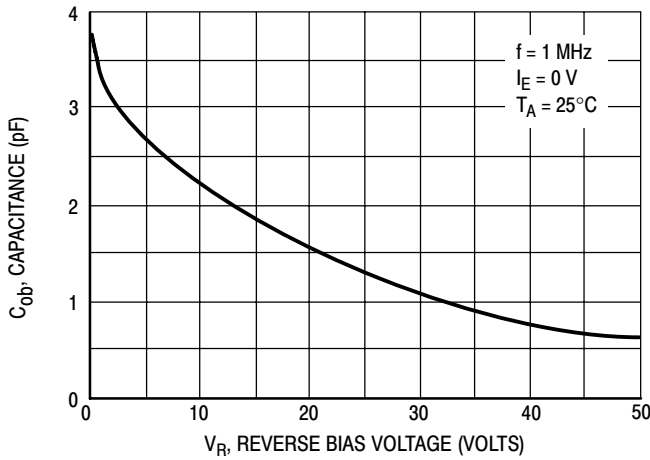


Figure 4. Output Capacitance

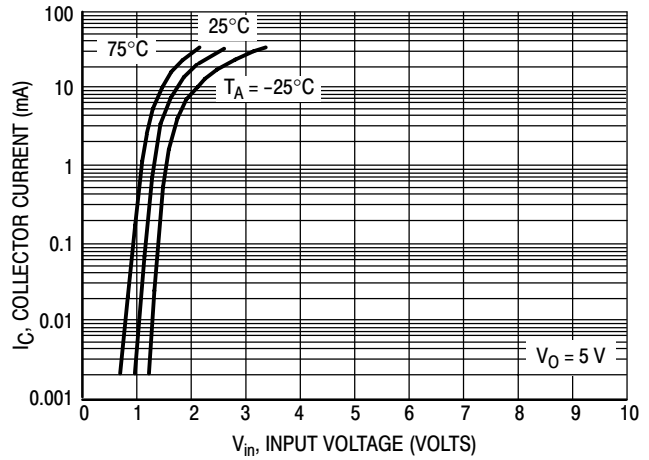


Figure 5. Output Current versus Input Voltage

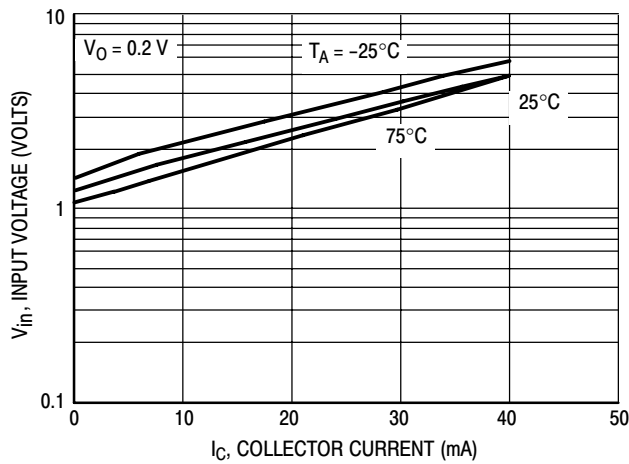


Figure 6. Input Voltage versus Output Current

DTC114EM3T5G Series

TYPICAL ELECTRICAL CHARACTERISTICS – DTC124EM3T5G

[查询"DTC143ZM3T5G"供应商](#)

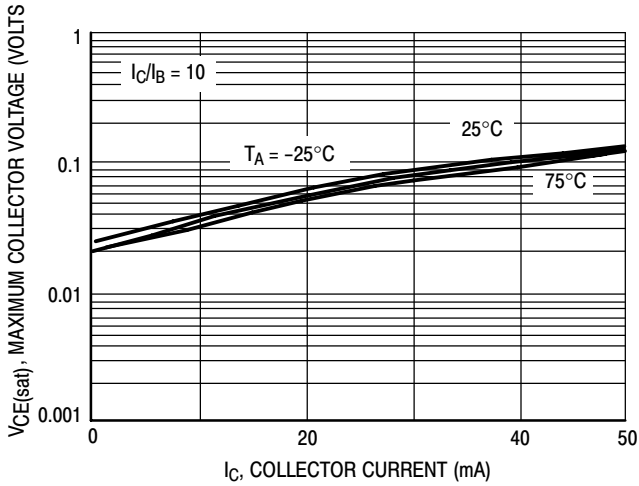


Figure 7. $V_{CE(sat)}$ versus I_C

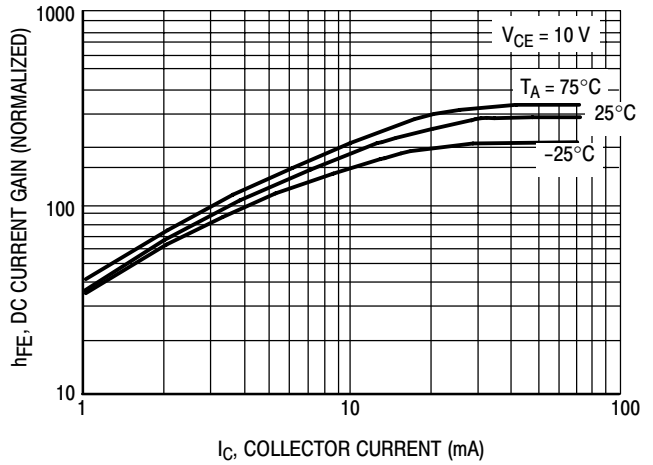


Figure 8. DC Current Gain

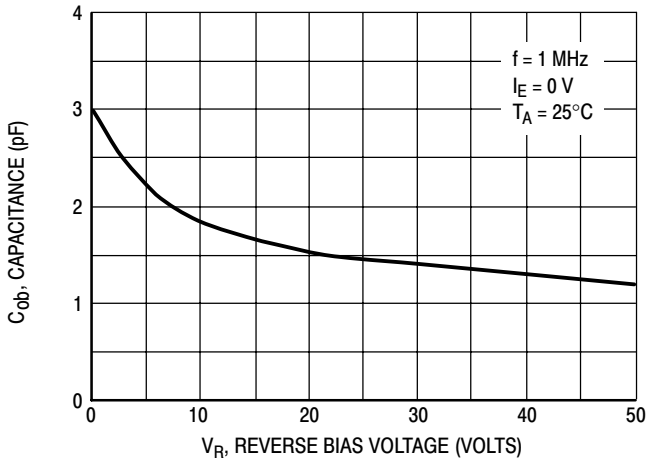


Figure 9. Output Capacitance

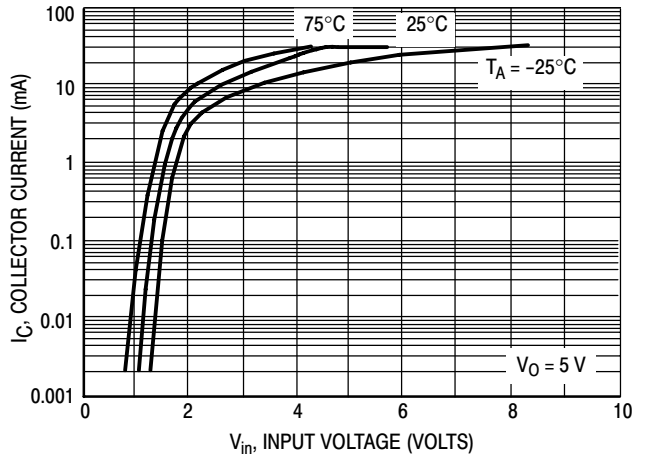


Figure 10. Output Current versus Input Voltage

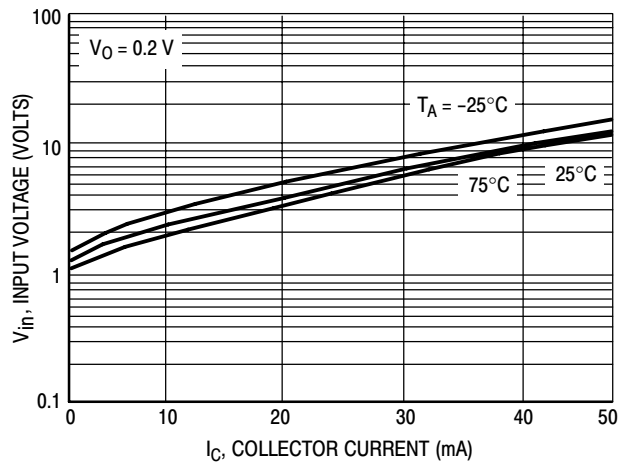


Figure 11. Input Voltage versus Output Current

DTC114EM3T5G Series

TYPICAL ELECTRICAL CHARACTERISTICS – DTC144EM3T5G

[查询"DTC143ZM3T5G"供应商](#)

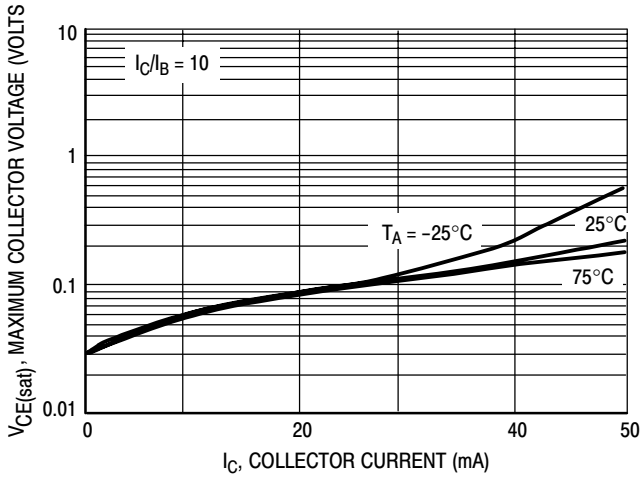


Figure 12. $V_{CE(sat)}$ versus I_C

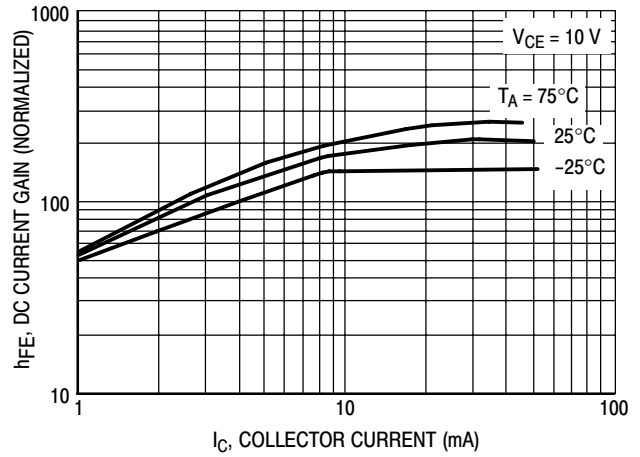


Figure 13. DC Current Gain

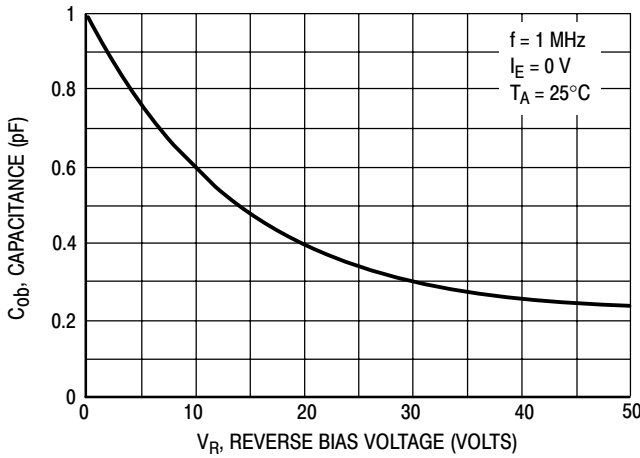


Figure 14. Output Capacitance

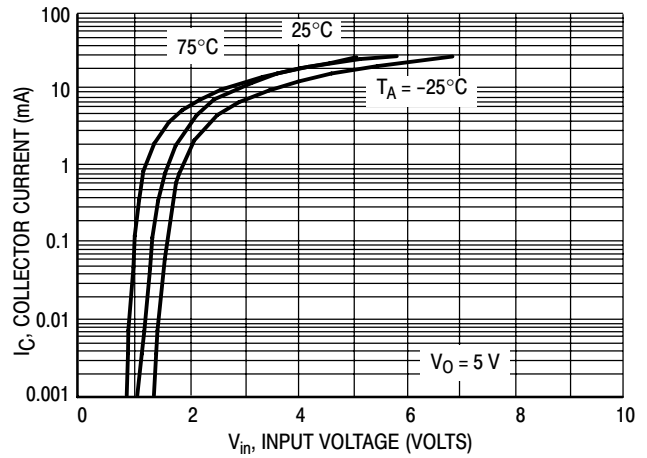


Figure 15. Output Current versus Input Voltage

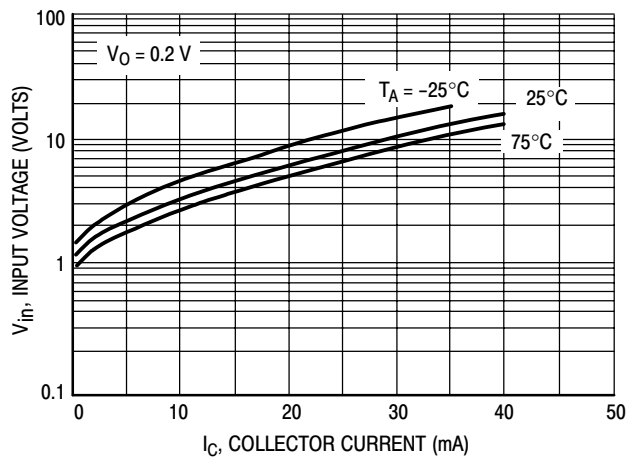


Figure 16. Input Voltage versus Output Current

DTC114EM3T5G Series

TYPICAL ELECTRICAL CHARACTERISTICS – DTC114YM3T5G

[查询"DTC143ZM3T5G"供应商](#)

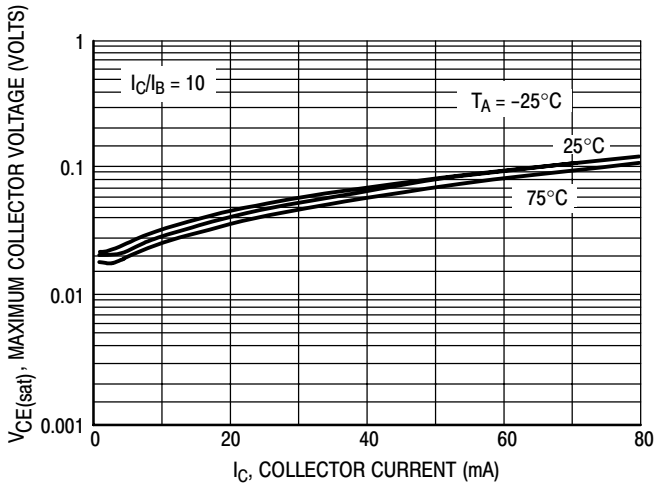


Figure 17. $V_{CE(sat)}$ versus I_C

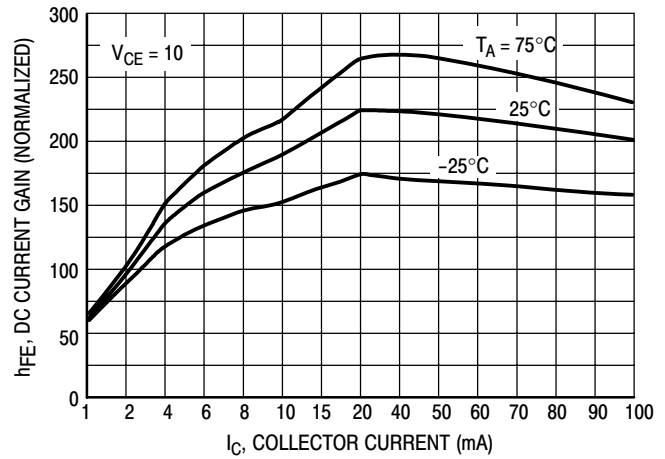


Figure 18. DC Current Gain

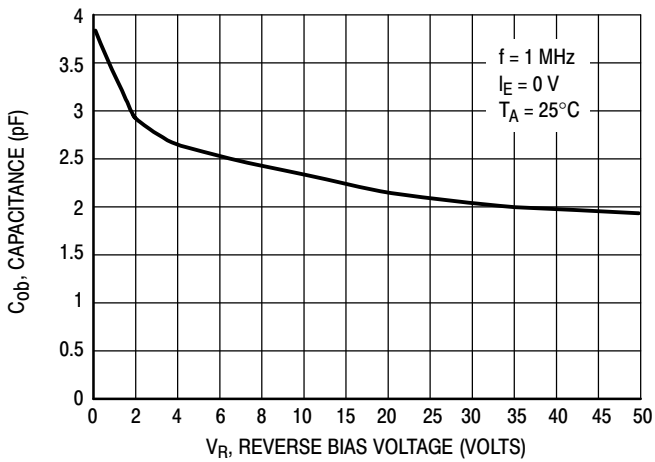


Figure 19. Output Capacitance

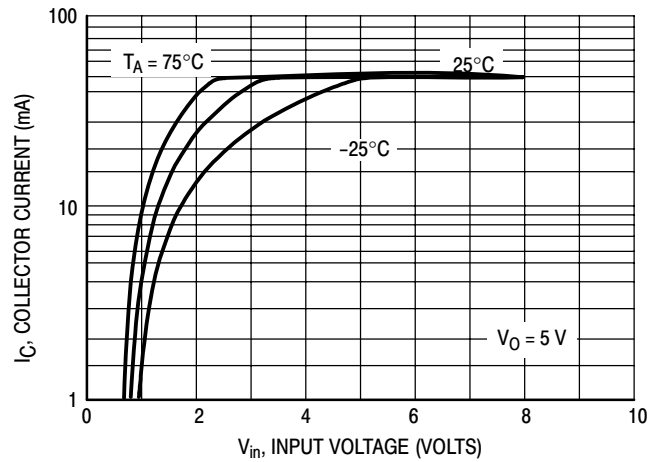


Figure 20. Output Current versus Input Voltage

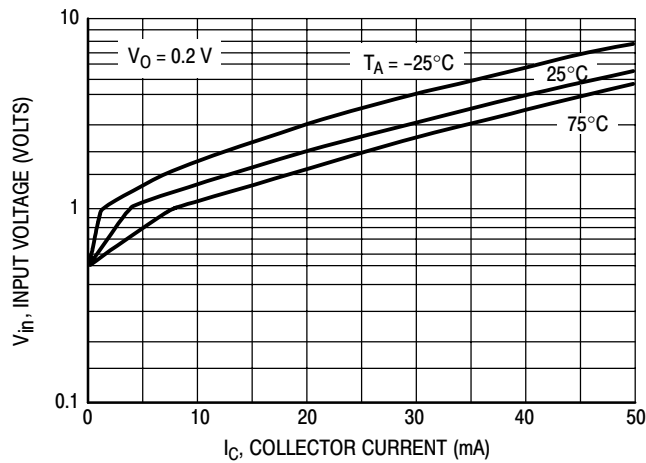


Figure 21. Input Voltage versus Output Current

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TYPICAL APPLICATIONS FOR NPN BRTs

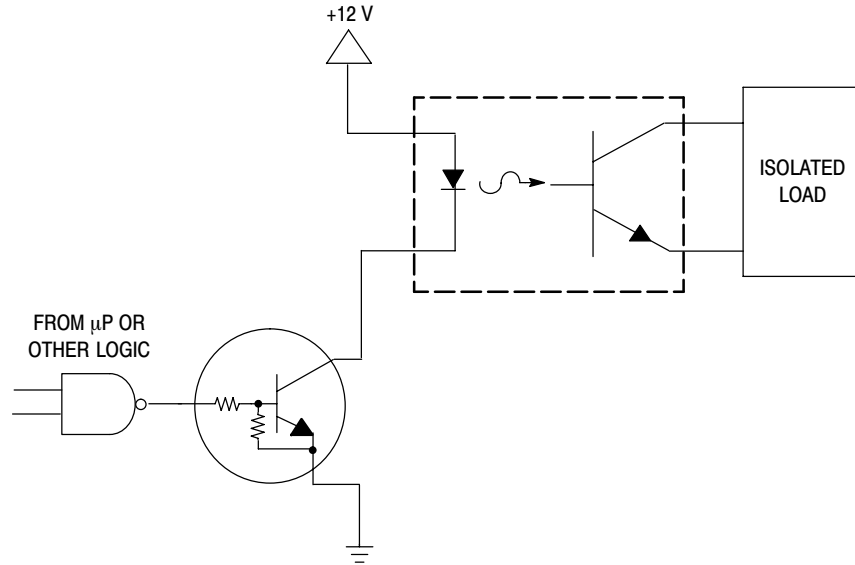


Figure 22. Level Shifter: Connects 12 or 24 Volt Circuits to Logic

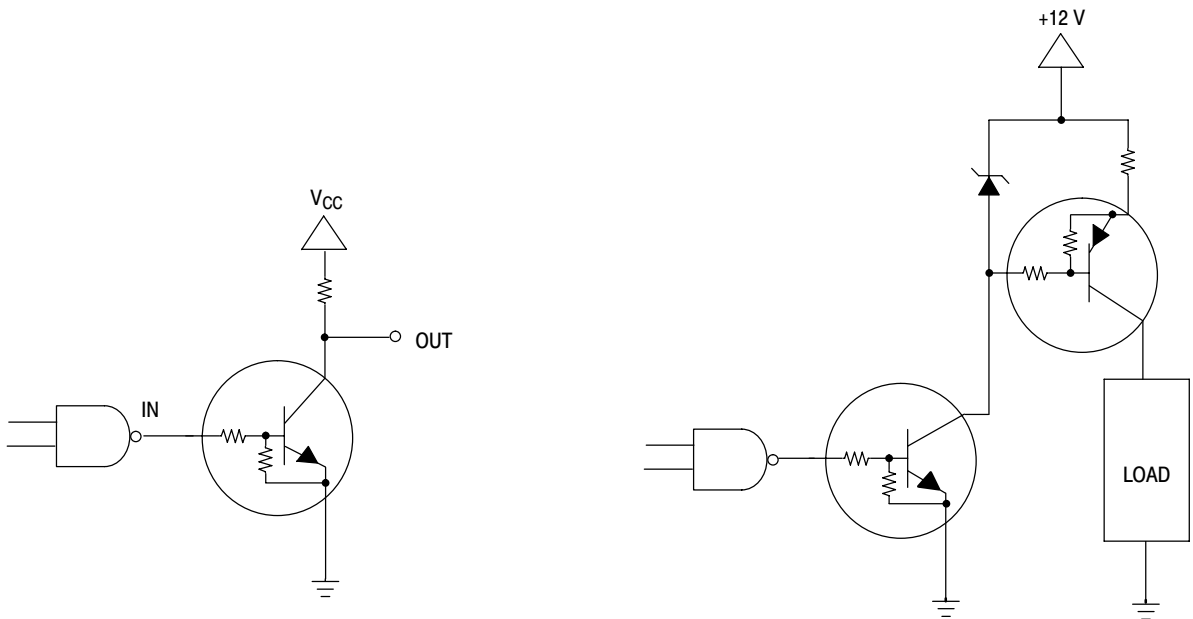


Figure 23. Open Collector Inverter: Inverts the Input Signal

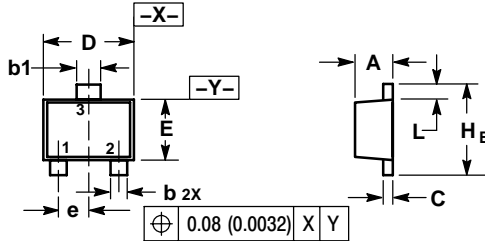
Figure 24. Inexpensive, Unregulated Current Source

DTC114EM3T5G Series

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PACKAGE DIMENSIONS

SOT-723
CASE 631AA-01
ISSUE B



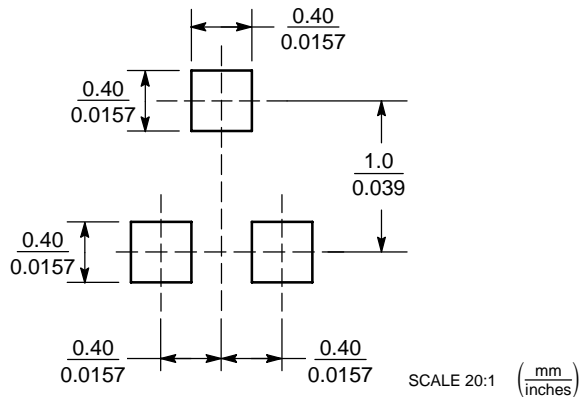
STYLE 1:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|-----------|--------|--------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.45 | 0.50 | 0.55 | 0.018 | 0.020 | 0.022 |
| b | 0.15 | 0.21 | 0.27 | 0.0059 | 0.0083 | 0.0106 |
| b1 | 0.25 | 0.31 | 0.37 | 0.010 | 0.012 | 0.015 |
| C | 0.07 | 0.12 | 0.17 | 0.0028 | 0.0047 | 0.0067 |
| D | 1.15 | 1.20 | 1.25 | 0.045 | 0.047 | 0.049 |
| E | 0.75 | 0.80 | 0.85 | 0.03 | 0.032 | 0.034 |
| e | 0.40 BSC | | | 0.016 BSC | | |
| H E | 1.15 | 1.20 | 1.25 | 0.045 | 0.047 | 0.049 |
| L | 0.15 | 0.20 | 0.25 | 0.0059 | 0.0079 | 0.0098 |

SOLDERING FOOTPRINT*



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

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