

Dual Bias Resistor Transistors

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

EMD5DXV6T5G

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 EMD5DXV6 series, two complementary BRT devices are housed in the SOT-563 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
- Available in 8 mm, 7 inch Tape and Reel
- Lead Free Solder Plating
- These Devices are Pb-Free and are RoHS Compliant

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)

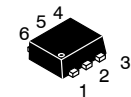
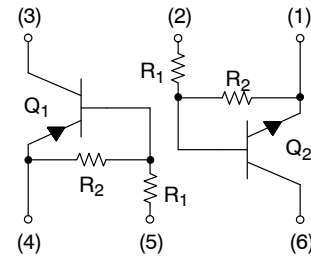
Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	50	Vdc
Collector-Emitter Voltage	V_{CEO}	50	Vdc
Collector Current	I_C	100	mAdc

THERMAL CHARACTERISTICS

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

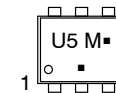
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-4 @ Minimum Pad



SOT-563
CASE 463A

MARKING DIAGRAM



U5 = Specific Device Code
M = Month Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping [†]
EMD5DXV6T5G	SOT-563 (Pb-Free)	8000 / Tape & Reel
EMD5DXV6T1G	SOT-563 (Pb-Free)	4000 / Tape & Reel

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

EMD5DXV6T5G

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

Characteristic	Symbol	Min	Typ	Max	Unit
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Q1 TRANSISTOR: PNP

OFF CHARACTERISTICS

Collector-Base Cutoff Current (V _{CB} = 50 V, I _E = 0)	I _{CBO}	–	–	100	nAdc
Collector-Emitter Cutoff Current (V _{CB} = 50 V, I _B = 0)	I _{CEO}	–	–	500	nAdc
Emitter-Base Cutoff Current (V _{EB} = 6.0, I _C = 5.0 mA)	I _{EBO}	–	–	1.0	mAdc

ON CHARACTERISTICS

Collector-Base Breakdown Voltage (I _C = 10 μA, I _E = 0)	V _{(BR)CBO}	50	–	–	Vdc
Collector-Emitter Breakdown Voltage (I _C = 2.0 mA, I _B = 0)	V _{(BR)CEO}	50	–	–	Vdc
DC Current Gain (V _{CE} = 10 V, I _C = 5.0 mA)	h _{FE}	20	35	–	
Collector-Emitter Saturation Voltage (I _C = 10 mA, I _B = 0.3 mA)	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
Output Voltage (off) (V _{CC} = 5.0 V, V _B = 0.5 V, R _L = 1.0 kΩ)	V _{OH}	4.9	–	–	Vdc
Input Resistor	R1	3.3	4.7	6.1	kΩ
Resistor Ratio	R1/R2	0.38	0.47	0.56	

Q2 TRANSISTOR: NPN

OFF CHARACTERISTICS

Collector-Base Cutoff Current (V _{CB} = 50 V, I _E = 0)	I _{CBO}	–	–	100	nAdc
Collector-Emitter Cutoff Current (V _{CB} = 50 V, I _B = 0)	I _{CEO}	–	–	500	nAdc
Emitter-Base Cutoff Current (V _{EB} = 6.0, I _C = 5.0 mA)	I _{EBO}	–	–	0.1	mAdc

ON CHARACTERISTICS

Collector-Base Breakdown Voltage (I _C = 10 μA, I _E = 0)	V _{(BR)CBO}	50	–	–	Vdc
Collector-Emitter Breakdown Voltage (I _C = 2.0 mA, I _B = 0)	V _{(BR)CEO}	50	–	–	Vdc
DC Current Gain (V _{CE} = 10 V, I _C = 5.0 mA)	h _{FE}	80	140	–	
Collector-Emitter Saturation Voltage (I _C = 10 mA, I _B = 0.3 mA)	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
Output Voltage (off) (V _{CC} = 5.0 V, V _B = 0.5 V, R _L = 1.0 kΩ)	V _{OH}	4.9	–	–	Vdc
Input Resistor	R1	33	47	61	kΩ
Resistor Ratio	R1/R2	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.

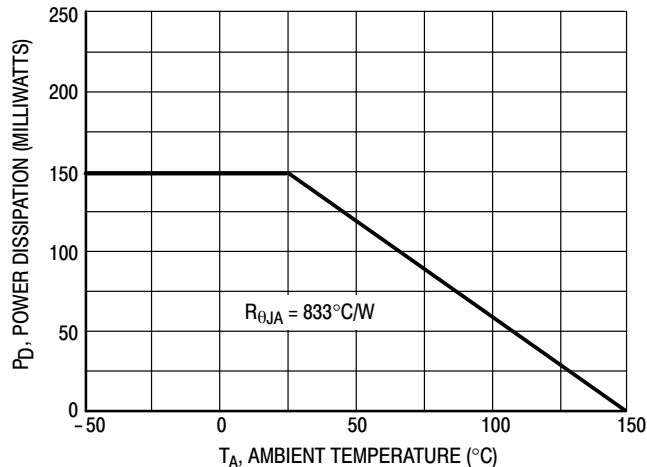


Figure 1. Derating Curve

EMD5DXV6T5G

TYPICAL ELECTRICAL CHARACTERISTICS — EMD5DXV6 PNP TRANSISTOR

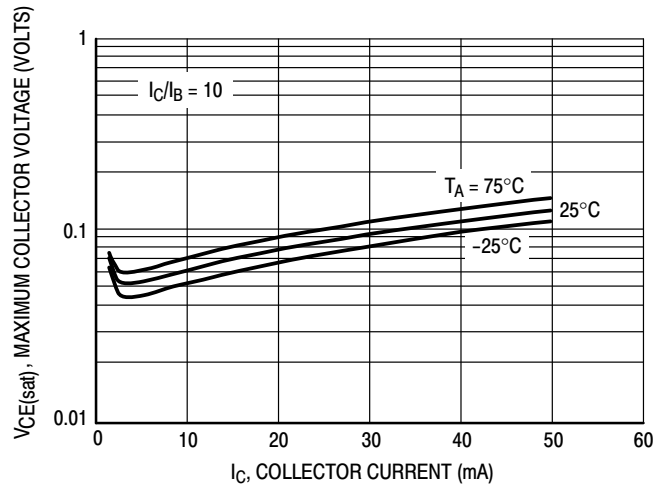


Figure 2. $V_{CE(sat)}$ versus I_C

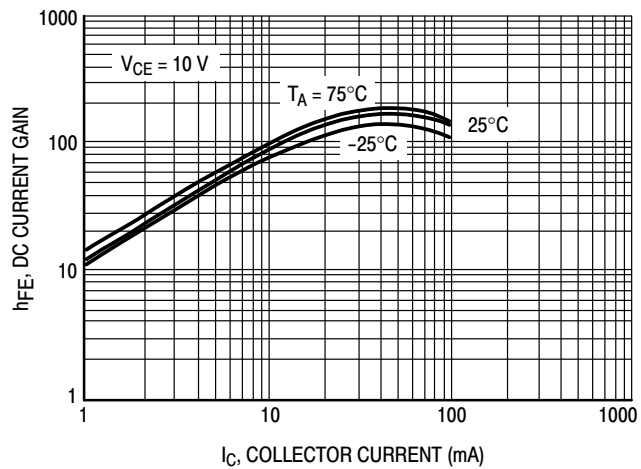


Figure 3. DC Current Gain

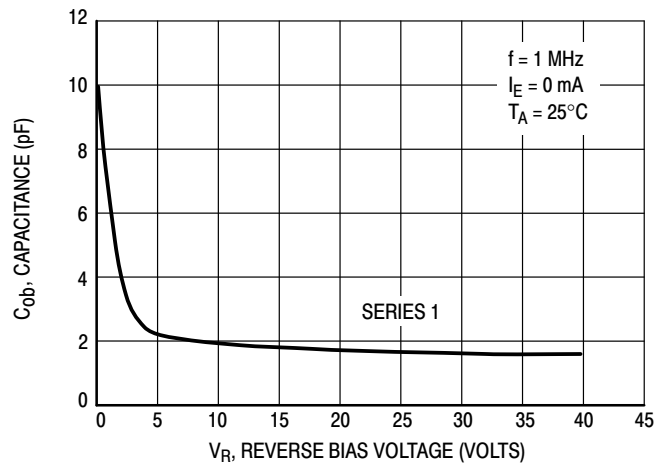


Figure 4. Output Capacitance

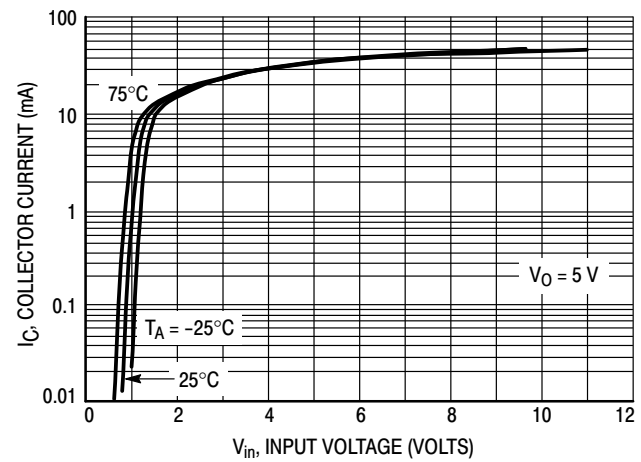


Figure 5. Output Current versus Input Voltage

EMD5DXV6T5G

TYPICAL ELECTRICAL CHARACTERISTICS — EMD5DXV6 NPN TRANSISTOR

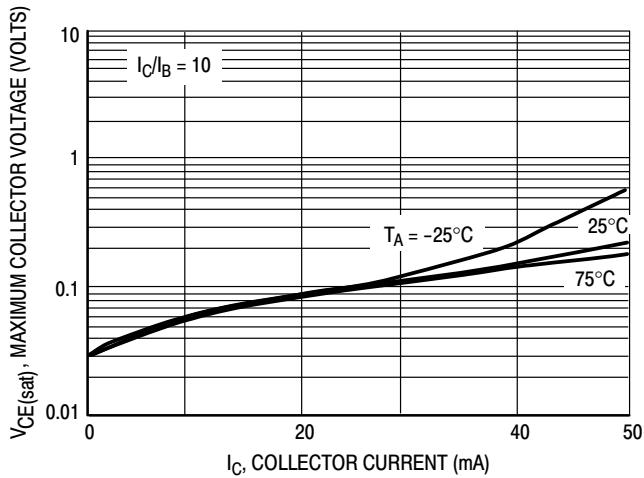


Figure 6. $V_{CE(sat)}$ versus I_C

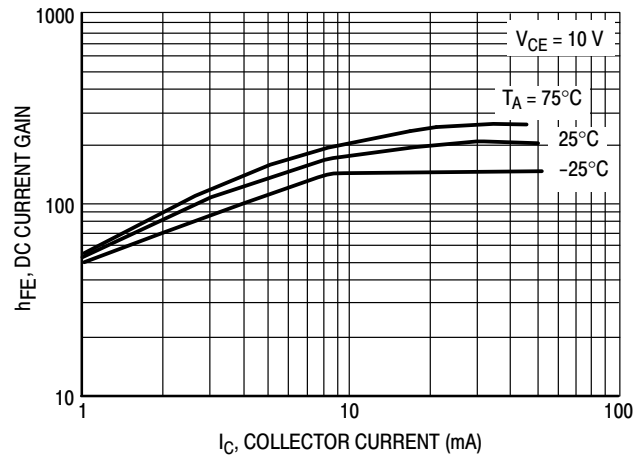


Figure 7. DC Current Gain

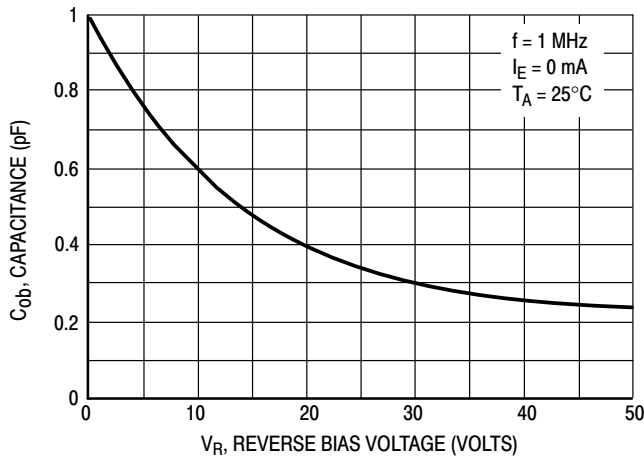


Figure 8. Output Capacitance

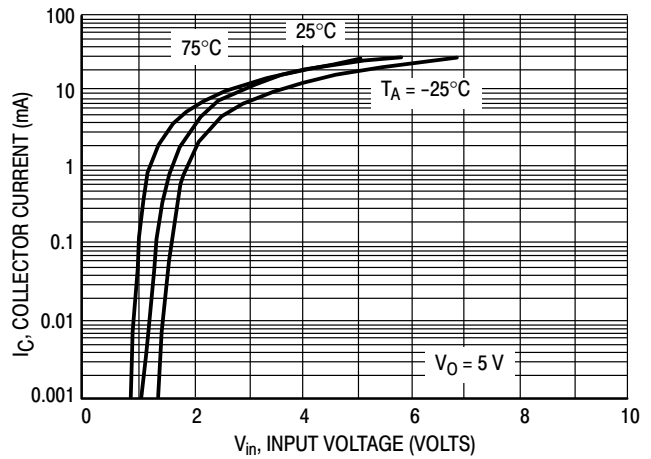


Figure 9. Output Current versus Input Voltage

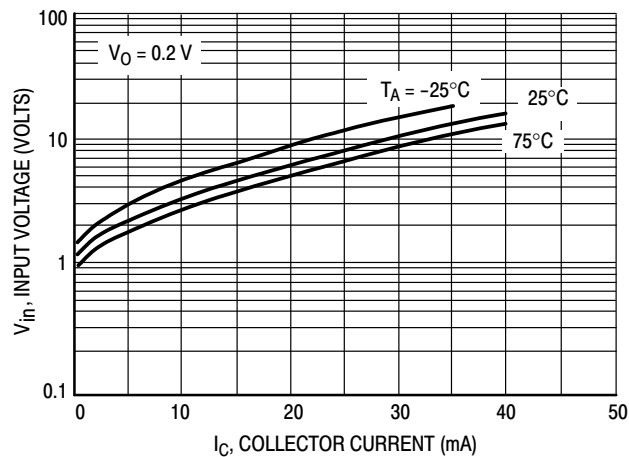


Figure 10. Input Voltage versus Output Current

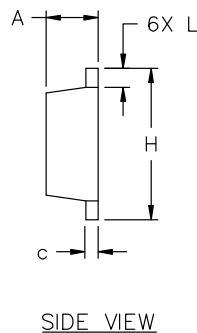
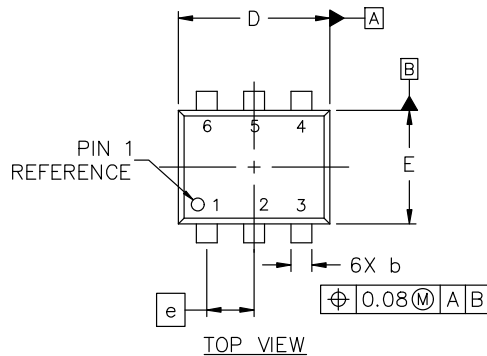


SOT-563-6 1.60x1.20x0.55, 0.50P
CASE 463A
ISSUE J

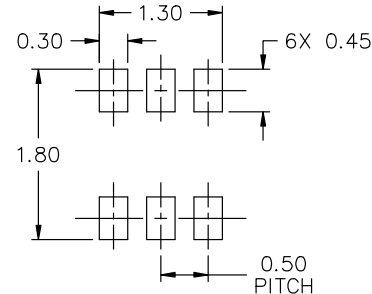
DATE 15 FEB 2024

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.50	0.55	0.60
b	0.17	0.22	0.27
c	0.08	0.13	0.18
D	1.50	1.60	1.70
E	1.10	1.20	1.30
e	0.50 BSC		
H	1.50	1.60	1.70
L	0.10	0.20	0.30



RECOMMENDED MOUNTING FOOTPRINT*

* FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D.

STYLE 1:
PIN 1. EMITTER 1
2. BASE 1
3. COLLECTOR 2
4. EMITTER 2
5. BASE 2
6. COLLECTOR 1

STYLE 2:
PIN 1. EMITTER 1
2. EMITTER 2
3. BASE 2
4. COLLECTOR 2
5. BASE 1
6. COLLECTOR 1

STYLE 3:
PIN 1. CATHODE 1
2. CATHODE 1
3. ANODE/ANODE 2
4. CATHODE 2
5. CATHODE 2
6. ANODE/ANODE 1

STYLE 4:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. EMITTER
5. COLLECTOR
6. COLLECTOR

STYLE 5:
PIN 1. CATHODE
2. CATHODE
3. ANODE
4. ANODE
5. CATHODE
6. CATHODE

STYLE 6:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. ANODE
6. CATHODE

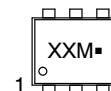
STYLE 8:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

STYLE 9:
PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

STYLE 10:
PIN 1. CATHODE 1
2. N/C
3. CATHODE 2
4. ANODE 2
5. N/C
6. ANODE 1

STYLE 11:
PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2

**GENERIC
MARKING DIAGRAM***



XX = Specific Device Code
M = Month Code
▪ = Pb-Free Package

*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. Some products may not follow the Generic Marking.

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DESCRIPTION:	SOT-563-6 1.60x1.20x0.55, 0.50P	PAGE 1 OF 1

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