

# DTC114EXV3T1 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 SC-89 package which is designed for low power surface mount applications.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7 inch/3000 Unit Tape & Reel
- Lead-Free Solder Plating (Pure Sn)

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

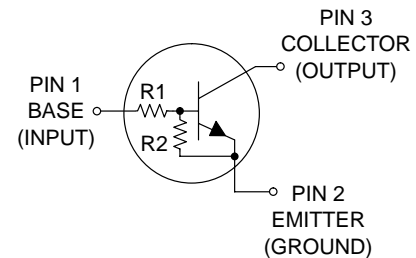
Rating	Symbol	Value	Unit
Collector-Base Voltage	$V_{CB0}$	50	Vdc
Collector-Emitter Voltage	$V_{CEO}$	50	Vdc
Collector Current	$I_C$	100	mAdc



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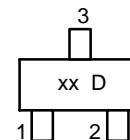
<http://onsemi.com>

### NPN SILICON DIGITAL TRANSISTORS



SC-89  
CASE 463C  
STYLE 1

#### MARKING DIAGRAM



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

## DTC114EXV3T1 Series

### DEVICE MARKING AND RESISTOR VALUES

Device	Marking	R1 (K)	R2 (K)	Shipping†
DTC114EXV3T1	8A	10	10	3000/Tape & Reel
DTC124EXV3T1	8B	22	22	
DTC144EXV3T1	8C	47	47	
DTC114YXV3T1	8D	10	47	
DTC114TXV3T1	94	10	∞	
DTC143TXV3T1	8F	4.7	∞	

†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.

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation, FR-4 Board (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	200 1.6	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient (Note 1)	$R_{\theta JA}$	600	$^\circ\text{C}/\text{W}$
Total Device Dissipation, FR-4 Board (Note 2) @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	400	$^\circ\text{C}/\text{W}$
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 × 1.0 Inch Pad.

## DTC114EXV3T1 Series

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
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 ( $V_{EB} = 6.0\text{ V}$ , $I_C = 0$ )	$I_{EBO}$	–	–	0.5	mAdc
	DTC114EXV3T1	–	–	0.2	
	DTC124EXV3T1	–	–	0.1	
	DTC144EXV3T1	–	–	0.2	
	DTC114YXV3T1	–	–	0.9	
	DTC114TXV3T1	–	–	1.9	
Collector–Base Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ , $I_E = 0$ )	$V_{(BR)CBO}$	50	–	–	Vdc
Collector–Emitter Breakdown Voltage (Note 3) ( $I_C = 2.0\text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	50	–	–	Vdc
<b>ON CHARACTERISTICS (Note 3)</b>					
DC Current Gain ( $V_{CE} = 10\text{ V}$ , $I_C = 5.0\text{ mA}$ )	$h_{FE}$	35	60	–	
	DTC114EXV3T1	60	100	–	
	DTC124EXV3T1	80	140	–	
	DTC144EXV3T1	80	140	–	
	DTC114YXV3T1	160	350	–	
	DTC114TXV3T1	160	350	–	
Collector–Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.3\text{ mA}$ ) ( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ )	$V_{CE(sat)}$	–	–	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
	DTC114EXV3T1	–	–	0.2	
	DTC124EXV3T1	–	–	0.2	
	DTC114YXV3T1	–	–	0.2	
	DTC114TXV3T1	–	–	0.2	
	DTC143TXV3T1	–	–	0.2	
	DTC144EXV3T1	–	–	0.2	
Output Voltage (off) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.25\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	$V_{OH}$	4.9	–	–	Vdc
	DTC143TXV3T1				
	DTC114TXV3T1				
Input Resistor	$R_1$	7.0	10	13	k $\Omega$
	DTC114EXV3T1	15.4	22	28.6	
	DTC124EXV3T1	32.9	47	61.1	
	DTC144EXV3T1	7.0	10	13	
	DTC114YXV3T1	7.0	10	13	
	DTC114TXV3T1	3.3	4.7	6.1	
Resistor Ratio	$R_1/R_2$	0.8	1.0	1.2	
	DTC114EXV3T1/DTC124EXV3T1/ DTC144EXV3T1	0.17	0.21	0.25	
	DTC114YXV3T1	–	–	–	
	DTC143TXV3T1/DTC114TXV3T1	–	–	–	

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

# DTC114EXV3T1 Series

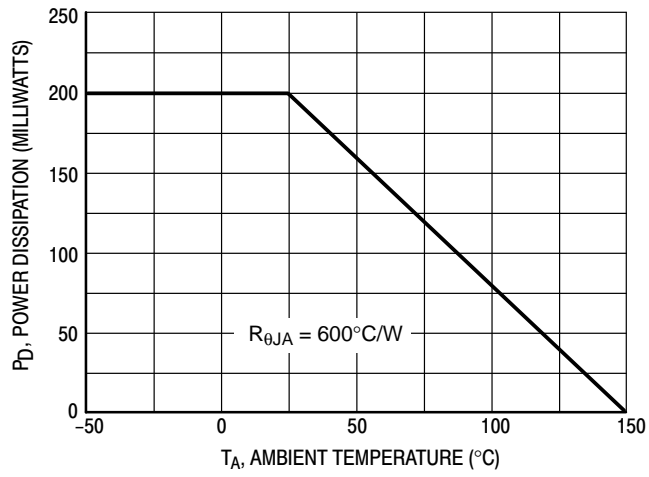


Figure 1. Derating Curve

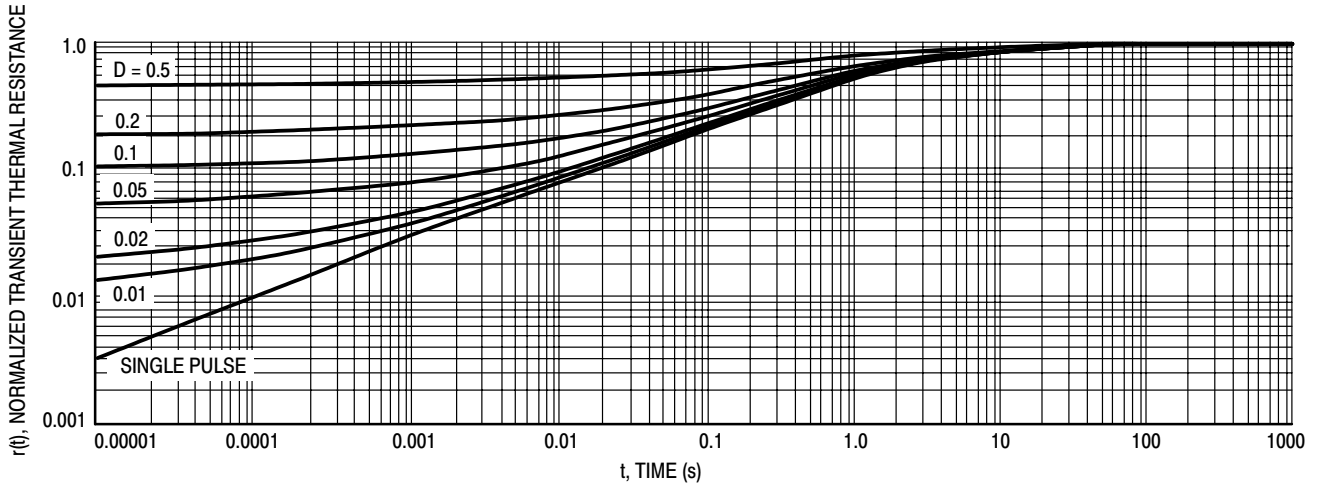


Figure 2. Normalized Thermal Response

# DTC114EXV3T1 Series

## TYPICAL ELECTRICAL CHARACTERISTICS – DTC114EXV3T1

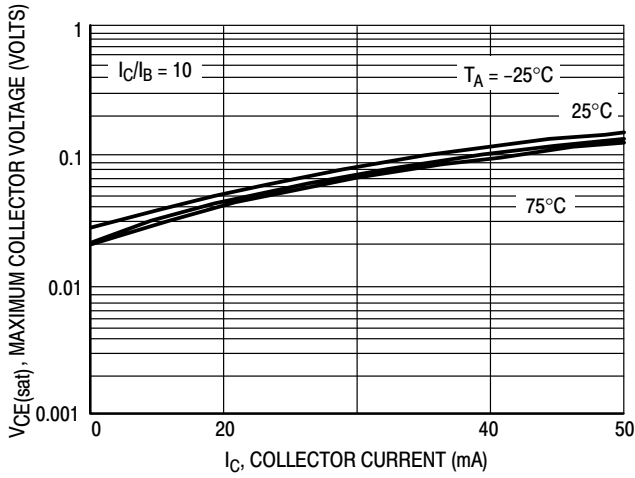


Figure 3.  $V_{CE(sat)}$  versus  $I_C$

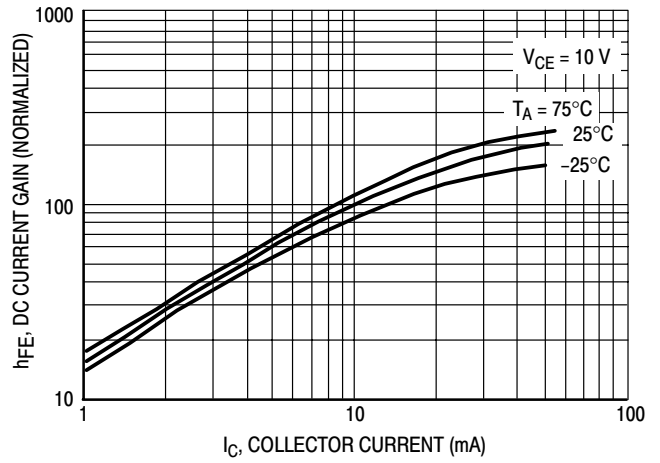


Figure 4. DC Current Gain

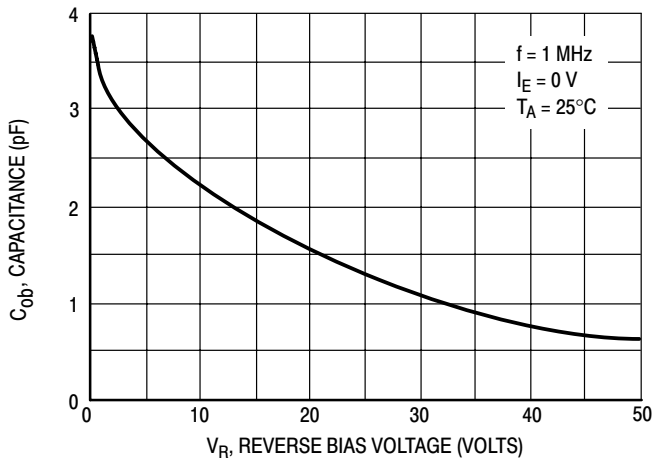


Figure 5. Output Capacitance

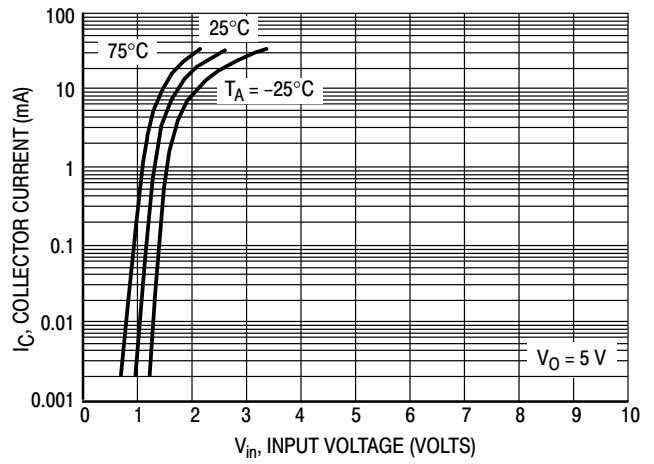


Figure 6. Output Current versus Input Voltage

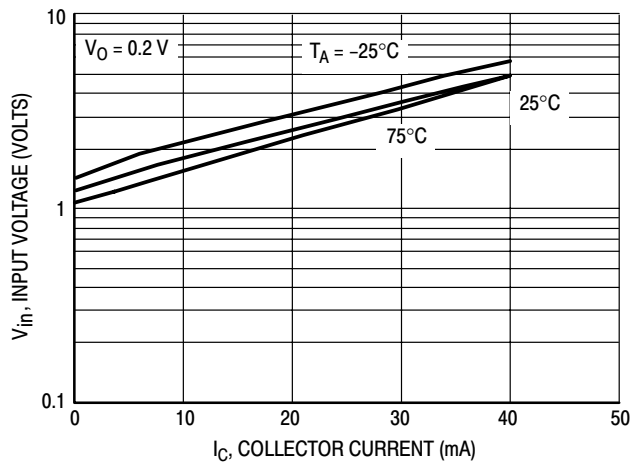


Figure 7. Input Voltage versus Output Current

# DTC114EXV3T1 Series

## TYPICAL ELECTRICAL CHARACTERISTICS – DTC124EXV3T1

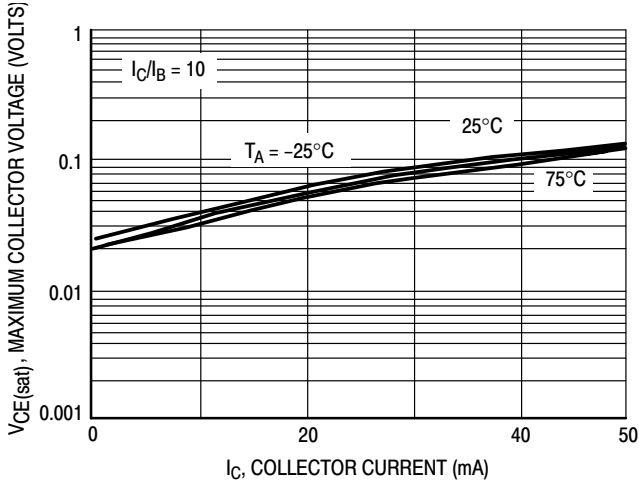


Figure 8.  $V_{CE(sat)}$  versus  $I_C$

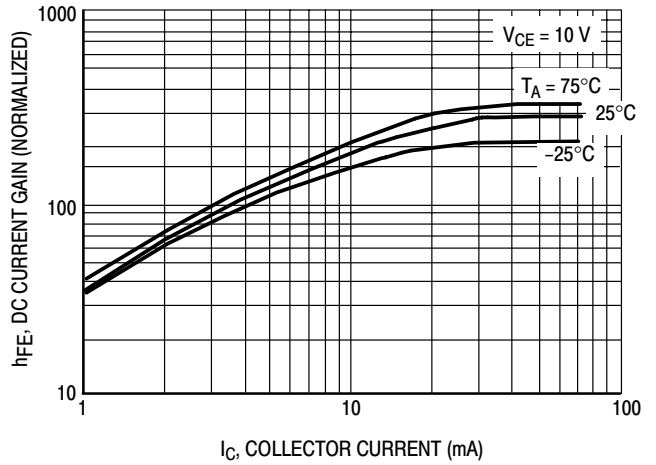


Figure 9. DC Current Gain

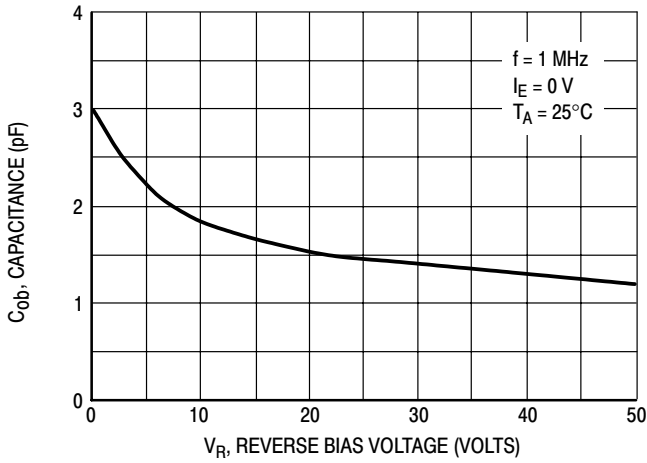


Figure 10. Output Capacitance

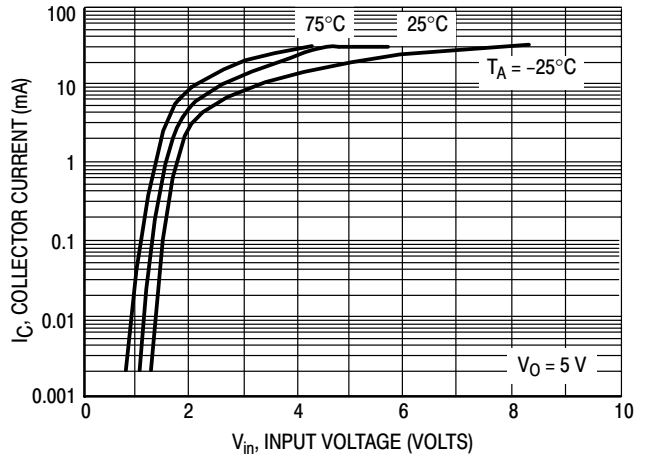


Figure 11. Output Current versus Input Voltage

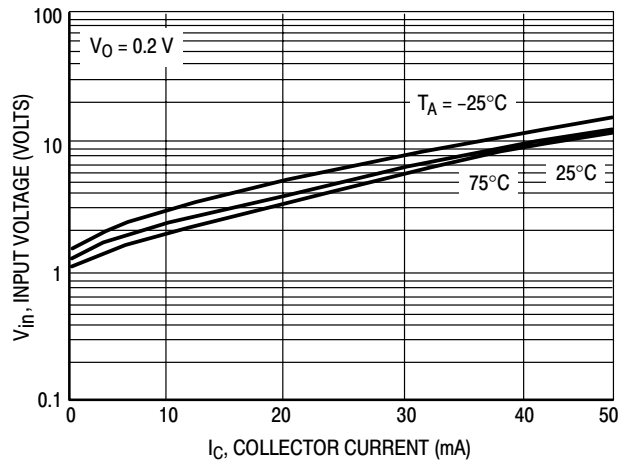


Figure 12. Input Voltage versus Output Current

# DTC114EXV3T1 Series

## TYPICAL ELECTRICAL CHARACTERISTICS – DTC144EXV3T1

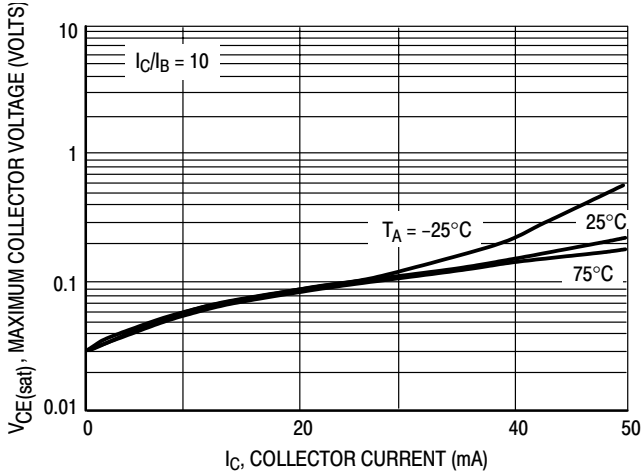


Figure 13.  $V_{CE(sat)}$  versus  $I_C$

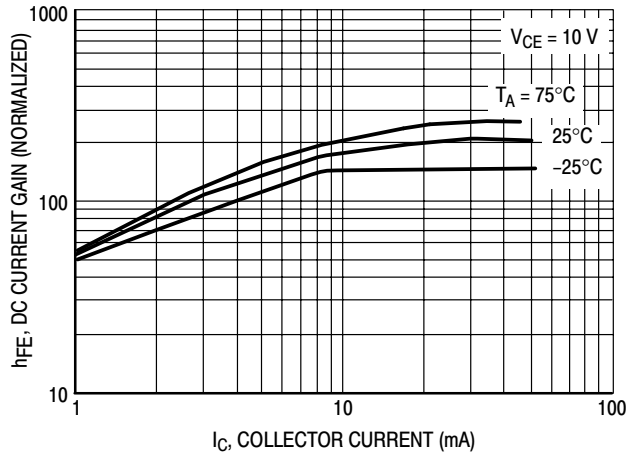


Figure 14. DC Current Gain

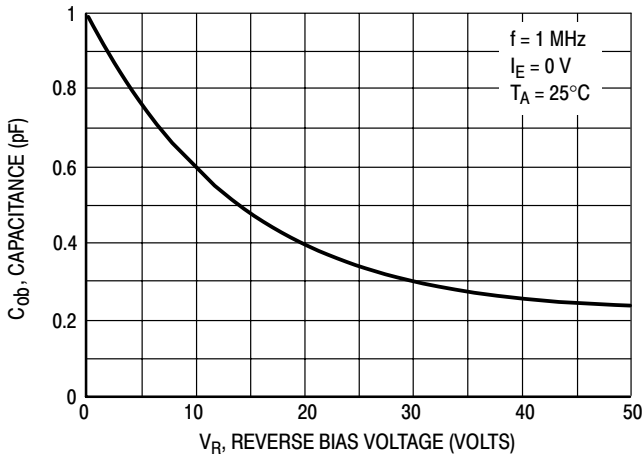


Figure 15. Output Capacitance

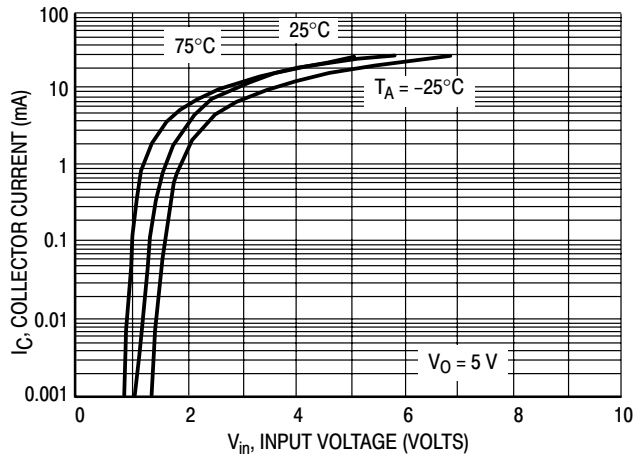


Figure 16. Output Current versus Input Voltage

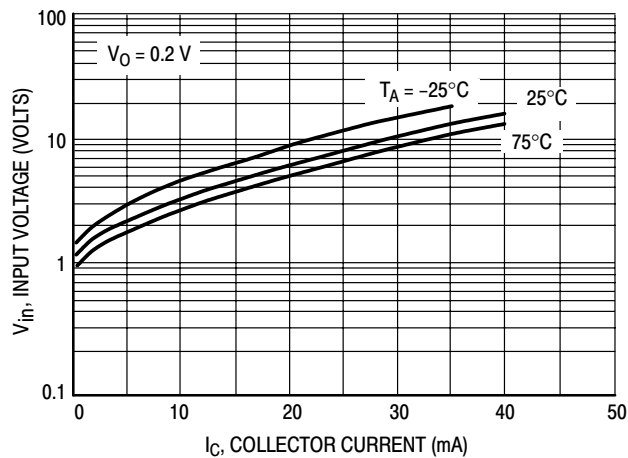


Figure 17. Input Voltage versus Output Current

# DTC114EXV3T1 Series

## TYPICAL ELECTRICAL CHARACTERISTICS – DTC114YXV3T1

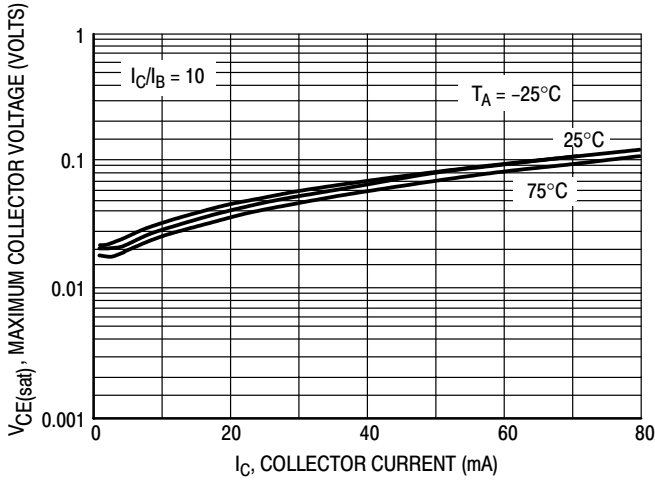


Figure 18.  $V_{CE(sat)}$  versus  $I_C$

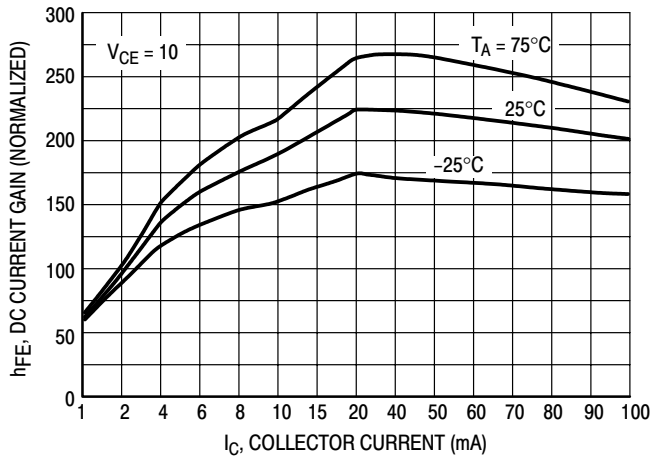


Figure 19. DC Current Gain

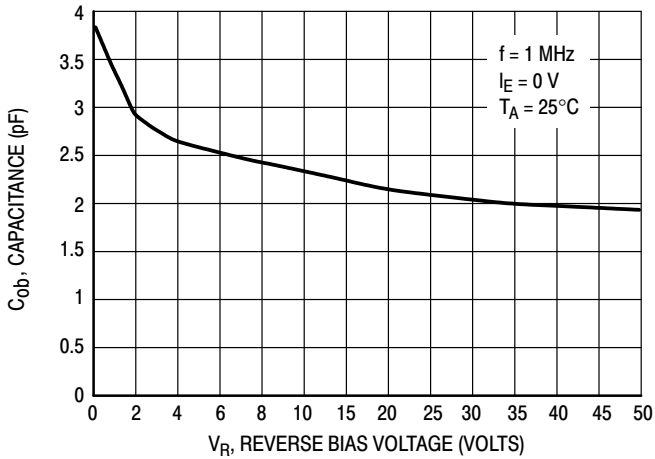


Figure 20. Output Capacitance

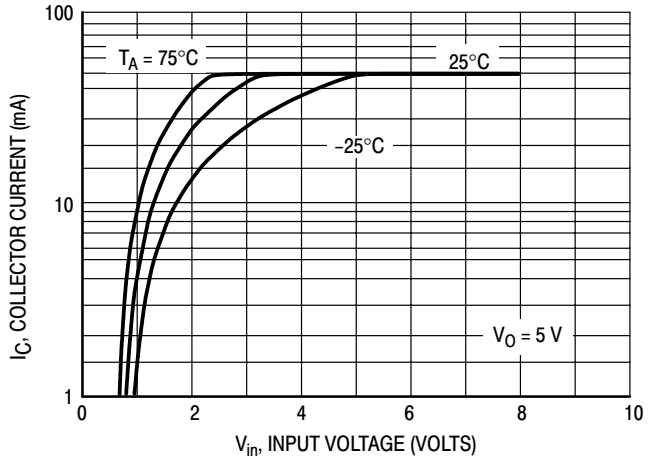


Figure 21. Output Current versus Input Voltage

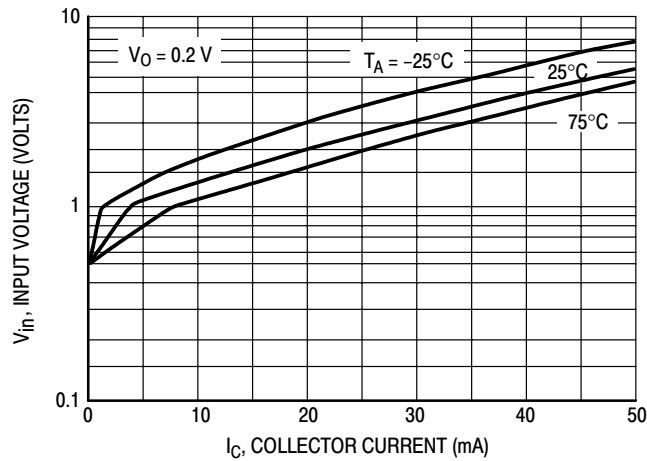


Figure 22. Input Voltage versus Output Current



# DTC114EXV3T1 Series

## TYPICAL APPLICATIONS FOR NPN BRTs

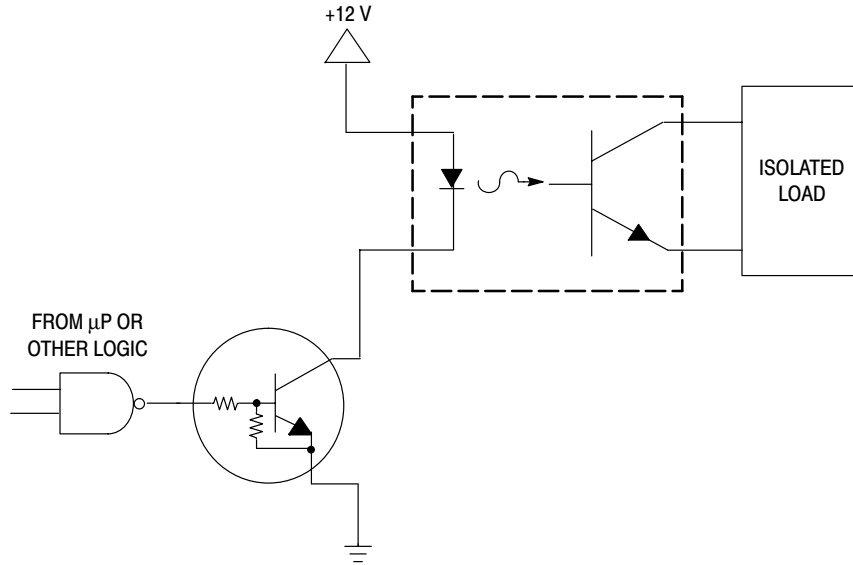


Figure 23. Level Shifter: Connects 12 or 24 Volt Circuits to Logic

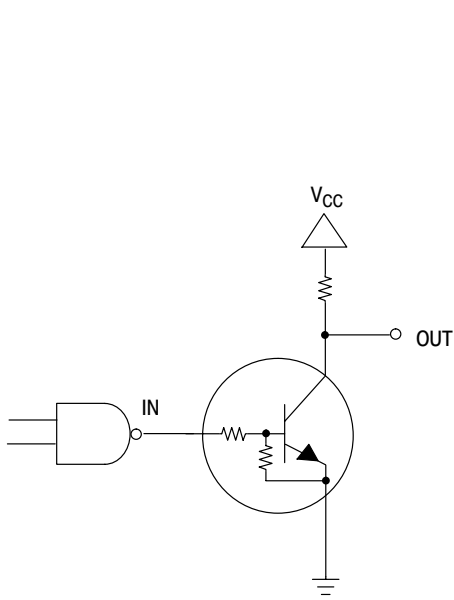


Figure 24. Open Collector Inverter:  
Inverts the Input Signal

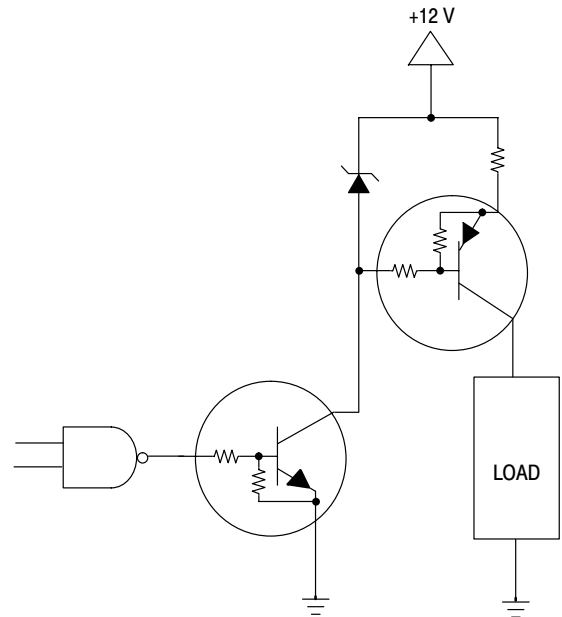
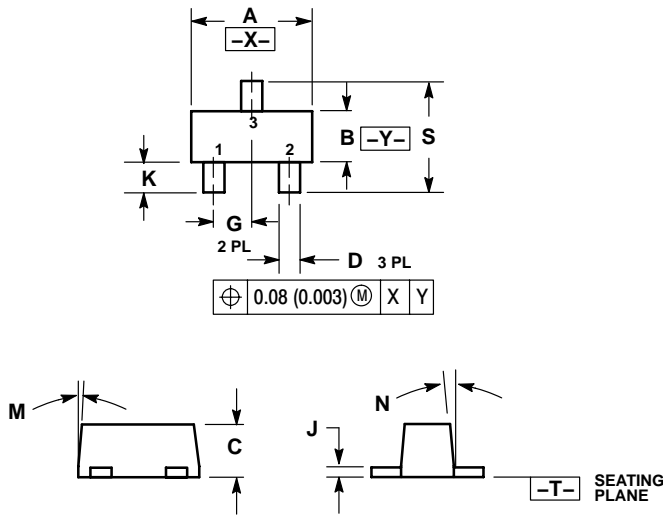


Figure 25. Inexpensive, Unregulated Current Source

# DTC114EXV3T1 Series

## PACKAGE DIMENSIONS

SC-89  
CASE 463C-03  
ISSUE C



### 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.
4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	1.60	1.70	0.059	0.063	0.067
B	0.75	0.85	0.95	0.030	0.034	0.040
C	0.60	0.70	0.80	0.024	0.028	0.031
D	0.23	0.28	0.33	0.009	0.011	0.013
G	0.50 BSC			0.020 BSC		
H	0.53 REF			0.021 REF		
J	0.10	0.15	0.20	0.004	0.006	0.008
K	0.30	0.40	0.50	0.012	0.016	0.020
L	1.10 REF			0.043 REF		
M	---	---	10	---	---	10
N	---	---	10	---	---	10
S	1.50	1.60	1.70	0.059	0.063	0.067

### STYLE 1:

1. BASE
2. EMITTER
3. COLLECTOR

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