

# EMG2DXV5T1, EMG5DXV5T1

Preferred Devices

## Product Preview Dual Bias Resistor Transistors

### 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 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. The BRT eliminates these individual components by integrating them into a single device. The use of a BRT can reduce both system cost and board space. The device is housed in the SOT-553 package which is designed for low power surface mount applications.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Moisture Sensitivity Level: 1
- Available in 8 mm, 7 inch Tape and Reel
- Lead-Free Solder Plating

**MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

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

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	230 (Note 1) 338 (Note 2) 1.8 (Note 1) 2.7 (Note 2)	mW $^\circ\text{C/W}$
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	540 (Note 1) 370 (Note 2)	$^\circ\text{C/W}$
Thermal Resistance – Junction-to-Lead	$R_{\theta JL}$	264 (Note 1) 287 (Note 2)	$^\circ\text{C/W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

1. FR-4 @ Minimum Pad
2. FR-4 @ 1.0 x 1.0 inch Pad

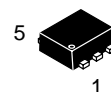
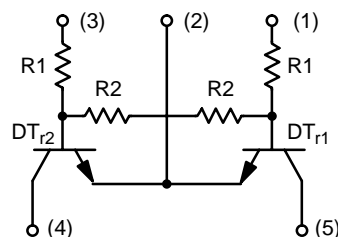
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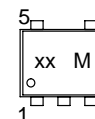
<http://onsemi.com>

### NPN SILICON BIAS RESISTOR TRANSISTORS



SOT-553  
CASE 463B

#### MARKING DIAGRAM



xx = Specific Device Code  
UF = EMG5  
UP = EMG2  
M = Date Code

#### ORDERING INFORMATION

Device	Package	Shipping†
EMG2DXV5T1	SOT-553	4 mm pitch 4000 / Tape & Reel
EMG2DXV5T5	SOT-553	2 mm pitch 8000 / Tape & Reel
EMG5DXV5T1	SOT-553	4 mm pitch 4000 / Tape & Reel
EMG5DXV5T5	SOT-553	2 mm pitch 8000 / 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.

Preferred devices are recommended choices for future use and best overall value.

# EMG2DXV5T1, EMG5DXV5T1

## DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1 (K)	R2 (K)
EMG2DXV5T1	SOT-553	UP	47	47
EMG5DXV5T1	SOT-553	UF	10	47

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS (Q1 & Q2)

Collector-Base Cutoff Current ( $V_{CB} = 50\text{ V}$ , $I_E = 0$ )	$I_{CBO}$	–	–	100	nAdc
Collector-Emitter Cutoff Current ( $V_{CE} = 50\text{ V}$ , $I_B = 0$ )	$I_{CEO}$	–	–	500	nAdc
Emitter-Base Cutoff Current ( $V_{EB} = 6.0\text{ V}$ , $I_C = 0$ )	$I_{EBO}$	–	–	0.1 0.2	mAdc
Collector-Base Breakdown Voltage ( $I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ )	$V_{(BR)CBO}$	50	–	–	Vdc
Collector-Emitter Breakdown Voltage (Note 3) ( $I_C = 2.0\text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	50	–	–	Vdc

### ON CHARACTERISTICS (Q1 & Q2) (Note 3)

DC Current Gain ( $V_{CE} = 10\text{ V}$ , $I_C = 5.0\text{ mA}$ )	EMG2DXV5T1 EMG5DXV5T1	$h_{FE}$	80 80	140 140	– –	
Collector-Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.3\text{ mA}$ )		$V_{CE(sat)}$	–	–	0.25	Vdc
Output Voltage (on) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 3.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	EMG2DXV5T1	$V_{OL}$	–	–	0.2	Vdc
( $V_{CC} = 5.0\text{ V}$ , $V_B = 2.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	EMG5DXV5T1		–	–	0.2	
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	EMG2DXV5T1 EMG5DXV5T1	$R_1$	32.9 7.0	47 10	61.1 13	k $\Omega$
Resistor Ratio	EMG2DXV5T1 EMG5DXV5T1	$R_1/R_2$	0.8 0.17	1.0 0.21	1.2 0.25	

3. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2.0%

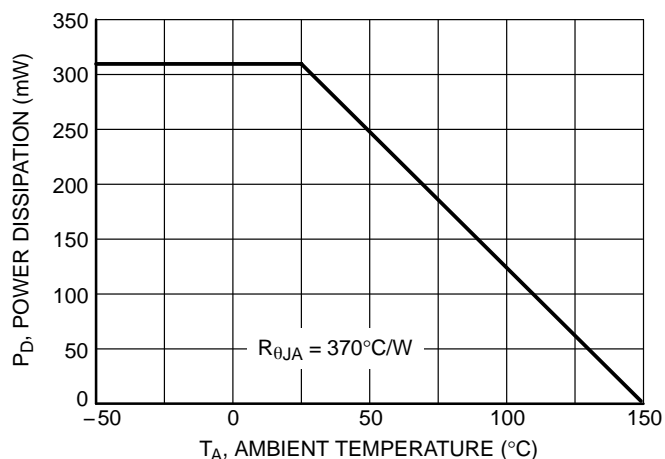


Figure 1. Derating Curve

# EMG2DXV5T1, EMG5DXV5T1

## TYPICAL ELECTRICAL CHARACTERISTICS — EMG2DXV5T1

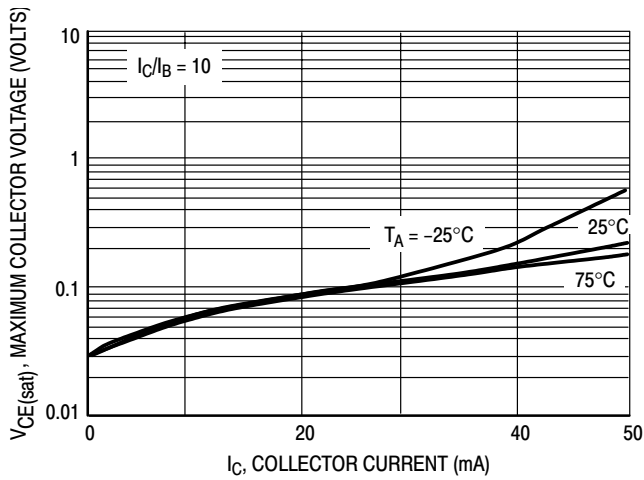


Figure 2.  $V_{CE(sat)}$  versus  $I_C$

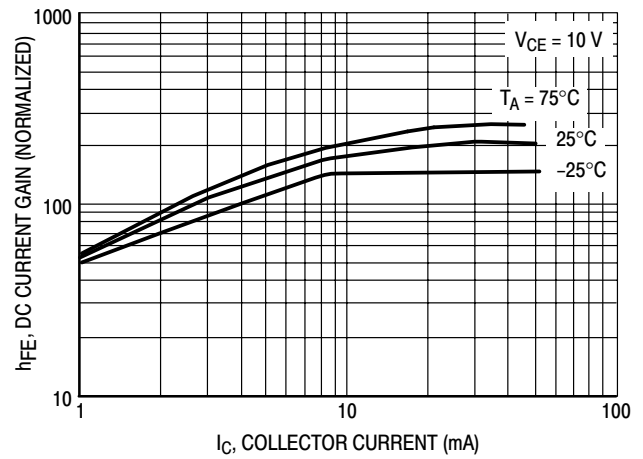


Figure 3. DC Current Gain

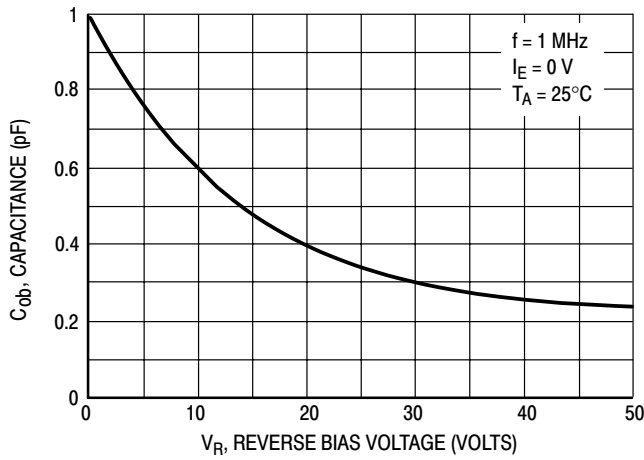


Figure 4. Output Capacitance

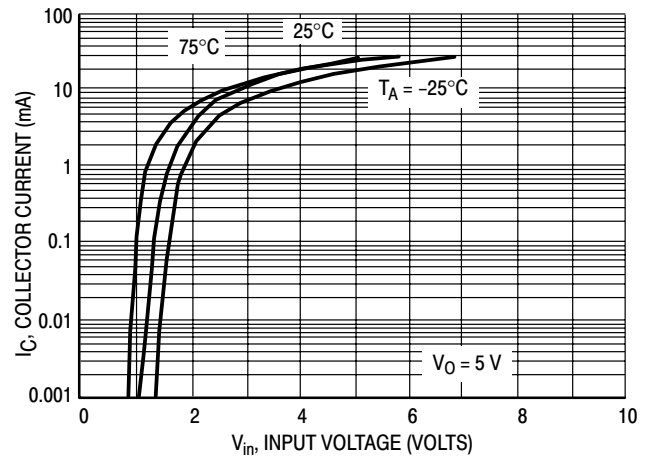


Figure 5. Output Current versus Input Voltage

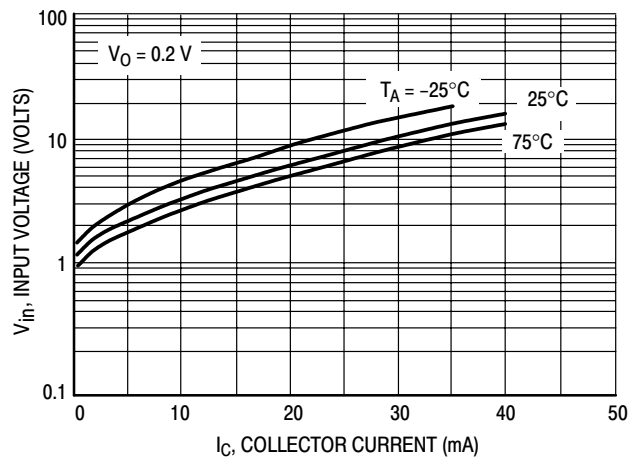


Figure 6. Input Voltage versus Output Current

# EMG2DXV5T1, EMG5DXV5T1

## TYPICAL ELECTRICAL CHARACTERISTICS – EMG5DXV5T1

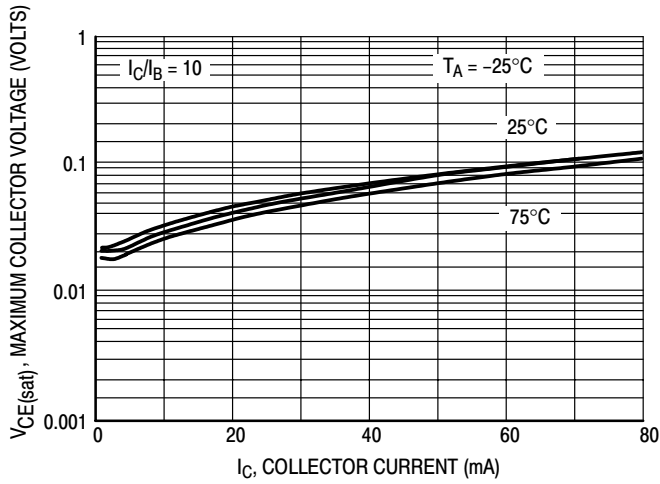


Figure 7.  $V_{CE(sat)}$  versus  $I_C$

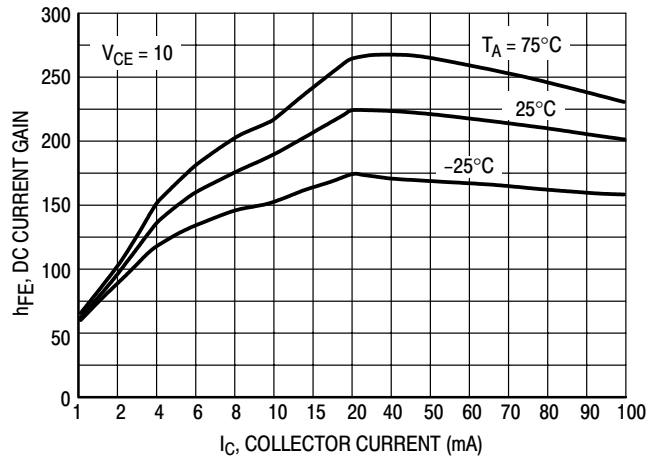


Figure 8. DC Current Gain

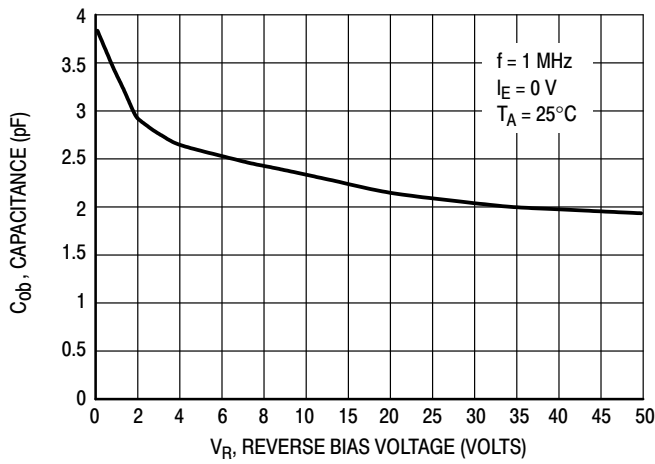


Figure 9. Output Capacitance

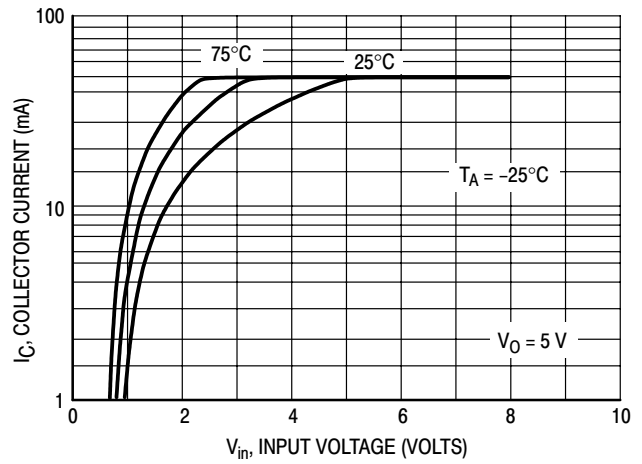


Figure 10. Output Current versus Input Voltage

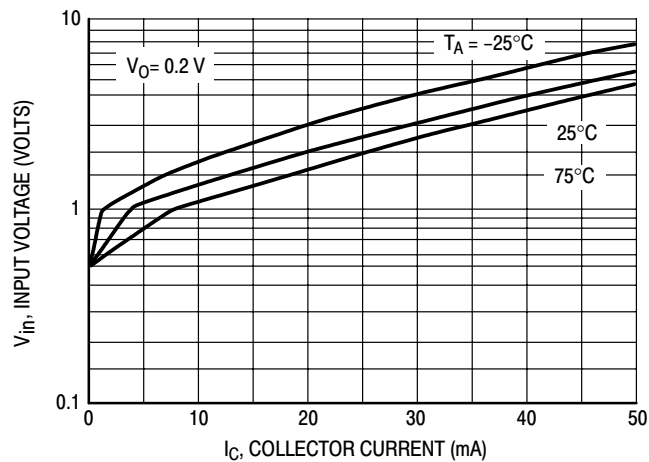


Figure 11. Input Voltage versus Output Current

# EMG2DXV5T1, EMG5DXV5T1

## TYPICAL APPLICATIONS FOR NPN BRTs

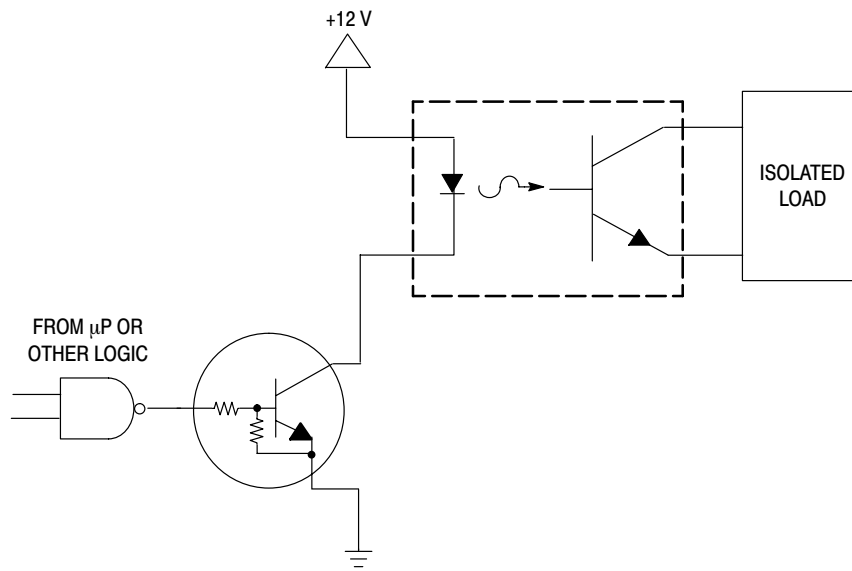


Figure 12. Level Shifter: Connects 12 or 24 Volt Circuits to Logic

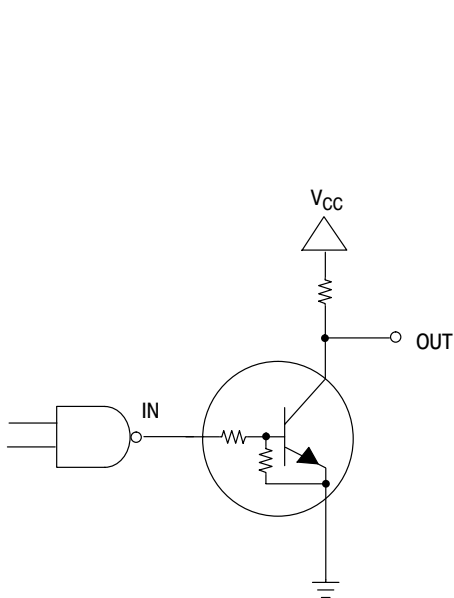


Figure 13. Open Collector Inverter:  
Inverts the Input Signal

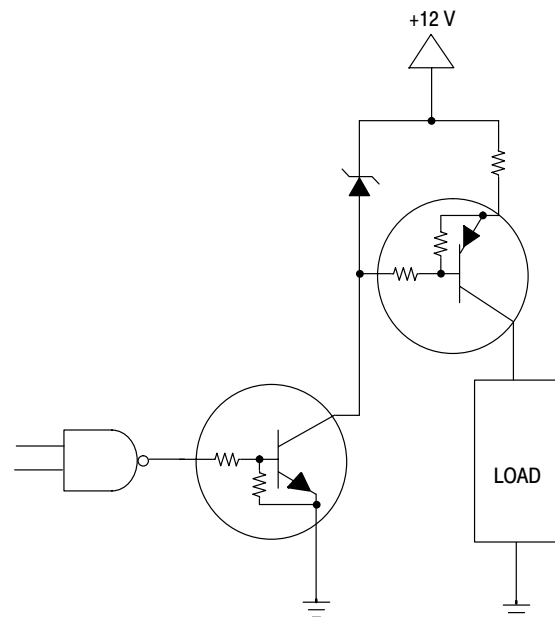
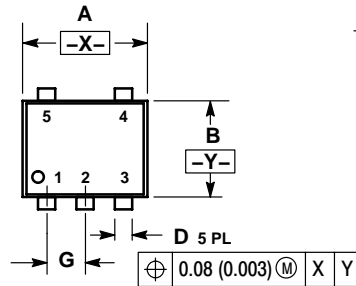


Figure 14. Inexpensive, Unregulated Current Source

# EMG2DXV5T1, EMG5DXV5T1

## PACKAGE DIMENSIONS

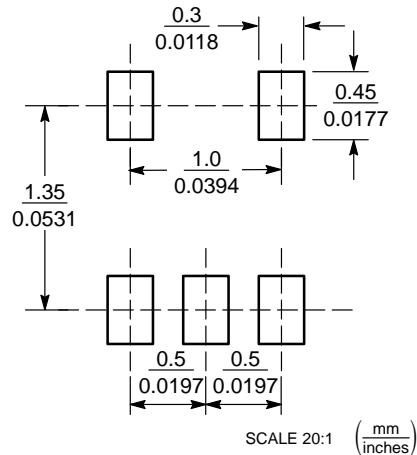
**SOT-553**  
**XV5 SUFFIX**  
**5-LEAD PACKAGE**  
**CASE 463B-01**  
**ISSUE O**



### 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	MAX	MIN	MAX
A	1.50	1.70	0.059	0.067
B	1.10	1.30	0.043	0.051
C	0.50	0.60	0.020	0.024
D	0.17	0.27	0.007	0.011
G	0.50 BSC		0.020 BSC	
J	0.08	0.18	0.003	0.007
K	0.10	0.30	0.004	0.012
S	1.50	1.70	0.059	0.067



### SOT-553

**Figure 15. SOT-553 POWER DISSIPATION**

\*For information on soldering specifications, please refer to our Soldering Reference Manual, SOLDERM/D.

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