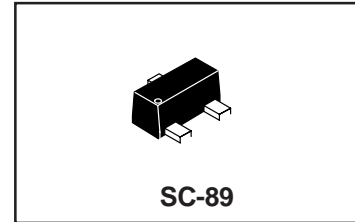


# Bias Resistor Transistors

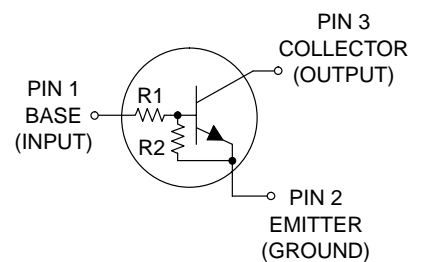
## NPN Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

### LDTTC114EET1G Series S-LDTTC114EET1G Series



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

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- The SC-89 package can be soldered using wave or reflow. The modified gull-winged leads absorb thermal stress during soldering eliminating the possibility of damage to the die.
- We declare that the material of product compliance with RoHS requirements.
- S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.



#### 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

Rating	Symbol	Value	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	$^\circ\text{C/W}$
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	$^\circ\text{C/W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. FR-4 @ Minimum Pad
2. FR-4 @  $1.0 \times 1.0$  Inch Pad

# LDTC114EET1G Series, S-LDTC114EET1G Series

## ORDERING INFORMATION AND RESISTOR VALUES

Device	Marking	R1 (K)	R2 (K)	Package	Shipping <sup>†</sup>
LDTC114EET1G	8A	10	10	SC-89	3000 Tape & Reel
LDTC124EET1G	8B	22	22	SC-89	3000 Tape & Reel
LDTC144EET1G	8C	47	47	SC-89	3000 Tape & Reel
LDTC114YET1G	8D	10	47	SC-89	3000 Tape & Reel
LDTC114TET1G	94	10	∞	SC-89	3000 Tape & Reel
LDTC143TET1G	8F	4.7	∞	SC-89	3000 Tape & Reel
LDTC123EET1G	8H	2.2	2.2	SC-89	3000 Tape & Reel
LDTC143EET1G	8J	4.7	4.7	SC-89	3000 Tape & Reel
LDTC143ZET1G	8K	4.7	47	SC-89	3000 Tape & Reel
LDTC124XET1G	8L	22	47	SC-89	3000 Tape & Reel
LDTC123JET1G	8M	2.2	47	SC-89	3000 Tape & Reel
LDTC115EET1G	8N	100	100	SC-89	3000 Tape & Reel
LDTC144WET1G	8P	47	22	SC-89	3000 Tape & Reel

<sup>†</sup>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.

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Base Cutoff Current (V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0)	I <sub>CBO</sub>	-	-	100	nAdc
Collector-Emitter Cutoff Current (V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0)	I <sub>CEO</sub>	-	-	500	nAdc
Emitter-Base Cutoff Current (V <sub>EB</sub> = 6.0 V, I <sub>C</sub> = 0)	I <sub>EBO</sub>	-	-	0.5	mAdc
LDTC114EET1G		-	-	0.2	
LDTC124EET1G		-	-	0.1	
LDTC144EET1G		-	-	0.2	
LDTC114YET1G		-	-	0.9	
LDTC114TET1G		-	-	1.9	
LDTC143TET1G		-	-	2.3	
LDTC123EET1G		-	-	1.5	
LDTC143EET1G		-	-	0.18	
LDTC143ZET1G		-	-	0.13	
LDTC124XET1G		-	-	0.2	
LDTC123JET1G		-	-	0.05	
LDTC115EET1G		-	-	0.13	
LDTC144WET1G		-	-		
Collector-Base Breakdown Voltage (I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 3) (I <sub>C</sub> = 2.0 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	50	-	-	Vdc

# LDTCC114EET1G Series, S-LDTCC114EET1G Series

Characteristic	Symbol	Min	Typ	Max	Unit	
<b>ON CHARACTERISTICS</b> (Note 3)						
DC Current Gain ( $V_{CE} = 10\text{ V}$ , $I_C = 5.0\text{ mA}$ )	LDTCC114EET1G LDTCC124EET1G LDTCC144EET1G LDTCC114YET1G LDTCC114TET1G LDTCC143TET1G LDTCC123EET1G LDTCC143EET1G LDTCC143ZET1G LDTCC124XET1G LDTCC123JET1G LDTCC115EET1G LDTCC144WET1G	$h_{FE}$	35 60 80 80 160 160 8.0 15 80 80 80 80 80	60 100 140 140 350 350 15 30 200 150 140 150 140	– – – – – – – – – – – – –	
Collector–Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.3\text{ mA}$ ) ( $I_C = 10\text{ mA}$ , $I_B = 5\text{ mA}$ ) LDTCC123EET1G ( $I_C = 10\text{ mA}$ , $I_B = 1\text{ mA}$ ) LDTCC143TET1G/LDTCC114TET1G/ LDTCC143EET1G/LDTCC143ZET1G/LDTCC124XET1G		$V_{CE(sat)}$	–	–	0.25	Vdc
Output Voltage (on) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 2.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )  ( $V_{CC} = 5.0\text{ V}$ , $V_B = 3.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 5.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 4.0\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	LDTCC114EET1G LDTCC124EET1G LDTCC114YET1G LDTCC114TET1G LDTCC143TET1G LDTCC123EET1G LDTCC143EET1G LDTCC143ZET1G LDTCC124XET1G LDTCC123JET1G LDTCC144EET1G LDTCC115EET1G LDTCC144WET1G	$V_{OL}$	– – – – – – – – – – – – –	– – – – – – – – – – – – –	0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	Vdc
Output Voltage (off) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.25\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	LDTCC143TET1G LDTCC143ZET1G LDTCC114TET1G LDTCC115EET1G	$V_{OH}$	4.9	–	–	Vdc

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

## ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	Min	Typ	Max	Unit	
Input Resistor	LDTCC114EET1G LDTCC124EET1G LDTCC144EET1G LDTCC114YET1G LDTCC114TET1G LDTCC143TET1G LDTCC123EET1G LDTCC143EET1G LDTCC143ZET1G LDTCC124XET1G LDTCC123JET1G LDTCC115EET1G LDTCC144WET1G	$R_1$	7.0 15.4 32.9 7.0 7.0 3.3 1.5 3.3 3.3 15.4 1.54 70 32.9	10 22 47 10 10 4.7 2.2 4.7 4.7 22 2.2 100 47	13 28.6 61.1 13 13 6.1 2.9 6.1 6.1 28.6 2.86 130 61.1	$\text{k}\Omega$
Resistor Ratio	LDTCC114EET1G/LDTCC124EET1G/ LDTCC144EET1G/LDTCC115EET1G LDTCC114YET1G LDTCC143TET1G/LDTCC114TET1G LDTCC123EET1G/LDTCC143EET1G LDTCC143ZET1G LDTCC124XET1G LDTCC123JET1G LDTCC144WET1G	$R_1/R_2$	0.8 0.17 – 0.8 0.055 0.38 0.038 1.7	1.0 0.21 – 1.0 0.1 0.47 0.047 2.1	1.2 0.25 – 1.2 0.185 0.56 0.056 2.6	

# LDT C114EET1G Series, S-LDT C114EET1G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – LDT C114EET1G

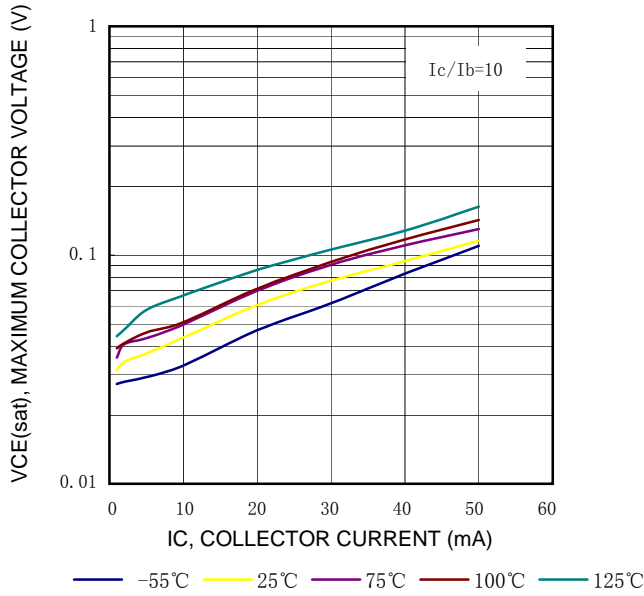


Fig. 1 VCE(sat) VS IC

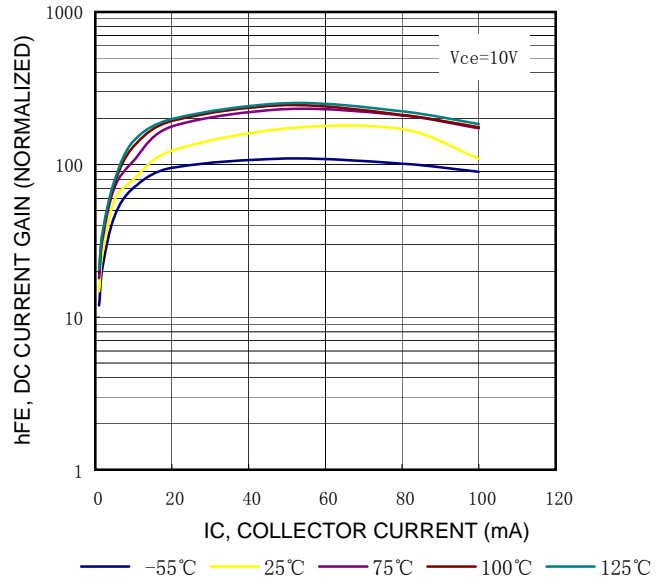


Fig. 2 DC CURRENT GAIN

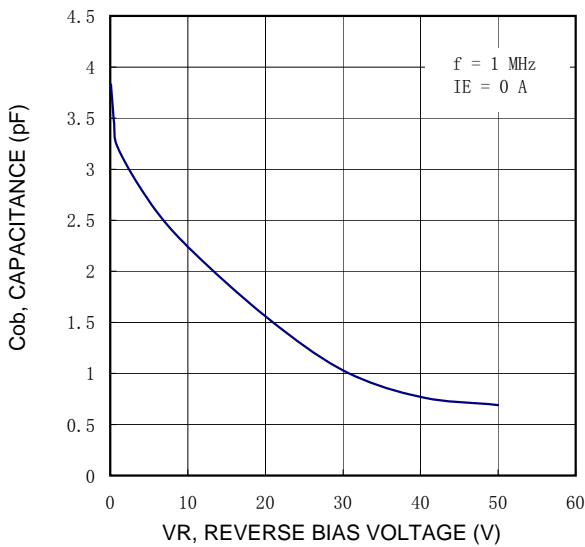


Fig. 3 OUTPUT CAPACITANCE

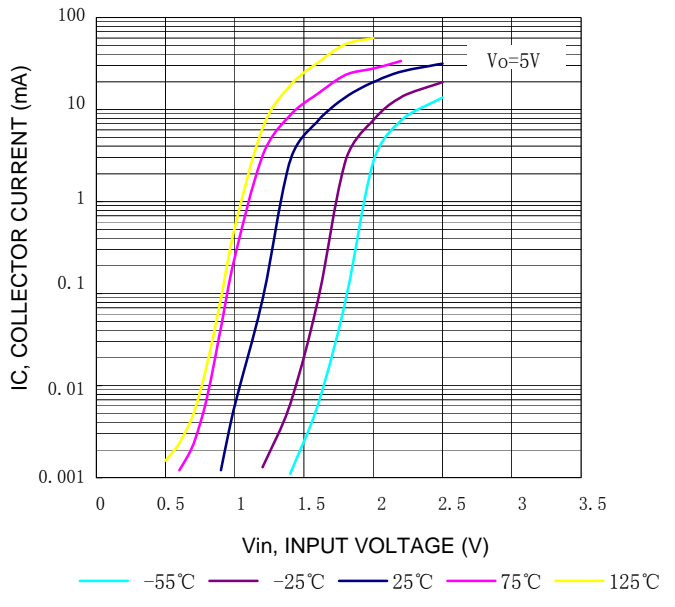


Fig. 4 OUTPUT CURRENT VS INPUT VOLTAGE

# LDTC114EET1G Series, S-LDTC114EET1G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – LDTC114EET1G

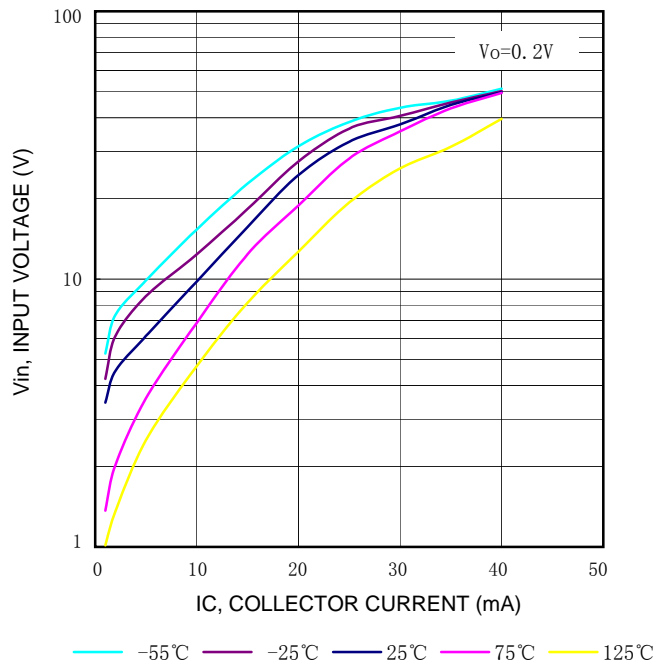


Fig. 5 INPUT VOLTAGE VS OUTPUT CURRENT

# LDT C114EET1G Series, S-LDT C114EET1G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – LDT C115EET1G

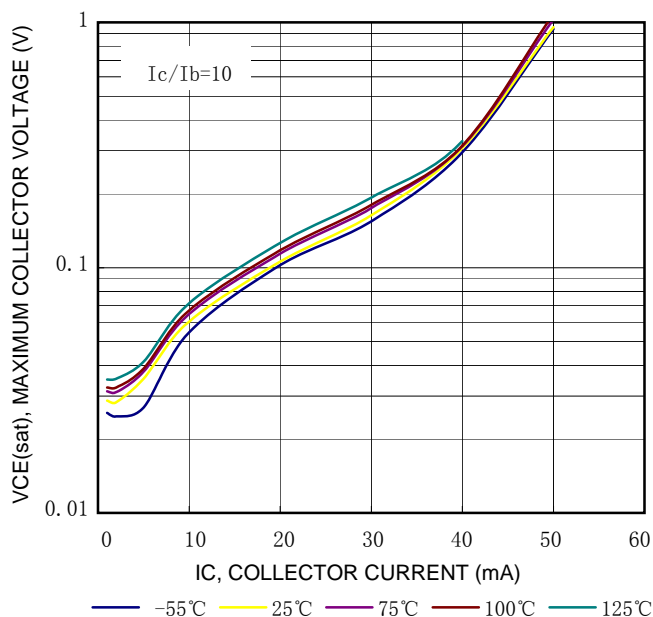


Fig. 6 VCE(sat) VS IC

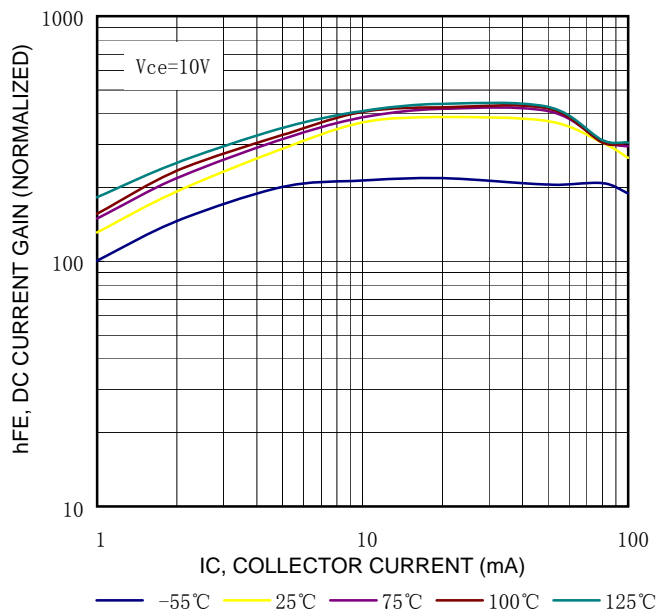


Fig. 7 DC CURRENT GAIN

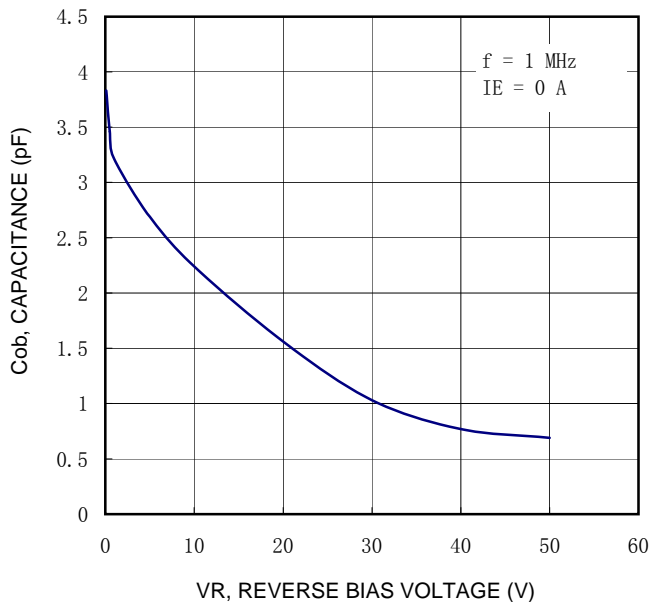


Fig. 8 OUTPUT CAPACITANCE

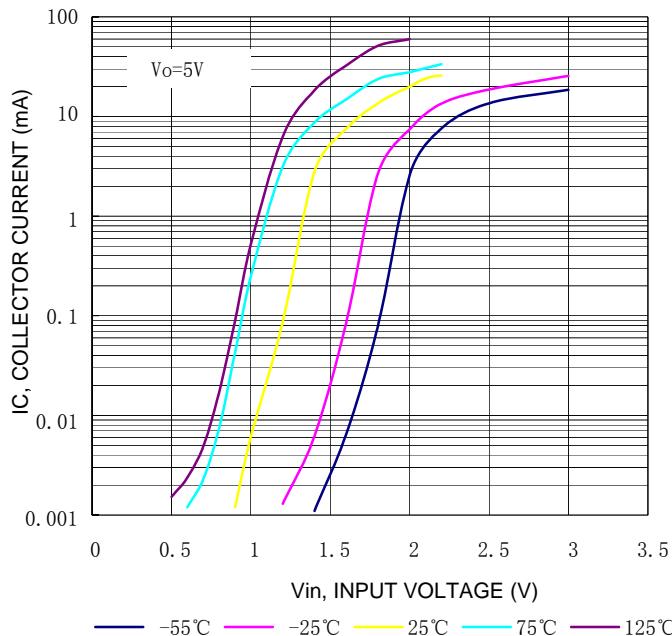


Fig. 9 OUTPUT CURRENT VS INPUT VOLTAGE

# LDTTC114EET1G Series, S-LDTTC114EET1G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – LDTTC115EET1G

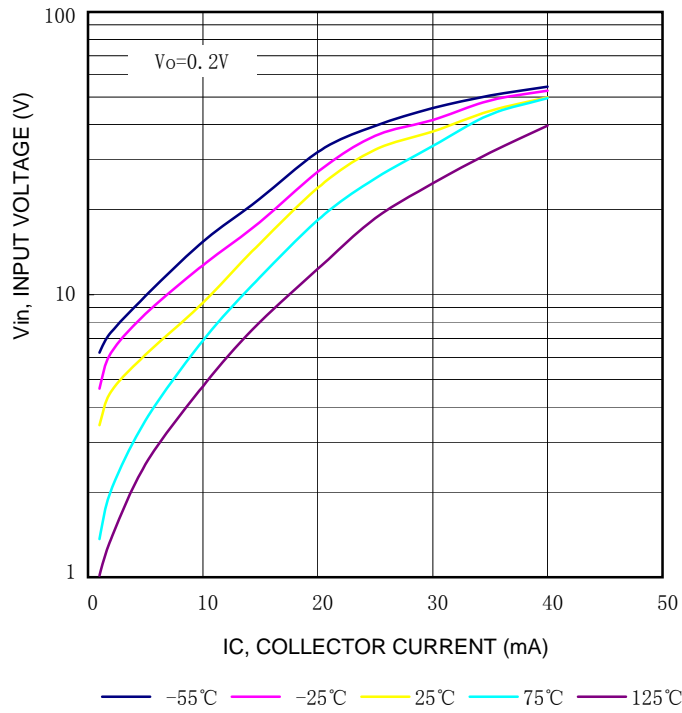


Fig. 10 INPUT VOLTAGE VS OUTPUT CURRENT

# LDT C114EET1G Series, S-LDT C114EET1G Series

## TYPICAL APPLICATIONS FOR NPN BRTs

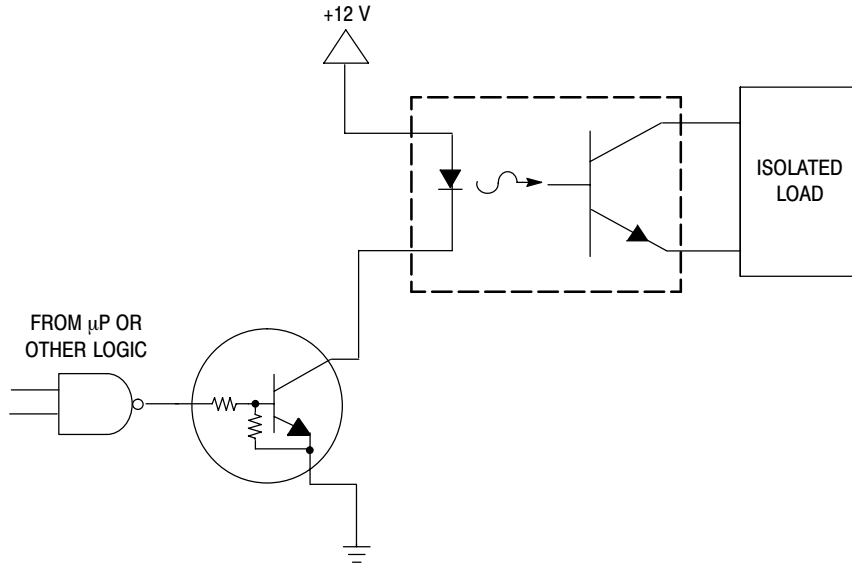


Fig. 11 LEVEL SHIFTER:CONNECTS 12 TO 24 VOLT CIRCUITS TO LOGIC

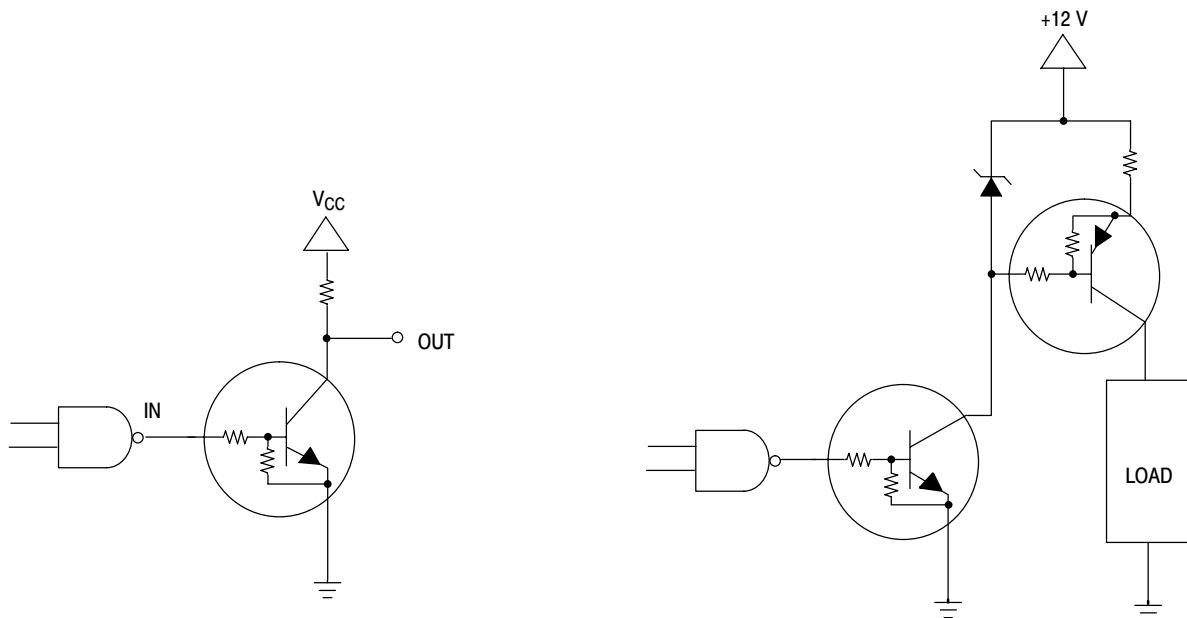


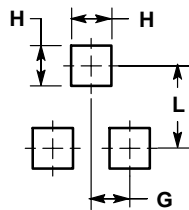
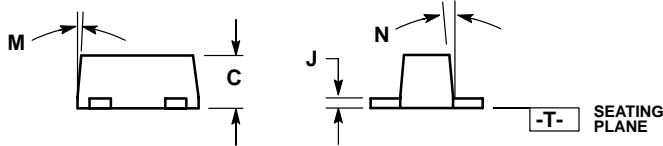
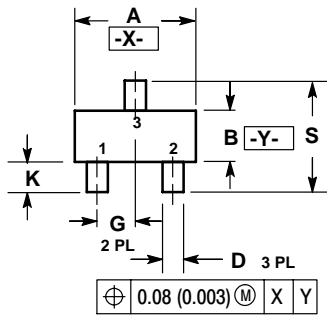
Fig. 12 OPEN COLLECTOR INVERTER:  
INVERTS THE INPUT SIGNAL

Fig. 13 INEXPENSIVE,UNREGULATED CURRENT SOURCE



# LDTC114EET1G Series, S-LDTC114EET1G Series

SC-89



RECOMMENDED PATTERN OF SOLDER PADS

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

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[Jantx2N5416](#) [US6T6TR](#) [KSF350](#) [068071B](#)