DESCRIPTION

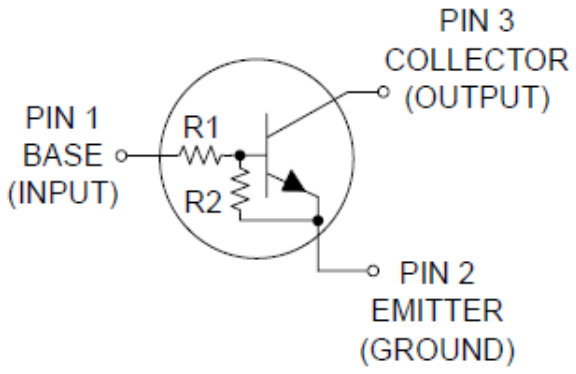
This new series of digital transistors is designed to replace a single device and its external resistor bias network. The Bias Resistor Transistor (BRT) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. The BRT 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 DTC114EE~WE is available in SC-89 package

FEATURES

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in SC-89 package

PIN DESCRIPTION



ORDERING INFORMATION

Package Type	Part Number
SC-89	DTC114EE
	DTC124EE
	DTC144EE
	DTC114YE
	DTC114TE
	DTC143TE
	DTC123EE
	DTC143EE
	DTC143ZE
	DTC124XE
	DTC123JE
	DTC115EE
	DTC144WE
Note	SPQ: 3,000pcs/Reel
AiT provides all RoHS Compliant Products	

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C, unless otherwise noted

V_{CBO}, Collector-Base Voltage	50Vdc
V_{CEO}, Collector-Emitter Voltage	50Vdc
I_C, Collector Current	100mAdc

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Total Device Dissipation,FR−4 Board NOTE1 @ T_A = 25°C Derate above 25°C	P_D	200 1.6	mW mW/°C
Thermal Resistance,Junction−to−Ambient NOTE1	$R_{\theta JA}$	600	°C/W
Total Device Dissipation, FR−4 Board NOTE2 @ T_A = 25°C Derate above 25°C	P_D	300 2.4	mW mW/°C
Thermal Resistance, Junction−to−Ambient NOTE2	$R_{\theta JA}$	400	°C/W
Junction and Storage Temperature Range	T_J, T_{STG}	−55 to +150	°C

NOTE1: FR−4 @ Minimum Pad
NOTE2: FR−4 @ 1.0 × 1.0 Inch Pad

ELECTRICAL CHARACTERISTICS

T_A = 25°C, unless otherwise noted

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS							
Collector−Base Cutoff Current	I_{CBO}	V_{CB} = 50 V, I_E = 0				100	nAdc
Collector−Emitter Cutoff Current	I_{CEO}	V_{CE} = 50 V, I_B = 0				500	nAdc
Emitter−Base Cutoff Current	I_{EBO}	V_{EB} = 6.0 V, I_C = 0	DTC114EE			0.5	mAdc
			DTC124EE			0.2	
			DTC144EE			0.1	
			DTC114YE			0.2	
			DTC114TE			0.9	
			DTC143TE			1.9	
			DTC123EE			2.3	
			DTC143EE			1.5	
			DTC143ZE			0.18	
			DTC124XE			0.13	
			DTC123JE			0.2	
			DTC115EE			0.05	
			DTC144WE			0.13	
Collector−Base Breakdown Voltage	$V_{(BR)CBO}$	I_C = 10μA, I_E = 0		50			Vdc
Collector−Emitter Breakdown Voltage NOTE3	$V_{(BR)CEO}$	I_C = 2.0mA, I_B = 0		50			Vdc
ON CHARACTERISTICS NOTE3							
DC Current Gain	h_{FE}	V_{CE}=10V, I_C=5.0mA	DTC114EE	35	60		
			DTC124EE	60	100		
			DTC144EE	80	140		
			DTC114YE	80	140		
			DTC114TE	160	350		
			DTC143TE	160	350		
			DTC123EE	8.0	15		
			DTC143EE	15	30		
			DTC143ZE	80	200		
			DTC124XE	80	150		
			DTC123JE	80	140		
			DTC115EE	80	150		
			DTC144WE	80	140		

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Collector−Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 10mA, I_B = 0.3mA				0.25	Vdc
		I_C = 10mA, I_B = 5mA	DTC123EE				
		I_C = 10mA, I_B = 1mA	DTC143TE DTC114TE DTC143EE DTC143ZE DTC124XE				
Output Voltage (on)	V_{OL}	V_{CC} = 5.0V, V_B = 2.5V, R_L = 1.0kΩ	DTC114EE DTC124EE DTC114YE DTC114TE DTC143TE DTC123EE DTC143EE DTC143ZE DTC124XE DTC123JE			0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	Vdc
		V_{CC} = 5.0V, V_B = 3.5V, R_L = 1.0kΩ	DTC144EE			0.2	
		V_{CC} = 5.0V, V_B = 5.5V, R_L = 1.0kΩ	DTC115EE			0.2	
		V_{CC} = 5.0V, V_B = 4.0V, R_L = 1.0kΩ	DTC144WE			0.2	
Output Voltage (off)	V_{OH}	V_{CC} = 5.0V, V_B = 0.5V, R_L = 1.0kΩ		4.9			Vdc
		V_{CC} = 5.0V, V_B = 0.25V, R_L = 1.0kΩ	DTC143TE DTC143ZE DTC114TE DTC115EE				

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Resistor	R1	DTC114EE	7.0	10	13	kΩ
		DTC124EE	15.4	22	28.6	
		DTC144EE	32.9	47	61.1	
		DTC114YE	7.0	10	13	
		DTC114TE	7.0	10	13	
		DTC143TE	3.3	4.7	6.1	
		DTC123EE	1.5	2.2	2.9	
		DTC143EE	3.3	4.7	6.1	
		DTC143ZE	3.3	4.7	6.1	
		DTC124XE	15.4	22	28.6	
		DTC123JE	1.54	2.2	2.86	
		DTC115EE	70	100	130	
		DTC144WE	32.9	47	61.1	
Resistor Ratio	R1/R2	DTC114EE/DTC124EE/ DTC144EE/DTC115EE	0.8	1.0	1.2	
		DTC114YE	0.17	0.21	0.25	
		DTC143TE/DTC114TE	–	–	–	
		DTC123EE/DTC143EE	0.8	1.0	1.2	
		DTC143ZE	0.055	0.1	0.185	
		DTC124XE	0.38	0.47	0.56	
		DTC123JE	0.038	0.047	0.056	
		DTC144WE	1.7	2.1	2.6	

NOTE3: Pulse Test: Pulse Width < 300 us, Duty Cycle < 2.0%

RESISTOR VALUES

Device	R1 (k)	R2 (k)
DTC114EE	10	10
DTC124EE	22	22
DTC144EE	47	47
DTC114YE	10	47
DTC114TE	10	∞
DTC143TE	4.7	∞
DTC123EE	2.2	2.2
DTC143EE	4.7	4.7
DTC143ZE	4.7	47
DTC124XE	22	47
DTC123JE	2.2	47
DTC115EE	100	100
DTC144WE	47	22

TYPICAL CHARACTERISTICS

DTC114EE

Figure 1. $V_{CE(sat)}$ vs. IC

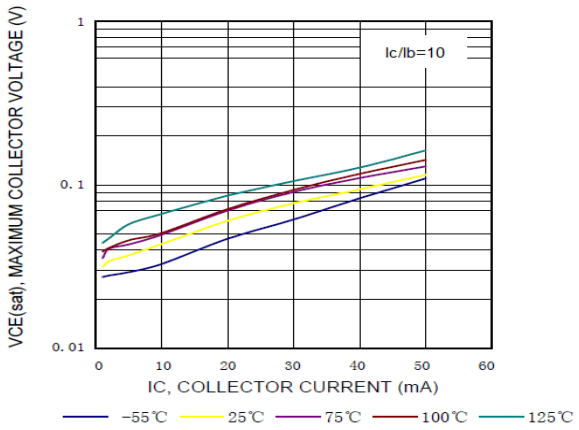


Figure 2. DC Current Gain

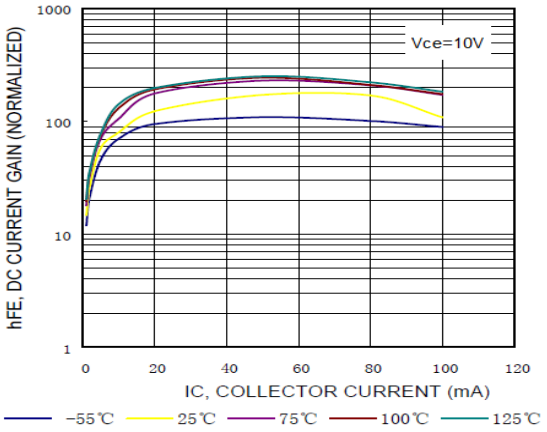


Figure 3. Output Capacitance

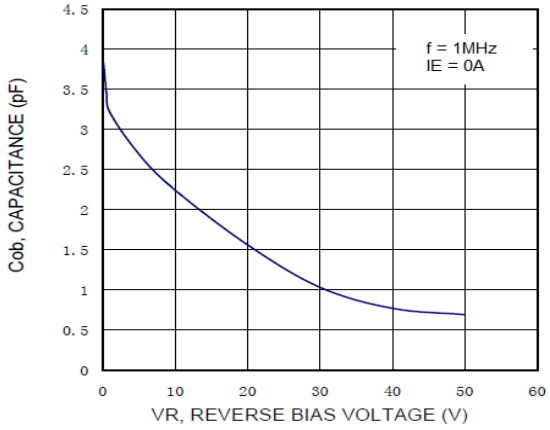


Figure 4. Output Current vs. Input Voltage

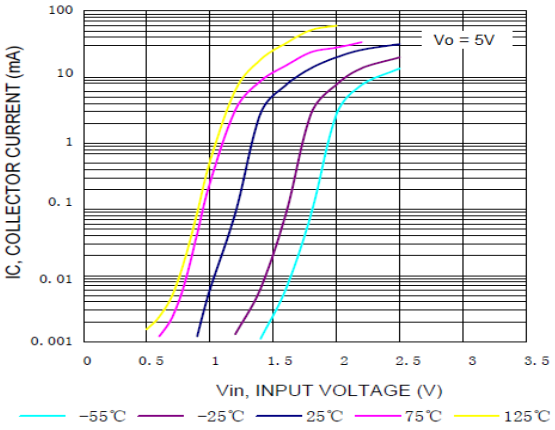
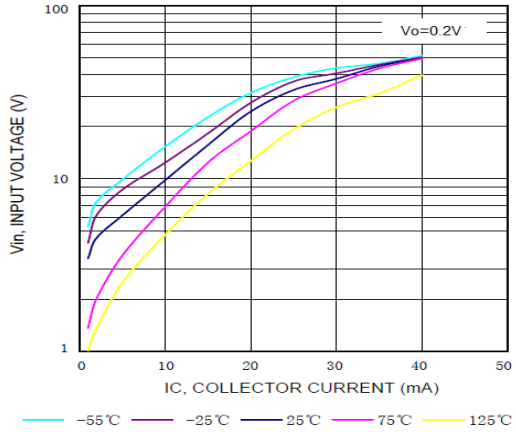


Figure 5. Input Voltage vs. Output Current



DTC115EE

Figure 6. V_{CE}(sat) vs. IC

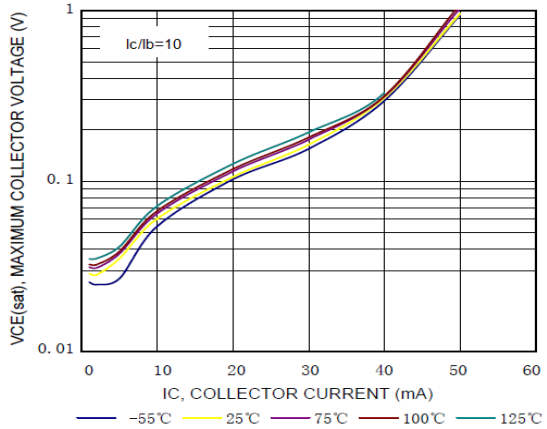


Figure 7. DC Current Gain

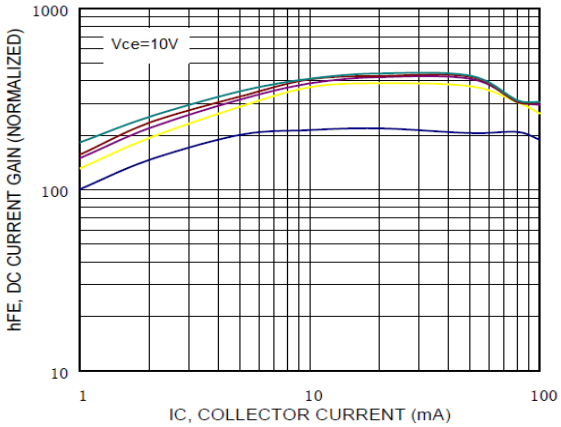


Figure 8. Output Capacitance

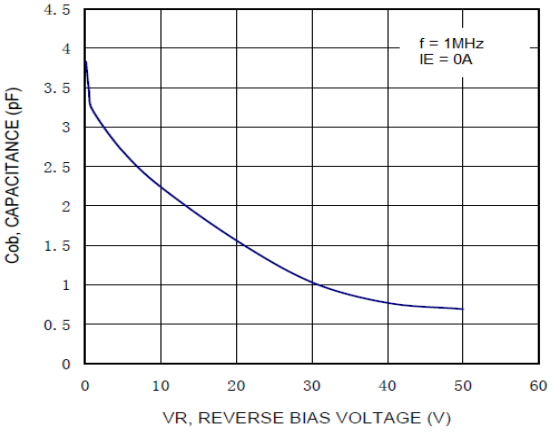


Figure 9. Output Current vs. Input Voltage

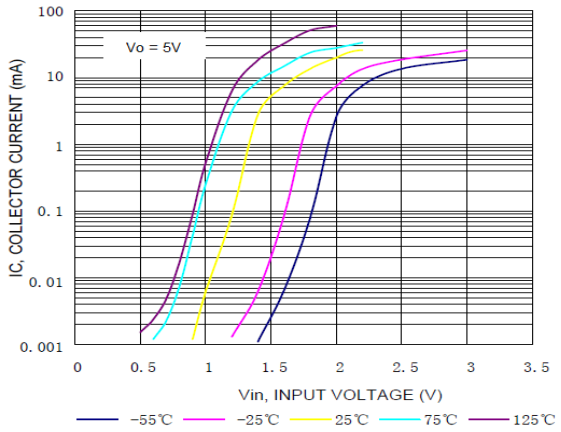
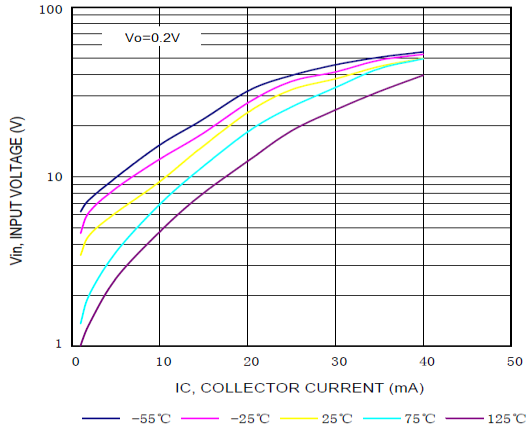


Figure 10. Input Voltage vs. Output Current



TYPICAL APPLICATIONS FOR NPN BRTs

Figure 11. Level Shifter: Connects 12 To 24 Volt Circuits To Logic

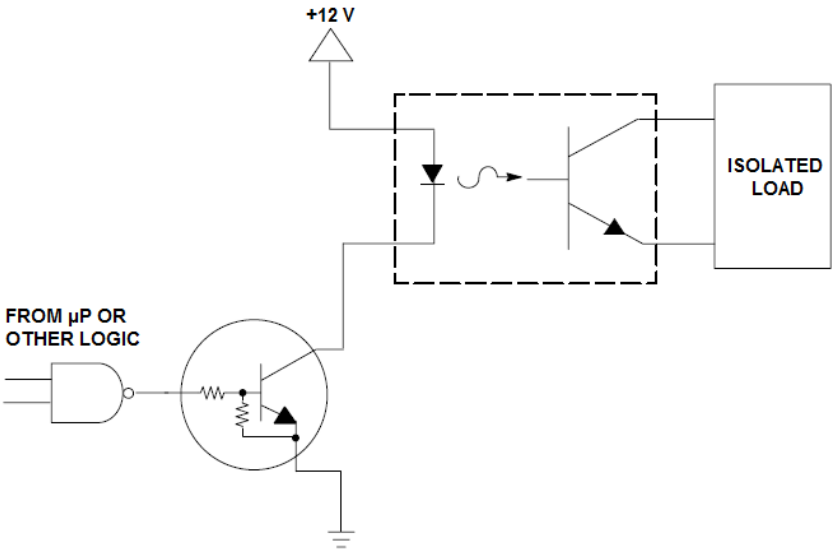


Figure12. Open Collector Inverter: Inverts The Input Signal

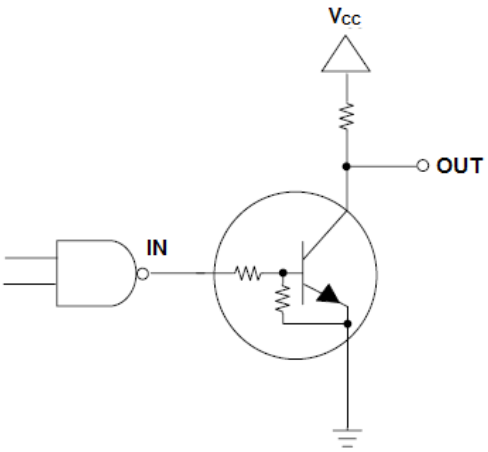
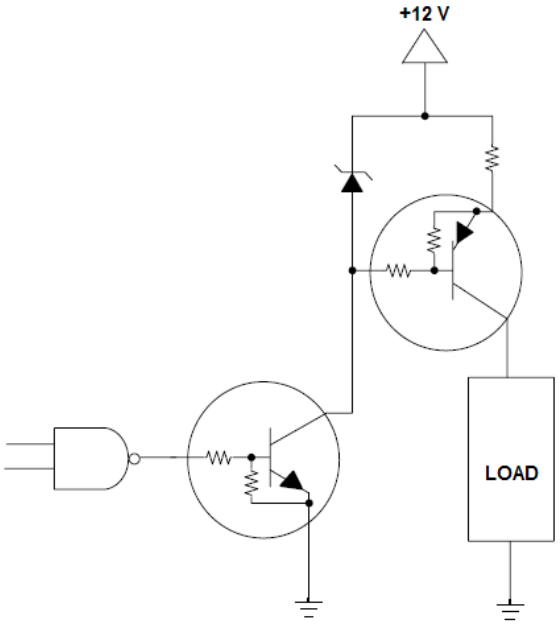
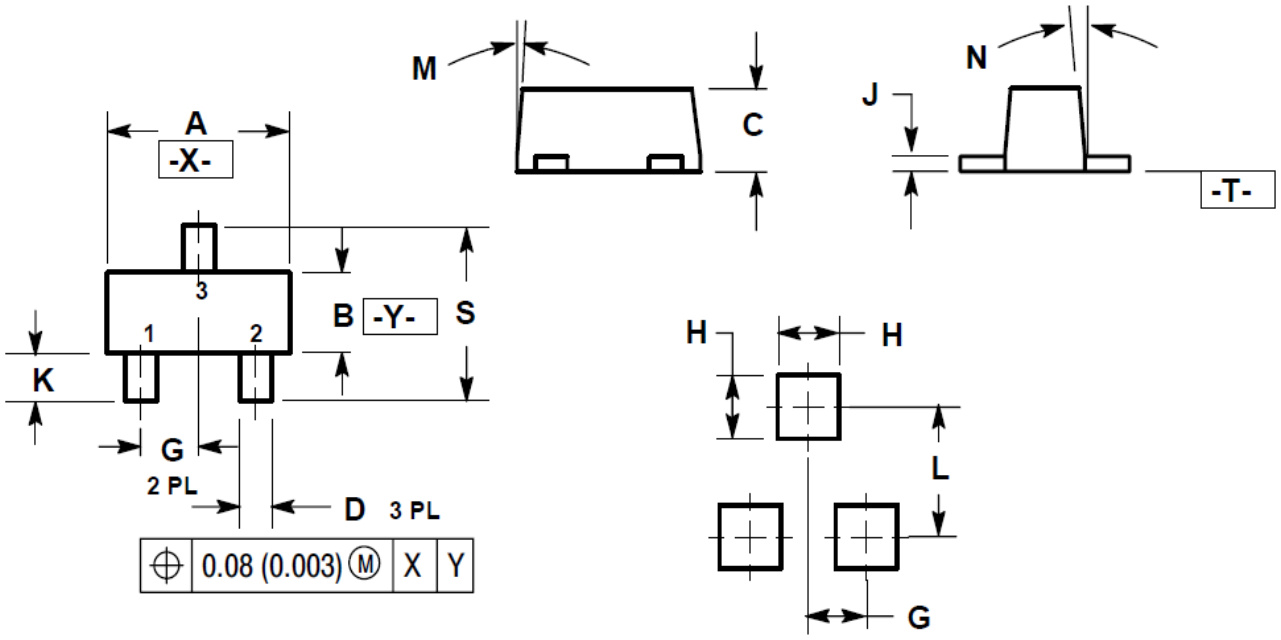


Figure 13. Inexpensive, Unregulated Current Source



PACKAGE INFORMATION

Dimension in SC-89 Package (Unit: mm)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.50	1.70	0.059	0.067
B	0.75	0.95	0.030	0.040
C	0.60	0.80	0.024	0.031
D	0.23	0.33	0.009	0.013
G	0.50 BSC		0.020 BSC	
H	0.53 REF		0.021 REF	
J	0.10	0.20	0.004	0.008
K	0.30	0.50	0.012	0.020
L	1.10 REF		0.043 REF	
M	-	10°	-	10°
N	-	10°	-	10°
S	1.50	1.70	0.059	0.067

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