

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

Preferred Devices

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 EMC2DXV5T1 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.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7 inch Tape and Reel
- 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)

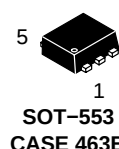
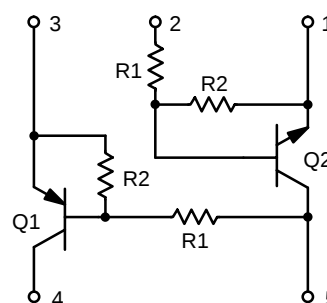
Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	50	Vdc
Collector-Emitter Voltage	V_{CEO}	50	Vdc
Collector Current	I_C	100	mAdc

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.

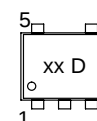


ON Semiconductor®

<http://onsemi.com>



MARKING DIAGRAM



xx = Specific Device Code
D = Date Code

ORDERING INFORMATION

Device	Package	Shipping [†]
EMC2DXV5T1	SOT-553 (Pb-Free)	4 mm pitch 4000/Tape & Reel
EMC2DXV5T5	SOT-553 (Pb-Free)	2 mm pitch 8000/Tape & Reel
EMC3DXV5T1	SOT-553 (Pb-Free)	4 mm pitch 4000/Tape & Reel
EMC3DXV5T5	SOT-553 (Pb-Free)	2 mm pitch 8000/Tape & Reel
EMC4DXV5T1	SOT-553 (Pb-Free)	4 mm pitch 4000/Tape & Reel
EMC4DXV5T5	SOT-553 (Pb-Free)	2 mm pitch 8000/Tape & Reel
EMC5DXV5T1	SOT-553 (Pb-Free)	4 mm pitch 4000/Tape & Reel
EMC5DXV5T5	SOT-553 (Pb-Free)	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.

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

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 MARKING AND RESISTOR VALUES

Device	Marking	Transistor 1 – PNP		Transistor 2 – NPN	
		R1 (K)	R2 (K)	R1 (K)	R2 (K)
EMC2DXV5T1	UC	22	22	22	22
EMC3DXV5T1	U3	10	10	10	10
EMC4DXV5T1	UE	10	47	47	47
EMC5DXV5T1	U5	4.7	10	47	47

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

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

OFF CHARACTERISTICS

Q1 TRANSISTOR: PNP

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 ($V_{EB} = 6.0\text{ V}, I_C = 5.0\text{ mA}$)	I_{EBO}	–	–	0.2	mAdc
EMC2DXV5T1		–	–	0.5	
EMC3DXV5T1		–	–	0.2	
EMC4DXV5T1		–	–	1.0	
EMC5DXV5T1		–	–		

ON CHARACTERISTICS

Collector-Base Breakdown Voltage ($I_C = 10\text{ }\mu\text{A}, I_E = 0$)	$V_{(BR)CBO}$	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 35 80 20	100 60 140 35	– – – –	
EMC2DXV5T1					
EMC3DXV5T1					
EMC4DXV5T1					
EMC5DXV5T1					
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 7.0 3.3	22 10 4.7	28.6 13 6.1	k Ω
EMC2DXV5T1					
EMC3DXV5T1					
EMC4DXV5T1					
EMC5DXV5T1					
Resistor Ratio	R_1/R_2	0.8 0.8 0.17 0.38	1.0 1.0 0.21 0.47	1.2 1.2 0.25 0.56	
EMC2DXV5T1					
EMC3DXV5T1					
EMC4DXV5T1					
EMC5DXV5T1					

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

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

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

Q2 TRANSISTOR: NPN OFF CHARACTERISTICS

Collector-Base Cutoff Current (V _{CB} = 50 V, I _E = 0)	I _{CBO}	–	–	100	nA _{dc}
Collector-Emitter Cutoff Current (V _{CB} = 50 V, I _B = 0)	I _{CEO}	–	–	500	nA _{dc}
Emitter-Base Cutoff Current (V _{EB} = 6.0, I _C = 5.0 mA)	I _{EBO}	–	–	0.2	mA _{dc}
EMC2DXV5T1		–	–	0.5	
EMC3DXV5T1		–	–	0.1	
EMC4DXV5T1, EMC5DXV5T1		–	–		

ON CHARACTERISTICS

Collector-Base Breakdown Voltage (I _C = 10 μA, I _E = 0)	V _{(BR)CBO}	50	–	–	V _{dc}
Collector-Emitter Breakdown Voltage (I _C = 2.0 mA, I _B = 0)	V _{(BR)CEO}	50	–	–	V _{dc}
DC Current Gain (V _{CE} = 10 V, I _C = 5.0 mA)	h _{FE}	60	100	–	
EMC2DXV5T1		35	60	–	
EMC3DXV5T1		80	140	–	
EMC4DXV5T1, EMC5DXV5T1					
Collector-Emitter Saturation Voltage (I _C = 10 mA, I _B = 0.3 mA)	V _{CE(SAT)}	–	–	0.25	V _{dc}
Output Voltage (on) (V _{CC} = 5.0 V, V _B = 2.5 V, R _L = 1.0 kΩ)	V _{OL}	–	–	0.2	V _{dc}
Output Voltage (off) (V _{CC} = 5.0 V, V _B = 0.5 V, R _L = 1.0 kΩ)	V _{OH}	4.9	–	–	V _{dc}
Input Resistor	R ₁	15.4	22	28.6	kΩ
EMC2DXV5T1		7.0	10	13	
EMC3DXV5T1		33	47	61	
EMC4DXV5T1, EMC5DXV5T1					
Resistor Ratio	R ₁ /R ₂	0.8	1.0	1.2	
EMC2DXV5T1		0.8	1.0	1.2	
EMC3DXV5T1		0.8	1.0	1.2	
EMC4DXV5T1, EMC5DXV5T1					

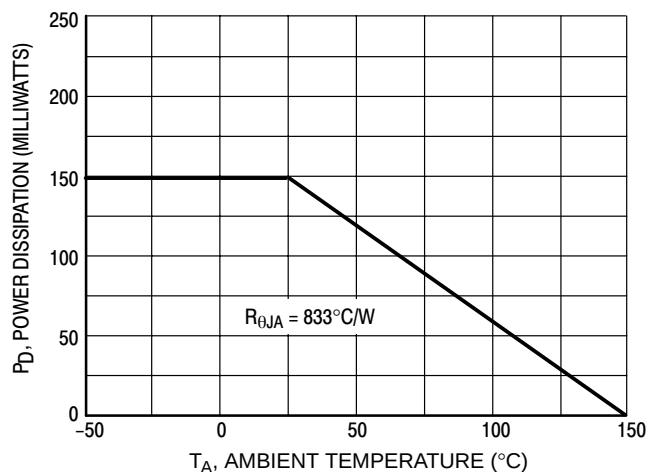


Figure 1. Derating Curve

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

TYPICAL ELECTRICAL CHARACTERISTICS – EMC2DXV5T1 PNP TRANSISTOR

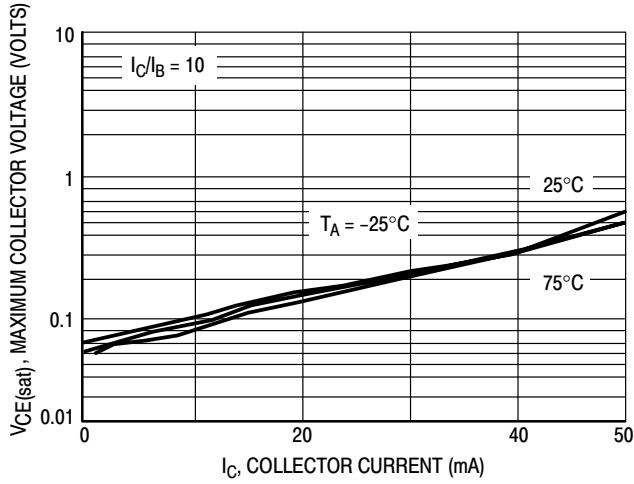


Figure 2. $V_{CE(sat)}$ versus I_C

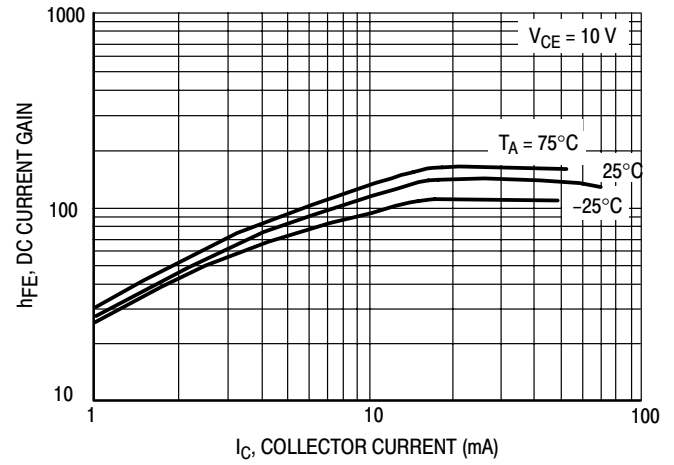


Figure 3. DC Current Gain

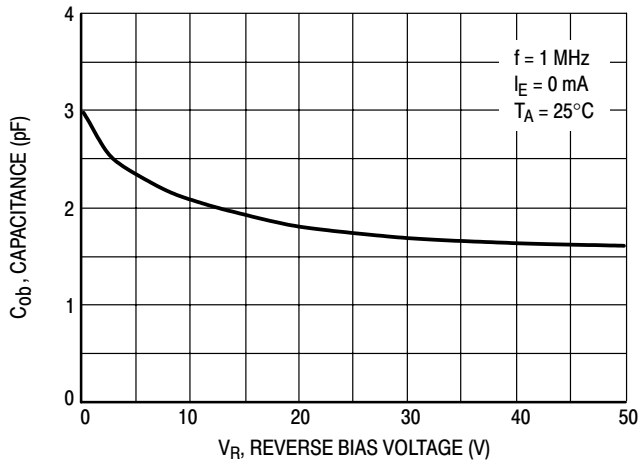


Figure 4. Output Capacitance

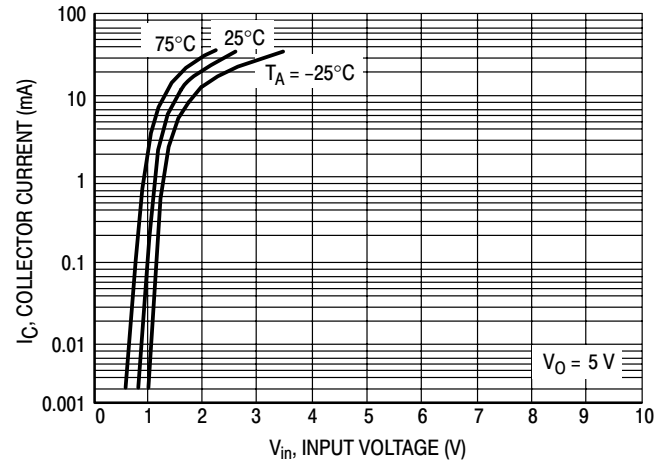


Figure 5. Output Current versus Input Voltage

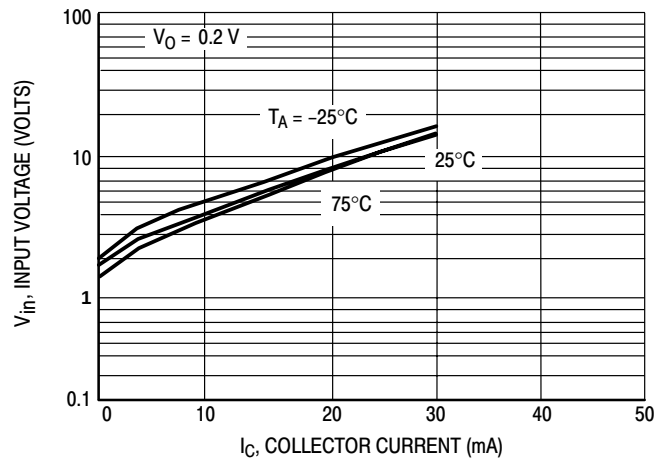


Figure 6. Input Voltage versus Output Current

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

TYPICAL ELECTRICAL CHARACTERISTICS – EMC2DXV5T1 NPN TRANSISTOR

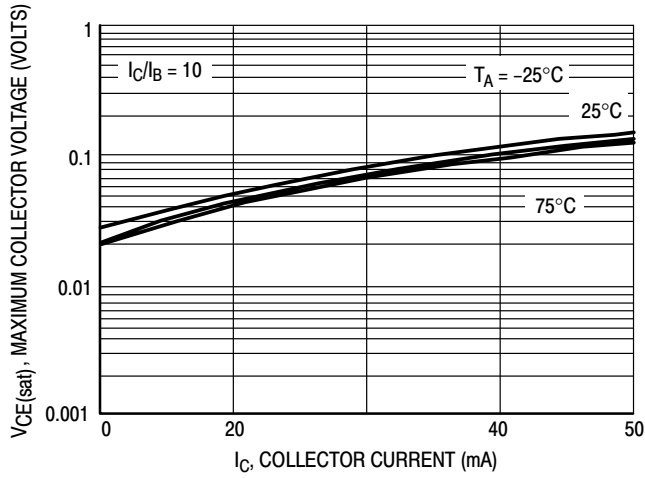


Figure 7. $V_{CE(sat)}$ versus I_C

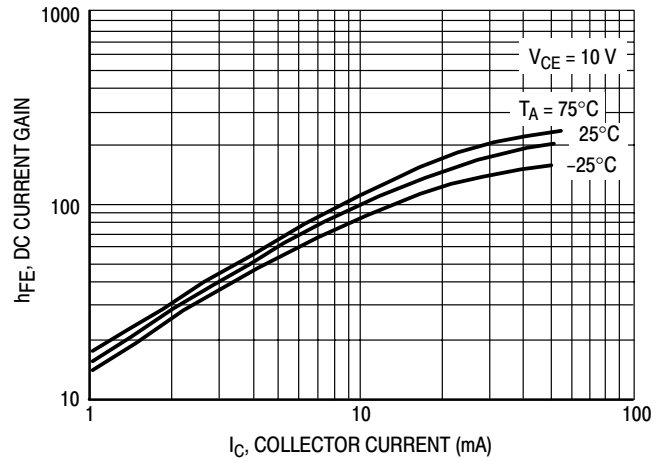


Figure 8. DC Current Gain

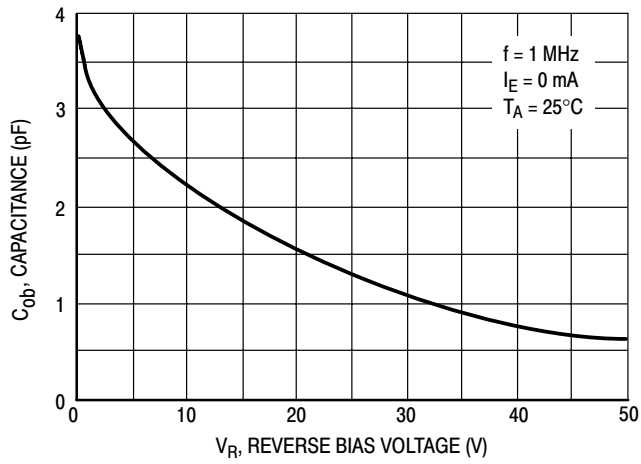


Figure 9. Output Capacitance

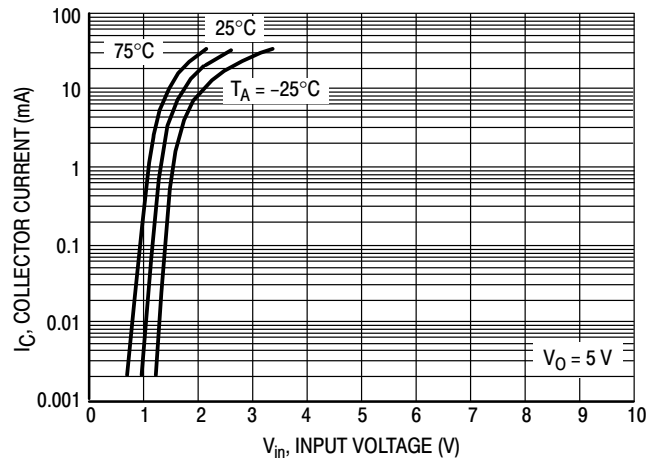


Figure 10. Output Current versus Input Voltage

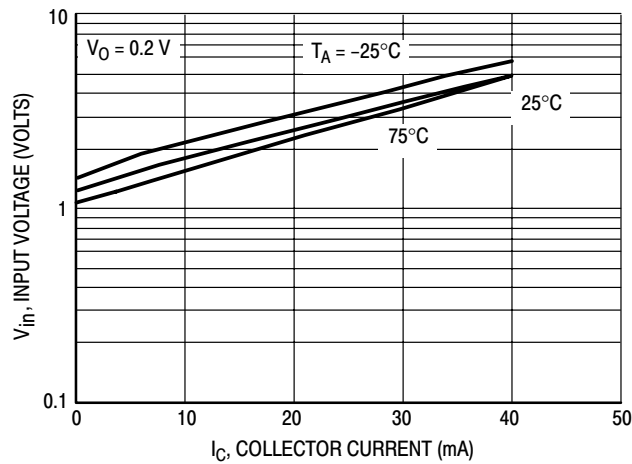


Figure 11. Input Voltage versus Output Current

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

TYPICAL ELECTRICAL CHARACTERISTICS – EMC3DXV5T1 PNP TRANSISTOR

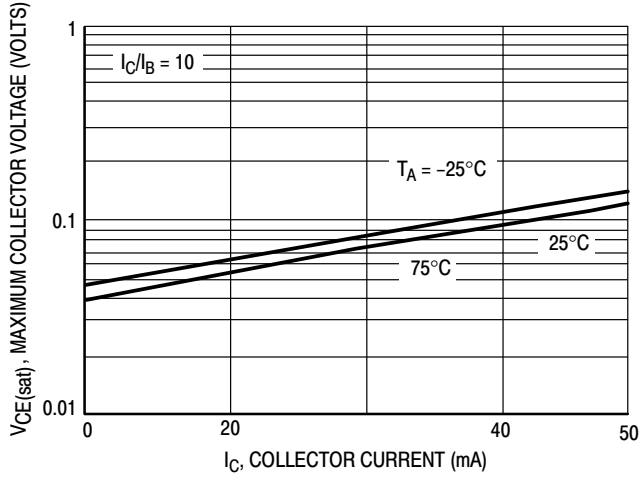


Figure 12. $V_{CE(sat)}$ versus I_C

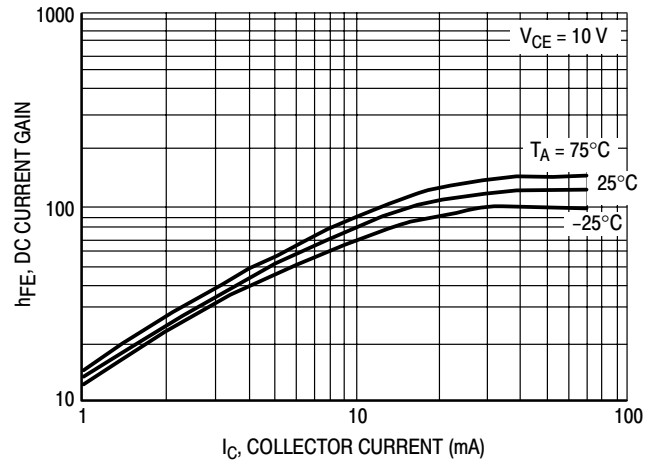


Figure 13. DC Current Gain

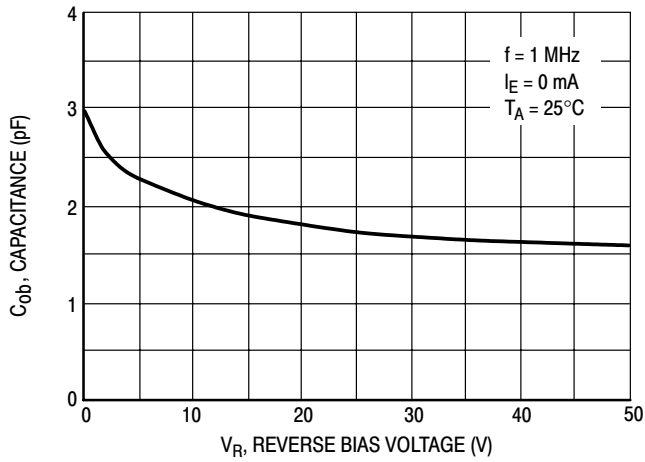


Figure 14. Output Capacitance

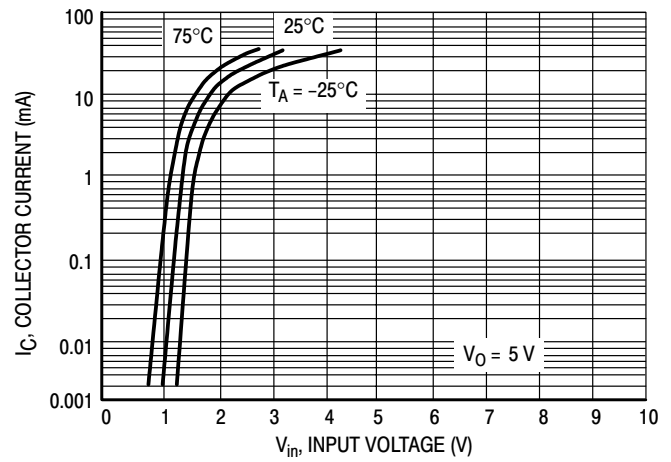


Figure 15. Output Current versus Input Voltage

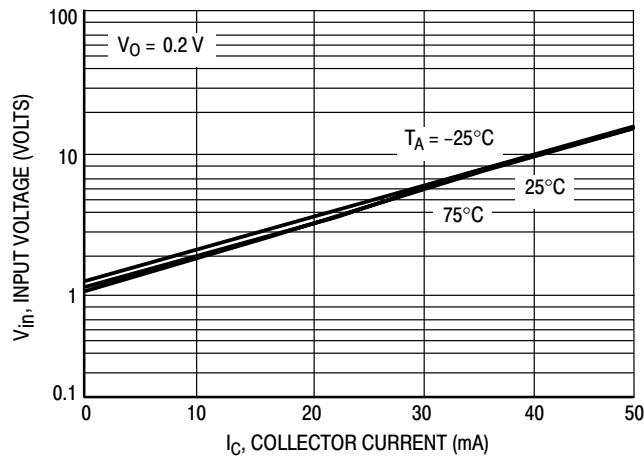


Figure 16. Input Voltage versus Output Current

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

TYPICAL ELECTRICAL CHARACTERISTICS – EMC3DXV5T1 NPN TRANSISTOR

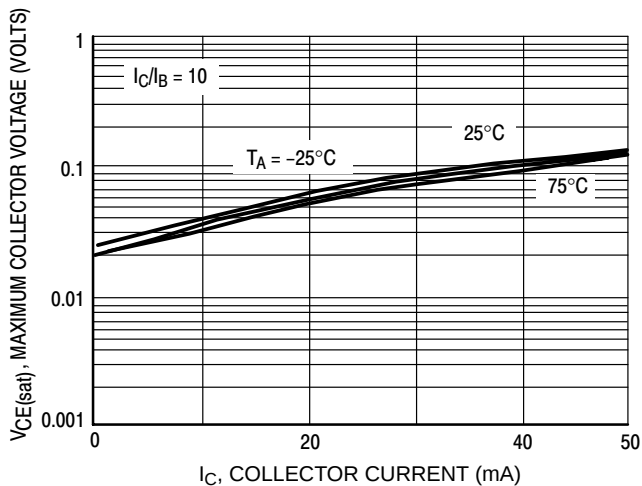


Figure 17. $V_{CE(sat)}$ versus I_C

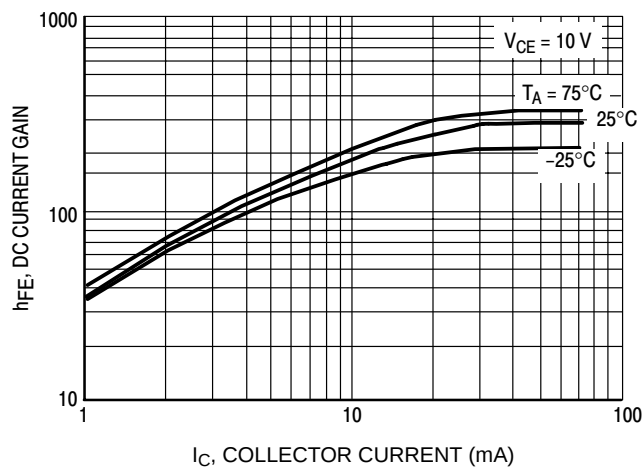


Figure 18. DC Current Gain

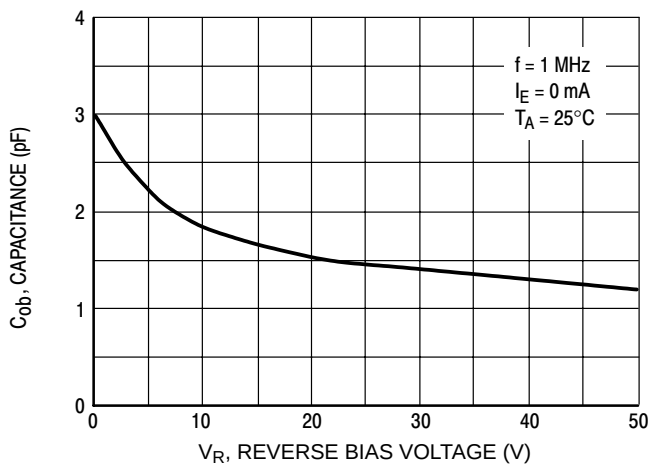


Figure 19. Output Capacitance

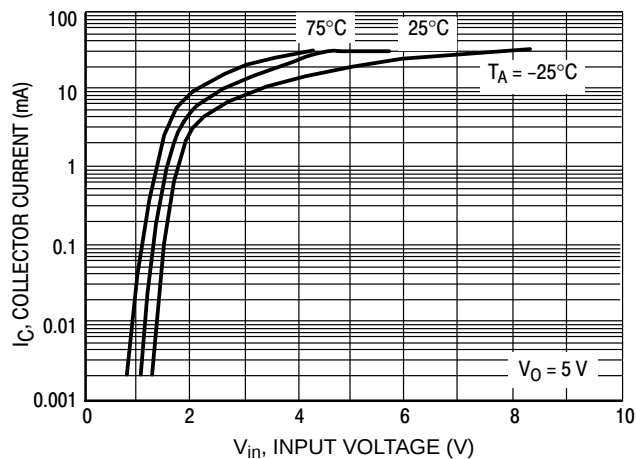


Figure 20. Output Current versus Input Voltage

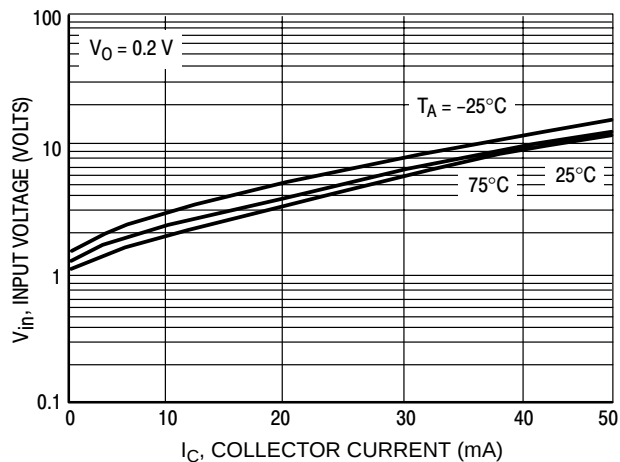


Figure 21. Input Voltage versus Output Current

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

TYPICAL ELECTRICAL CHARACTERISTICS –EMC4DXV5T1 PNP TRANSISTOR

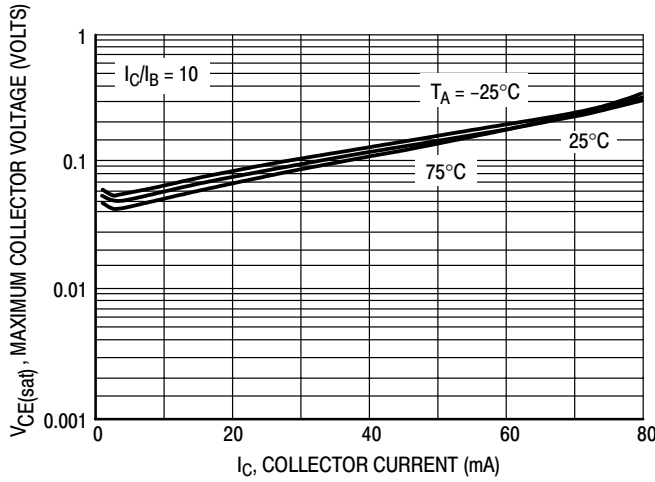


Figure 22. $V_{CE(sat)}$ versus I_C

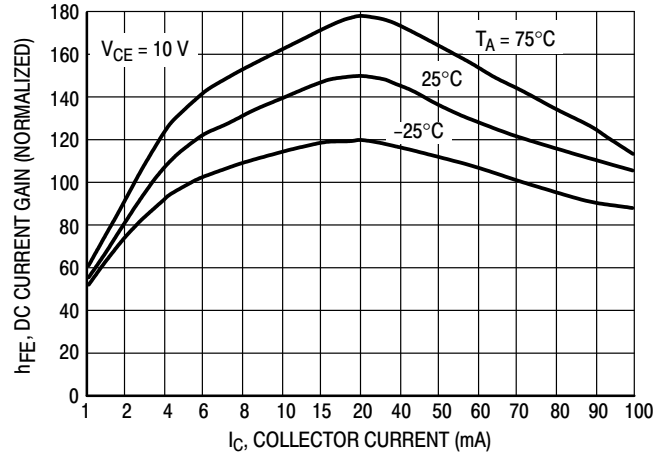


Figure 23. DC Current Gain

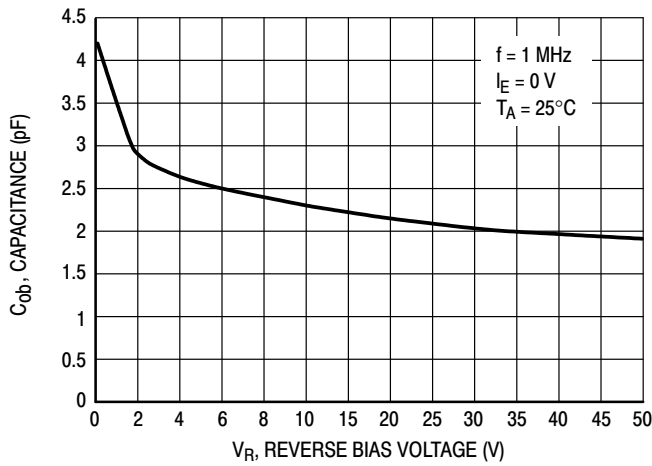


Figure 24. Output Capacitance

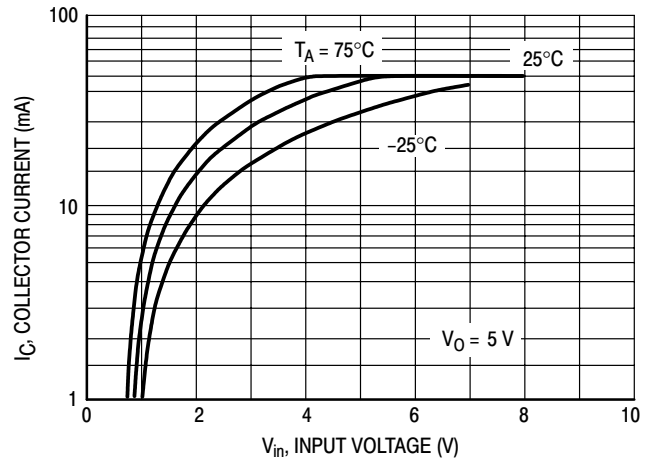


Figure 25. Output Current versus Input Voltage

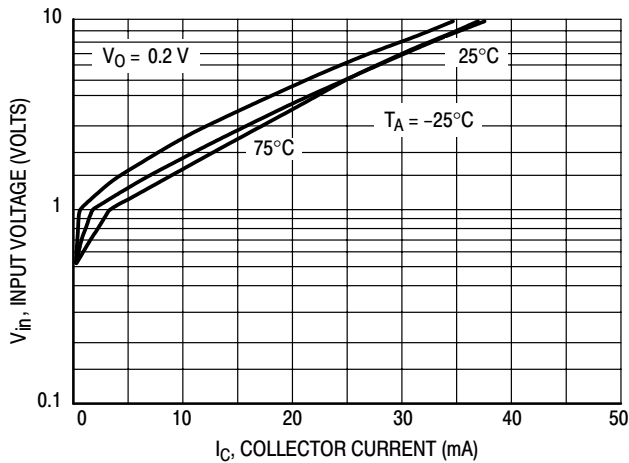


Figure 26. Input Voltage versus Output Current

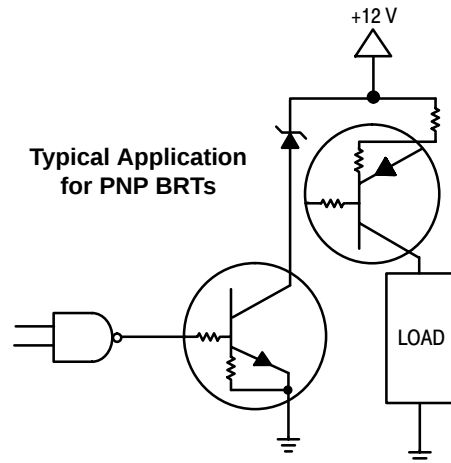


Figure 27. Inexpensive, Unregulated Current Source

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

TYPICAL ELECTRICAL CHARACTERISTICS – EMC5DXV5T1 PNP TRANSISTOR

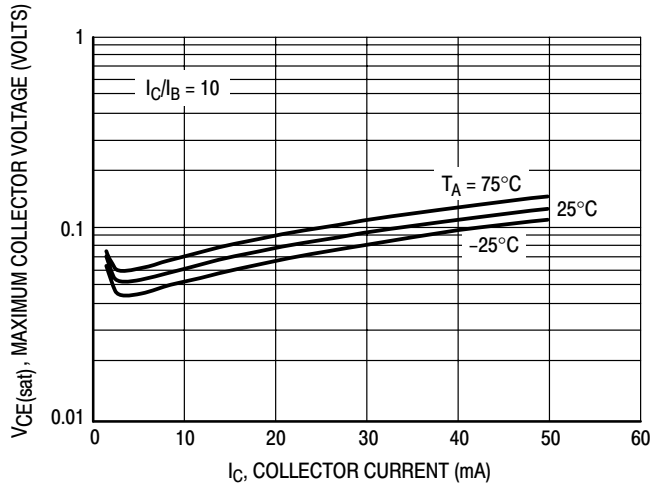


Figure 28. $V_{CE(sat)}$ versus I_C

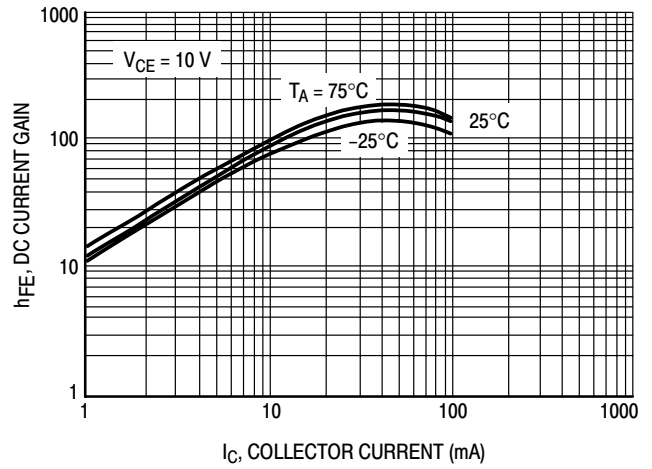


Figure 29. DC Current Gain

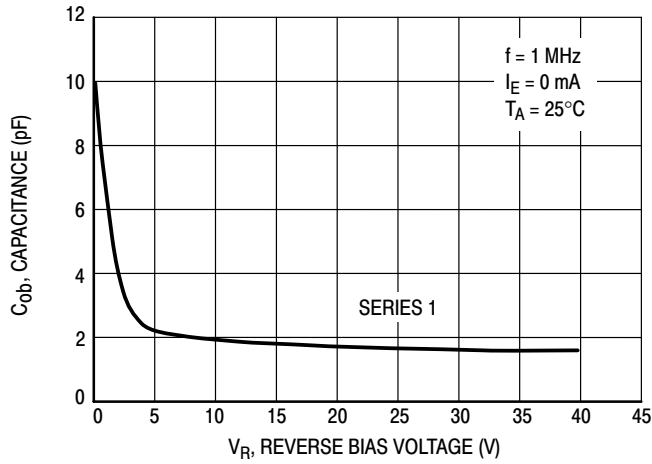


Figure 30. Output Capacitance

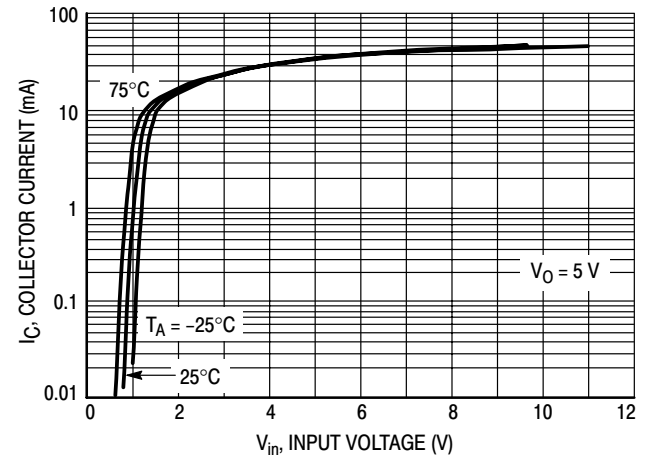


Figure 31. Output Current versus Input Voltage

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

TYPICAL ELECTRICAL CHARACTERISTICS – EMC4DXV5T1, EMC5DXV5T1 NPN TRANSISTOR

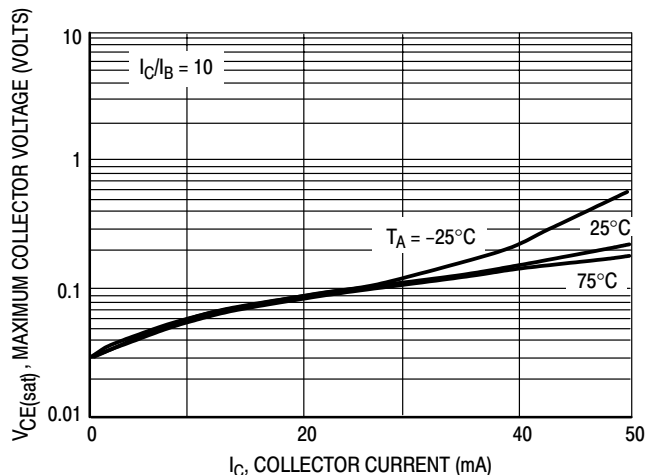


Figure 32. $V_{CE(sat)}$ versus I_C

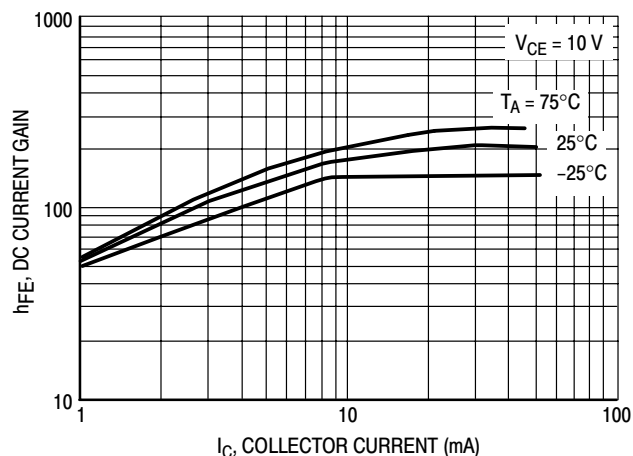


Figure 33. DC Current Gain

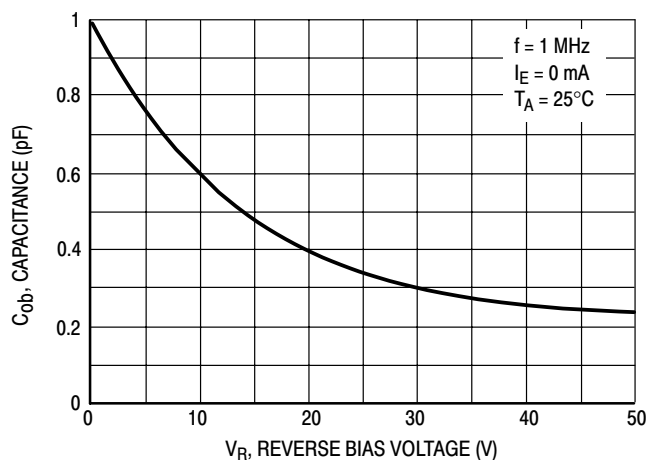


Figure 34. Output Capacitance

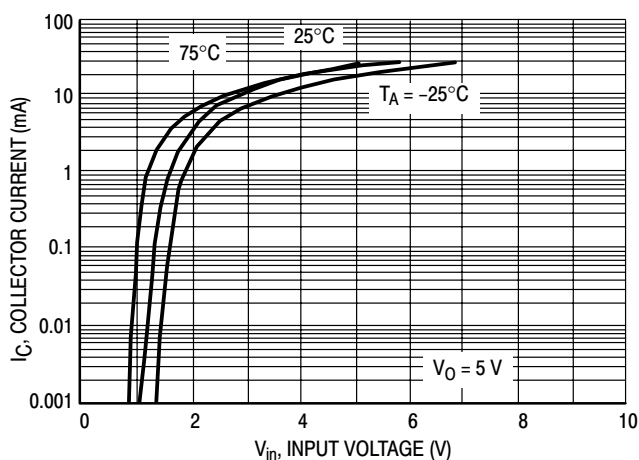


Figure 35. Output Current versus Input Voltage

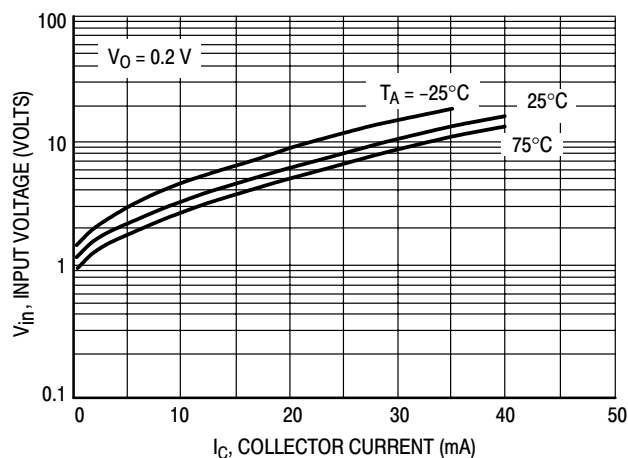
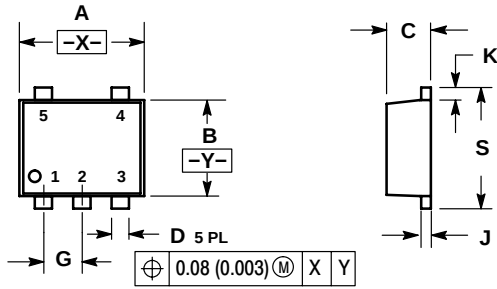


Figure 36. Input Voltage versus Output Current

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

PACKAGE DIMENSIONS

SOT-553
XV5 SUFFIX
CASE 463B-01
ISSUE A

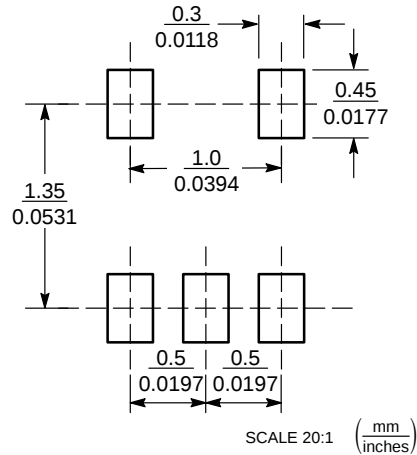


NOTES:

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

SOLDERING FOOTPRINT*



SCALE 20:1 (mm/inches)

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

EMC2DXV5T1, EMC3DXV5T1, EMC4DXV5T1, EMC5DXV5T1

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC 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. "Typical" parameters which may be provided in SCILLC 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. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC 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 SCILLC was negligent regarding the design or manufacture of the part. SCILLC 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:

Literature Distribution Center for ON Semiconductor
P.O. Box 61312, Phoenix, Arizona 85082-1312 USA
Phone: 480-829-7710 or 800-344-3860 Toll Free USA/Canada
Fax: 480-829-7709 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada

Japan: ON Semiconductor, Japan Customer Focus Center
2-9-1 Kamimeguro, Meguro-ku, Tokyo, Japan 153-0051
Phone: 81-3-5773-3850

ON Semiconductor Website: <http://onsemi.com>

Order Literature: <http://www.onsemi.com/litorder>

For additional information, please contact your
local Sales Representative.