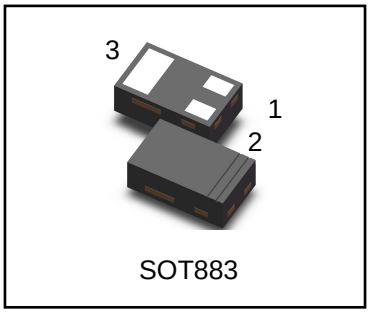
Bias Resistor Transistors

NPN Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

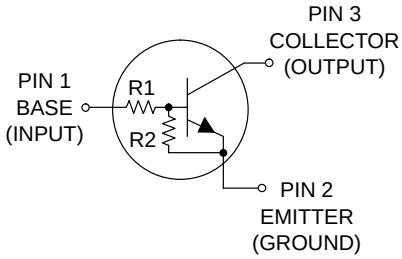
LDTC114EN3T5G Series
S-LDTC114EN3T5G Series

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 SOT883 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.



SOT883



MAXIMUM RATINGS (T_A = 25°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

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR– 5 Board, (1) T_A = 25°C	P_D	250	mW
Derate above 25°C		4	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	500	°C/W
Junction and Storage Temperature	T_J , T_{stg}	–55 to +150	°C

1. FR–5 = 1.0 x 0.75 x 0.062 in.

LDTC114EN3T5G Series;S-LDTC114EN3T5G Series

ORDERING INFORMATION AND RESISTOR VALUES

Device	Marking	R1 (K)	R2 (K)	Package	Shipping†
LDTC114EN3T5G S-LDTC114EN3T5G	8A	10	10	SOT883	10000 Tape & Reel
LDTC124EN3T5G S-LDTC124EN3T5G	8B	22	22	SOT883	10000 Tape & Reel
LDTC144EN3T5G S-LDTC144EN3T5G	8C	47	47	SOT883	10000 Tape & Reel
LDTC114YN3T5G S-LDTC114YN3T5G	8D	10	47	SOT883	10000 Tape & Reel
LDTC114TN3T5G S-LDTC114TN3T5G	94	10	∞	SOT883	10000 Tape & Reel
LDTC143TN3T5G S-LDTC143TN3T5G	8F	4.7	∞	SOT883	10000 Tape & Reel
LDTC123EN3T5G S-LDTC123EN3T5G	8H	2.2	2.2	SOT883	10000 Tape & Reel
LDTC143EN3T5G S-LDTC143EN3T5G	8J	4.7	4.7	SOT883	10000 Tape & Reel
LDTC143ZN3T5G S-LDTC143ZN3T5G	8K	4.7	47	SOT883	10000 Tape & Reel
LDTC124XN3T5G S-LDTC124XN3T5G	8L	22	47	SOT883	10000 Tape & Reel
LDTC123JN3T5G S-LDTC123JN3T5G	8M	2.2	47	SOT883	10000 Tape & Reel
LDTC115EN3T5G S-LDTC115EN3T5G	8N	100	100	SOT883	10000 Tape & Reel
LDTC144WN3T5G S-LDTC144WN3T5G	8P	47	22	SOT883	10000 Tape & Reel

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

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector−Base Cutoff Current (V_{CB} = 50 V, I_E = 0)		I_{CBO}	−	−	100	nAdc
Collector−Emitter Cutoff Current (V_{CE} = 50 V, I_B = 0)		I_{CEO}	−	−	500	nAdc
Emitter−Base Cutoff Current (V_{EB} = 6.0 V, I_C = 0)	LDTC114EN3T5G	I_{EBO}	−	−	0.5	mAdc
	LDTC124EN3T5G		−	−	0.2	
	LDTC144EN3T5G		−	−	0.1	
	LDTC114YN3T5G		−	−	0.2	
	LDTC114TN3T5G		−	−	0.9	
	LDTC143TN3T5G		−	−	1.9	
	LDTC123EN3T5G		−	−	2.3	
	LDTC143EN3T5G		−	−	1.5	
	LDTC143ZN3T5G		−	−	0.18	
	LDTC124XN3T5G		−	−	0.13	
	LDTC123JN3T5G		−	−	0.2	
	LDTC115EN3T5G		−	−	0.05	
	LDTC144WN3T5G		−	−	0.13	
Collector−Base Breakdown Voltage (I_C = 10 μA, I_E = 0)		$V_{(BR)CBO}$	50	−	−	Vdc
Collector−Emitter Breakdown Voltage (Note 2) (I_C = 2.0 mA, I_B = 0)		$V_{(BR)CEO}$	50	−	−	Vdc

2. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

LDTC114EN3T5G Series;S-LDTC114EN3T5G Series

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS (Note 3)						
DC Current Gain	LDTC114EN3T5G	h_{FE}	35	60	–	
(V_{CE} = 10 V, I_C = 5.0 mA)	LDTC124EN3T5G		60	100	–	
	LDTC144EN3T5G		80	140	–	
	LDTC114YN3T5G		80	140	–	
	LDTC114TN3T5G		160	350	–	
	LDTC143TN3T5G		160	350	–	
	LDTC123EN3T5G		8.0	15	–	
	LDTC143EN3T5G		15	30	–	
	LDTC143ZN3T5G		80	200	–	
	LDTC124XN3T5G		80	150	–	
	LDTC123JN3T5G		80	140	–	
	LDTC115EN3T5G		80	150	–	
	LDTC144WN3T5G		80	140	–	
Collector−Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.3 mA)		$V_{CE(sat)}$	–	–	0.25	Vdc
(I_C = 10 mA, I_B = 5 mA) LDTC123EN3T5G						
(I_C = 10 mA, I_B = 1 mA) LDTC143TN3T5G/LDTC114TN3T5G/ LDTC143EN3T5G/LDTC143ZN3T5G/LDTC124XN3T5G						
Output Voltage (on)		V_{OL}				Vdc
(V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	LDTC114EN3T5G		–	–	0.2	
	LDTC124EN3T5G		–	–	0.2	
	LDTC114YN3T5G		–	–	0.2	
	LDTC114TN3T5G		–	–	0.2	
	LDTC143TN3T5G		–	–	0.2	
	LDTC123EN3T5G		–	–	0.2	
	LDTC143EN3T5G		–	–	0.2	
	LDTC143ZN3T5G		–	–	0.2	
	LDTC124XN3T5G		–	–	0.2	
	LDTC123JN3T5G		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 3.5 V, R_L = 1.0 kΩ)	LDTC144EN3T5G		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 5.5 V, R_L = 1.0 kΩ)	LDTC115EN3T5G		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 4.0 V, R_L = 1.0 kΩ)	LDTC144WN3T5G		–	–	0.2	
Output Voltage (off) (V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ)		V_{OH}	4.9	–	–	Vdc
(V_{CC} = 5.0 V, V_B = 0.25 V, R_L = 1.0 kΩ)	LDTC143TN3T5G					
	LDTC143ZN3T5G					
	LDTC114TN3T5G					
	LDTC115EN3T5G					

3. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

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

Characteristic		Symbol	Min	Typ	Max	Unit
Input Resistor	LDTC114EN3T5G	R1	7.0	10	13	kΩ
	LDTC124EN3T5G		15.4	22	28.6	
	LDTC144EN3T5G		32.9	47	61.1	
	LDTC114YN3T5G		7.0	10	13	
	LDTC114TN3T5G		7.0	10	13	
	LDTC143TN3T5G		3.3	4.7	6.1	
	LDTC123EN3T5G		1.5	2.2	2.9	
	LDTC143EN3T5G		3.3	4.7	6.1	
	LDTC143ZN3T5G		3.3	4.7	6.1	
	LDTC124XN3T5G		15.4	22	28.6	
	LDTC123JN3T5G		1.54	2.2	2.86	
	LDTC115EN3T5G		70	100	130	
	LDTC144WN3T5G		32.9	47	61.1	
Resistor Ratio	LDTC114EN3T5G/LDTC124EN3T5G/ LDTC144EN3T5G/LDTC115EN3T5G	R_1/R_2	0.8	1.0	1.2	
	LDTC114YN3T5G		0.17	0.21	0.25	
	LDTC143TN3T5G/LDTC114TN3T5G		–	–	–	
	LDTC123EN3T5G/LDTC143EN3T5G		0.8	1.0	1.2	
	LDTC143ZN3T5G		0.055	0.1	0.185	
	LDTC124XN3T5G		0.38	0.47	0.56	
	LDTC123JN3T5G		0.038	0.047	0.056	
	LDTC144WN3T5G		1.7	2.1	2.6	

LDTC114EN3T5G Series;S-LDTC114EN3T5G Series

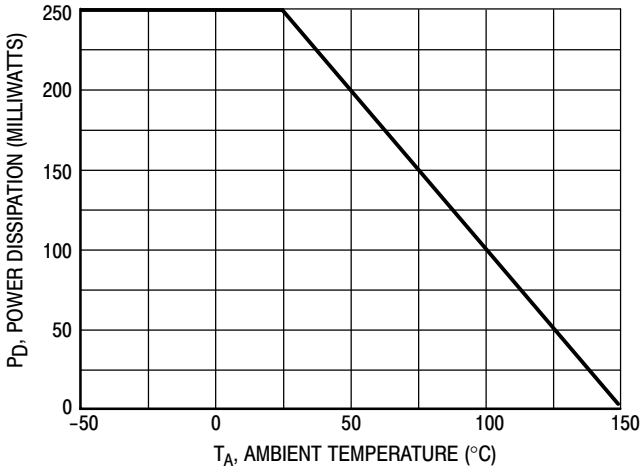


Figure 1. Derating Curve

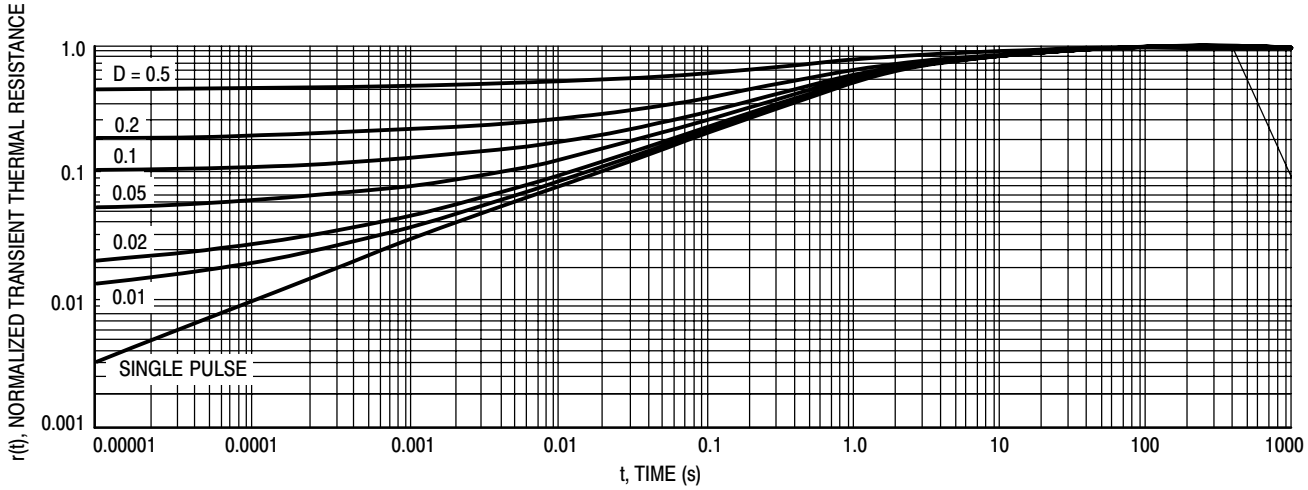


Figure 2. Normalized Thermal Response

LDTC114EN3T5G Series;S-LDTC114EN3T5G Series

TYPICAL ELECTRICAL CHARACTERISTICS − LDTC114EN3T5G

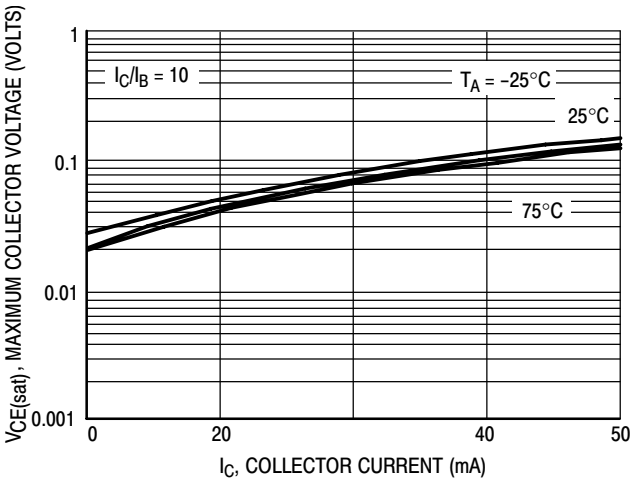


Figure 3. $V_{CE(sat)}$ versus I_C

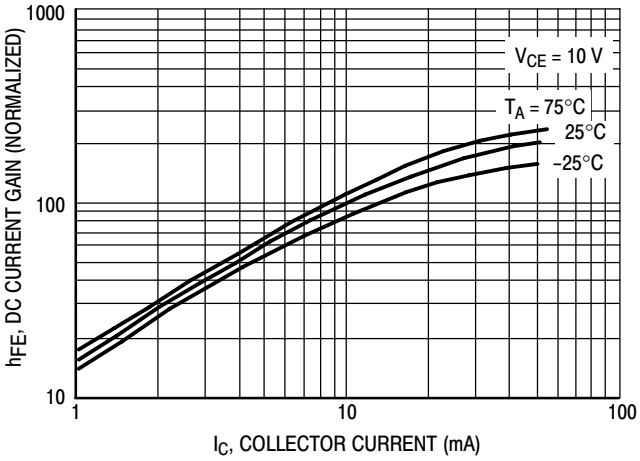


Figure 4. DC Current Gain

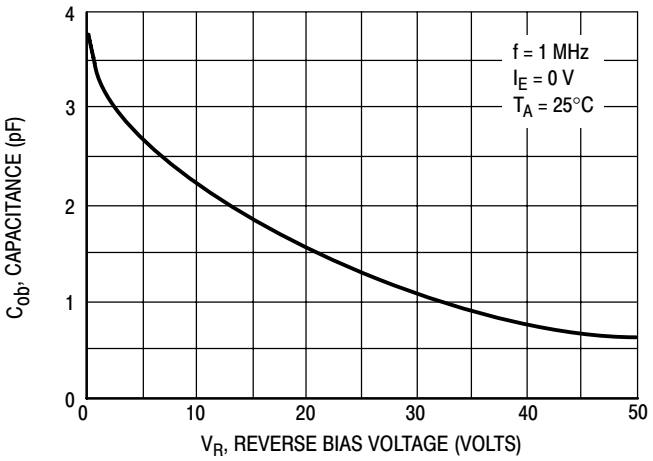


Figure 5. Output Capacitance

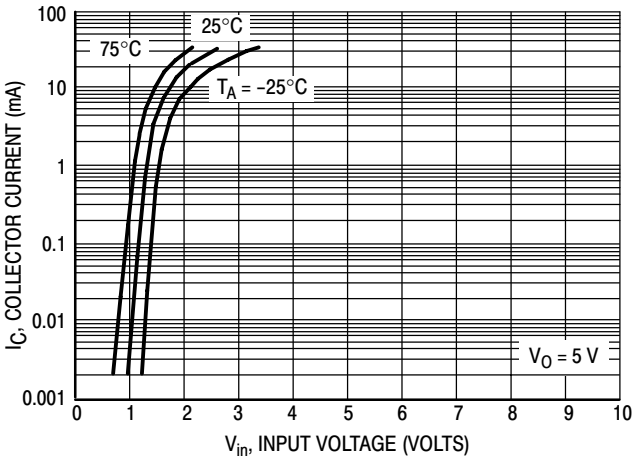


Figure 6. Output Current versus Input Voltage

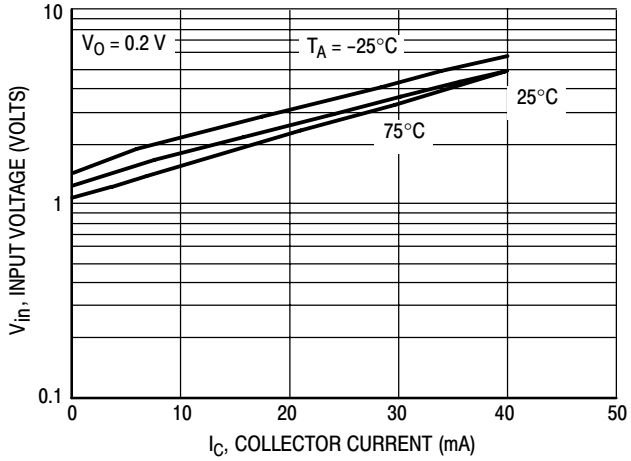


Figure 7. Input Voltage versus Output Current

LDTC114EN3T5G Series;S-LDTC114EN3T5G Series

TYPICAL ELECTRICAL CHARACTERISTICS − LDTC123EN3T5G

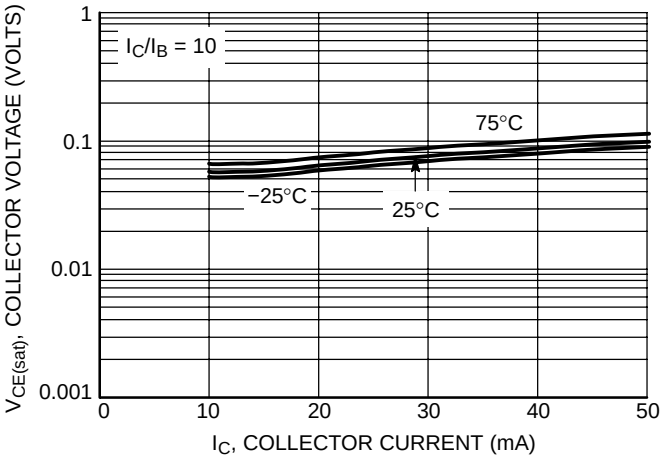


Figure 8. $V_{CE(sat)}$ versus I_C

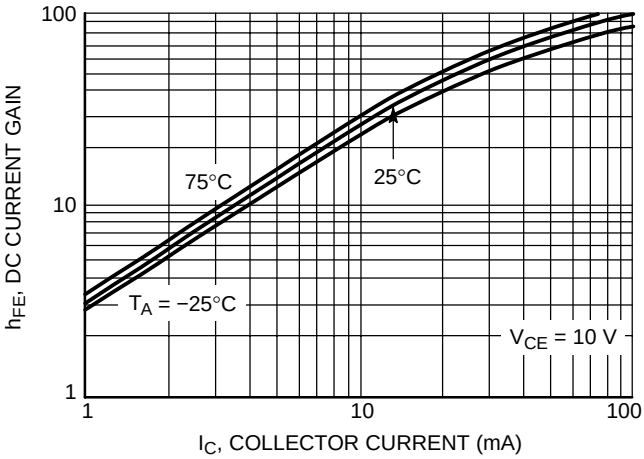


Figure 9. DC Current Gain

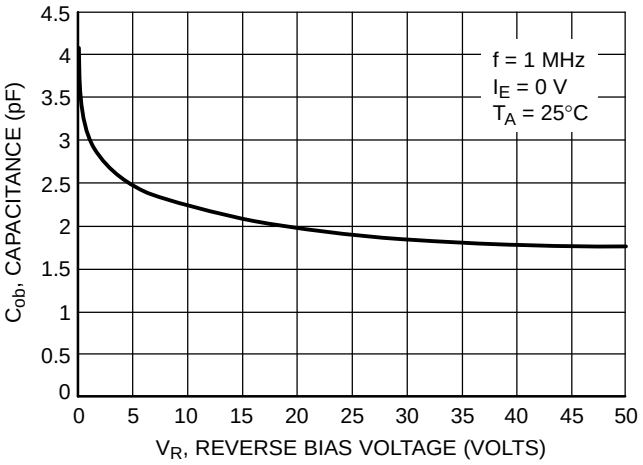


Figure 10. Output Capacitance

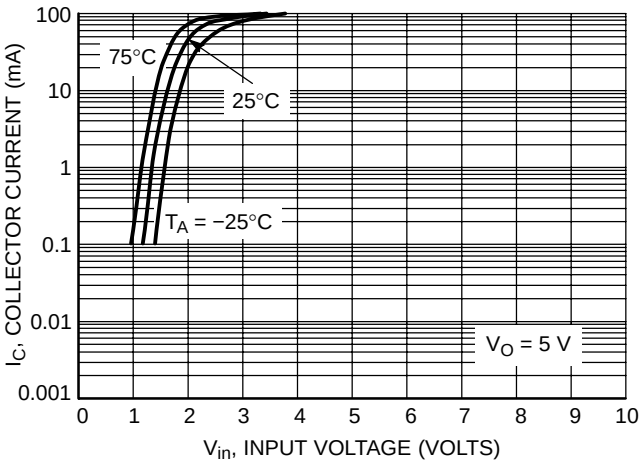


Figure 11. Output Current versus Input Voltage

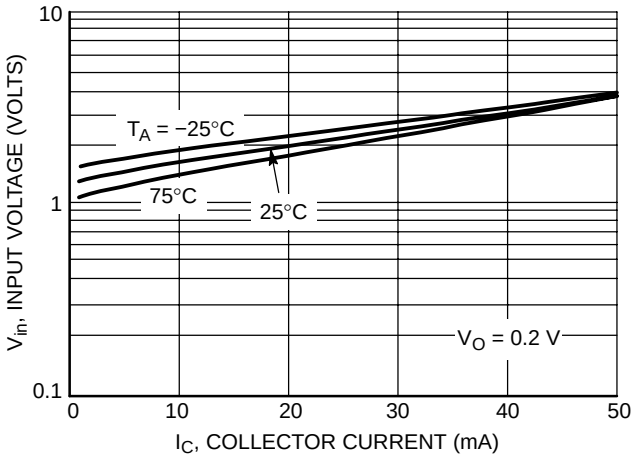


Figure 12. Input Voltage versus Output Current

LDTC114EN3T5G Series;S-LDTC114EN3T5G Series

TYPICAL ELECTRICAL CHARACTERISTICS − LDTC124EN3T5G

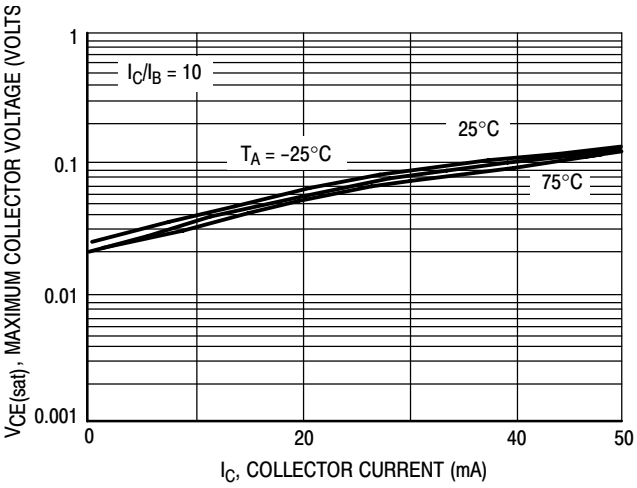


Figure 13. $V_{CE(sat)}$ versus I_C

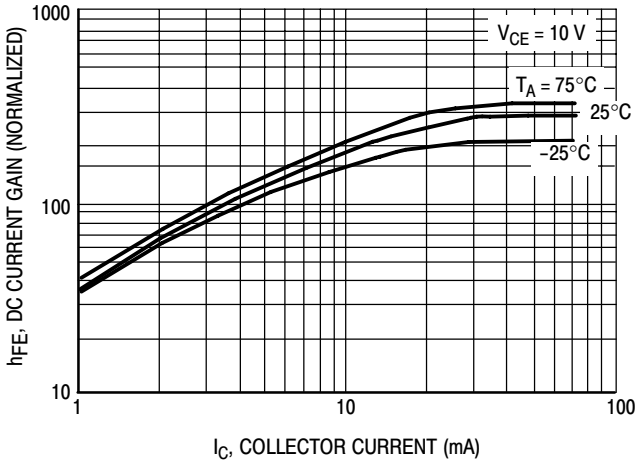


Figure 14. DC Current Gain

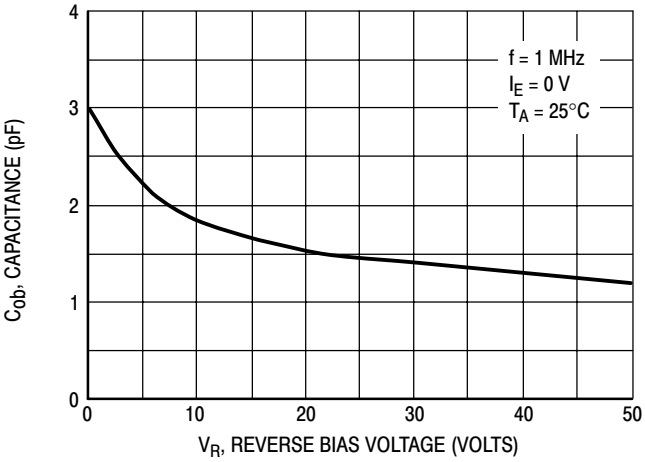


Figure 15. Output Capacitance

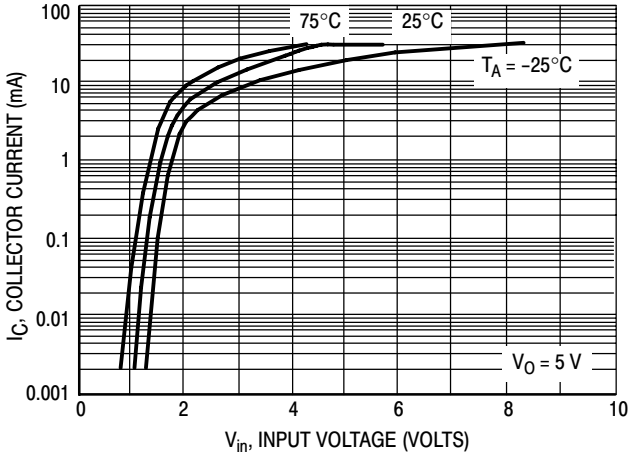


Figure 16. Output Current versus Input Voltage

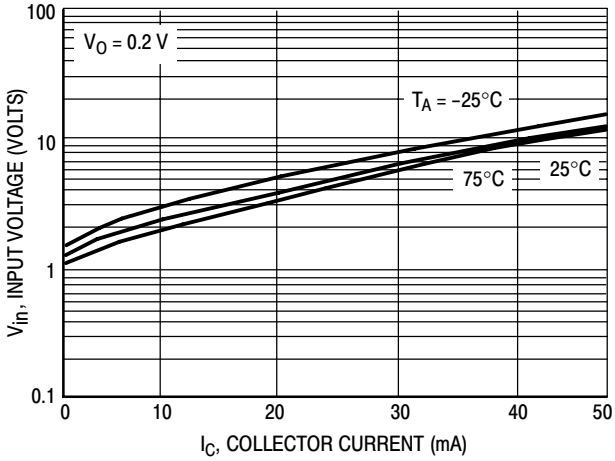


Figure 17. Input Voltage versus Output Current

LDTC114EN3T5G Series;S-LDTC114EN3T5G Series

TYPICAL ELECTRICAL CHARACTERISTICS − LDTC144EN3T5G

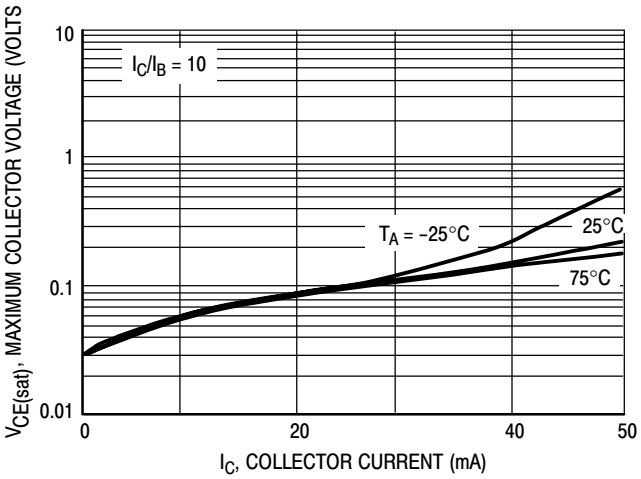


Figure 18. $V_{CE(sat)}$ versus I_C

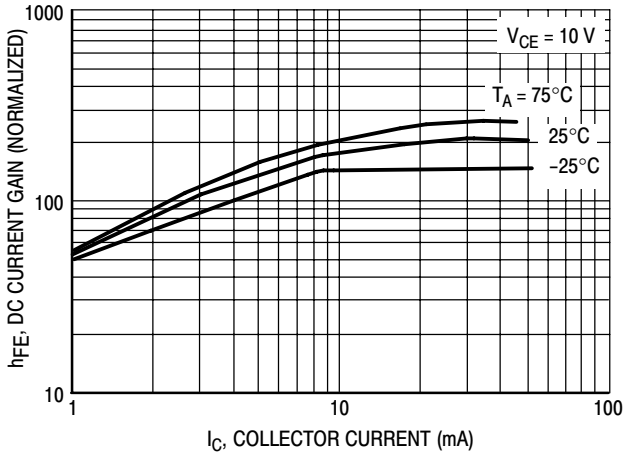


Figure 19. DC Current Gain

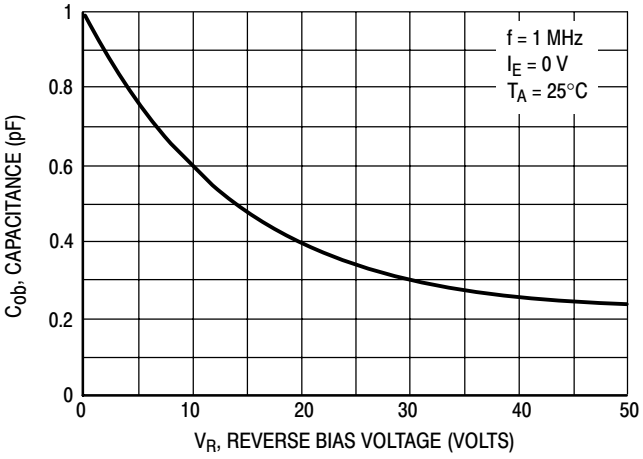


Figure 20. Output Capacitance

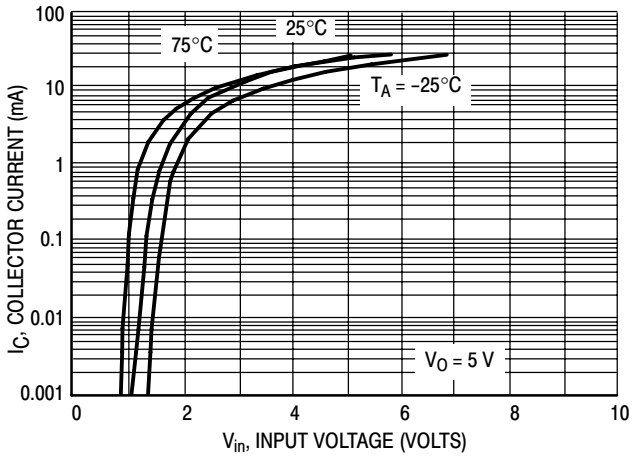


Figure 21. Output Current versus Input Voltage

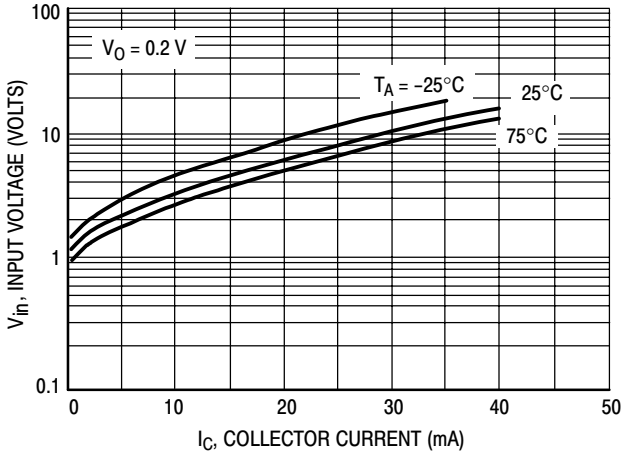


Figure 22. Input Voltage versus Output Current

LDTC114EN3T5G Series;S-LDTC114EN3T5G Series

TYPICAL ELECTRICAL CHARACTERISTICS − LDTC114YN3T5G

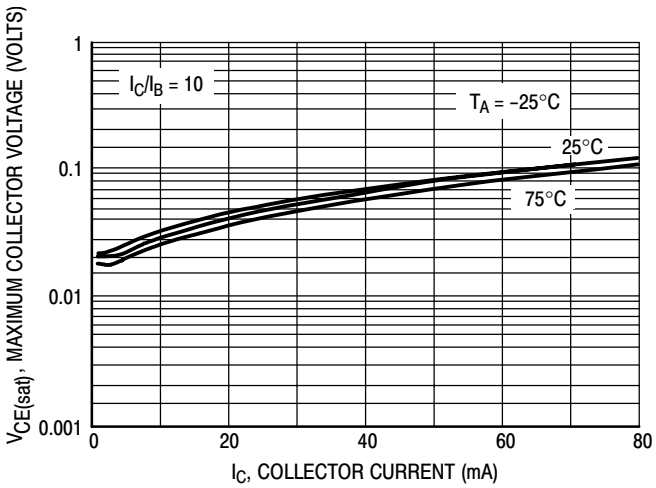


Figure 23. $V_{CE(sat)}$ versus I_C

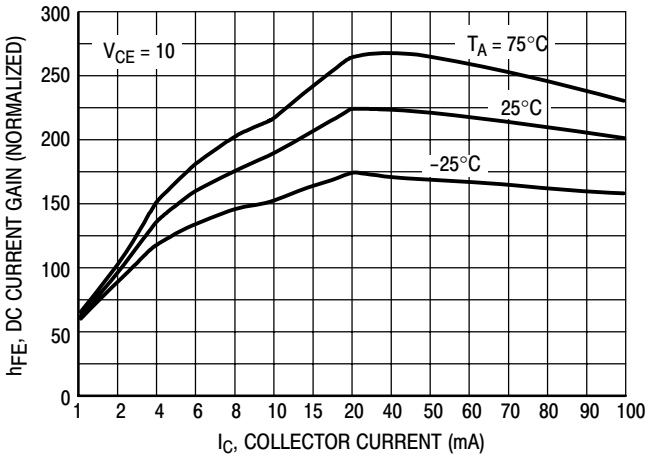


Figure 24. DC Current Gain

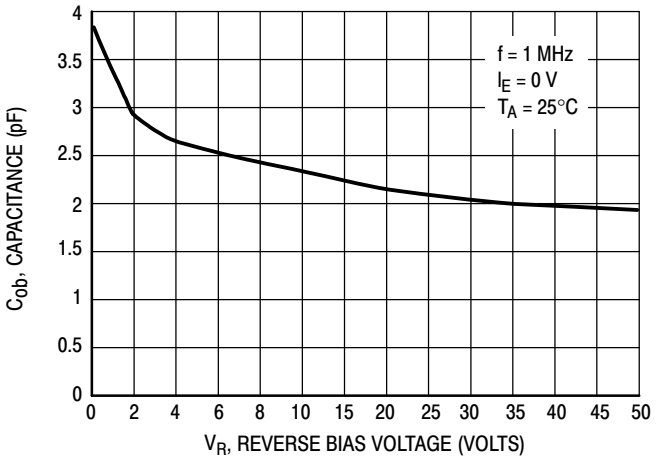


Figure 25. Output Capacitance

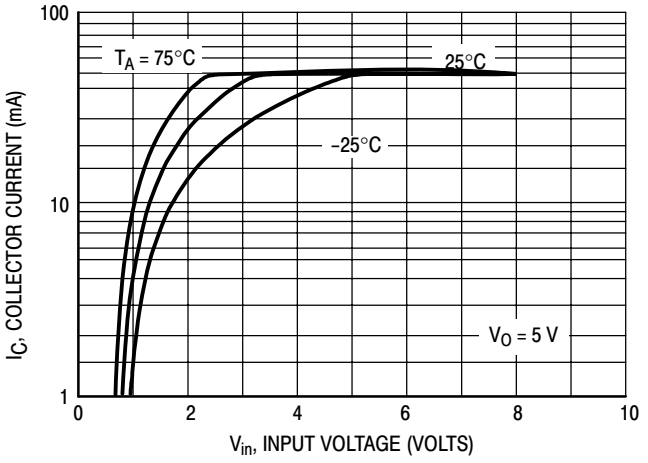


Figure 26. Output Current versus Input Voltage

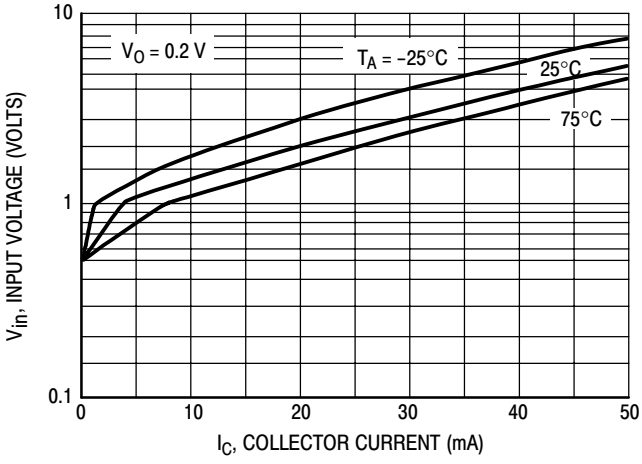


Figure 27. Input Voltage versus Output Current

LDTC114EN3T5G Series;S-LDTC114EN3T5G Series

TYPICAL APPLICATIONS FOR NPN BRTs

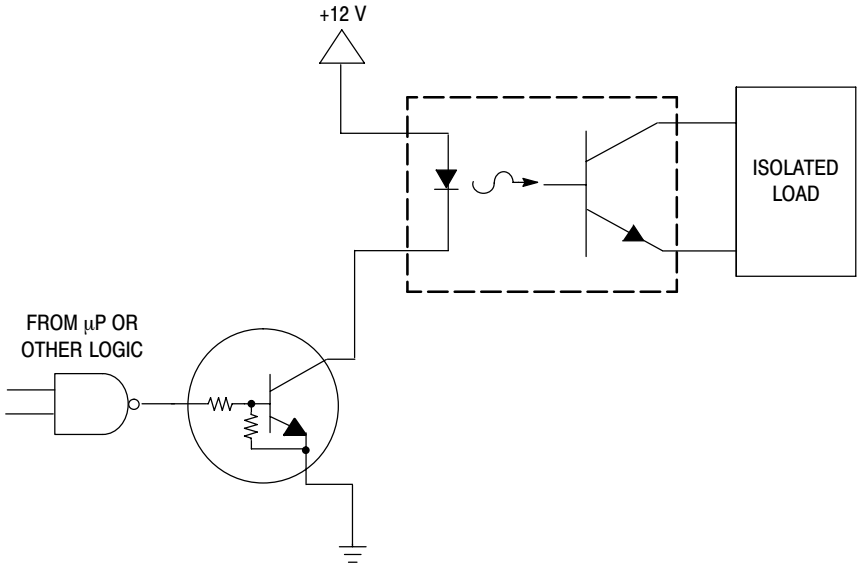


Figure 28. Level Shifter: Connects 12 or 24 Volt Circuits to Logic

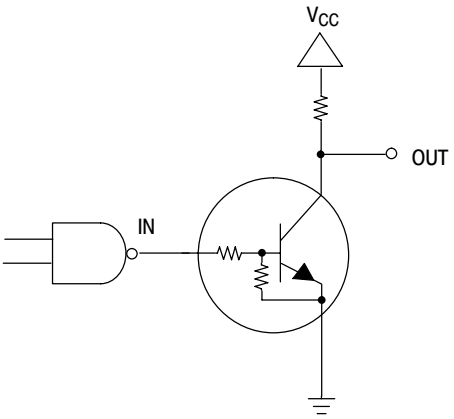


Figure 29. Open Collector Inverter: Inverts the Input Signal

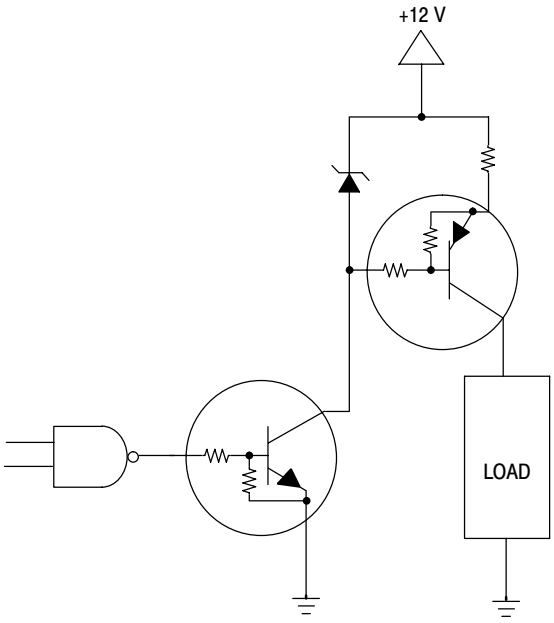
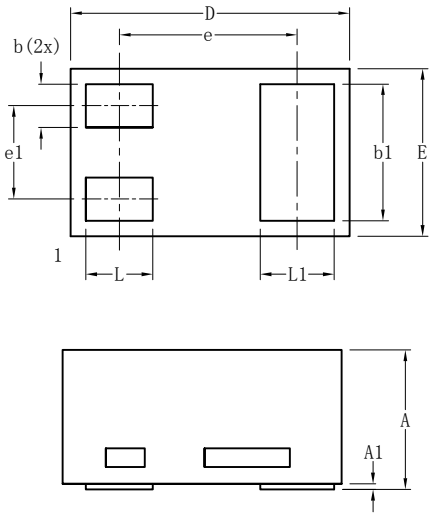


Figure 30. Inexpensive, Unregulated Current Source

LDTC114EN3T5G Series;S-LDTC114EN3T5G Series

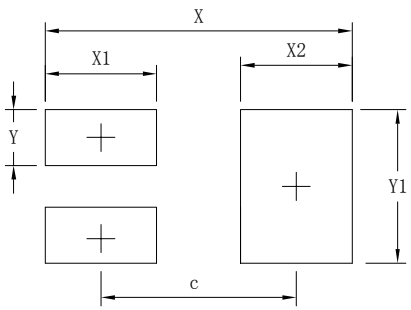
SOT883

Package Outline Dimensions



SOT883A			
Dim	Min	Typ	Max
D	0.95	1.00	1.05
E	0.50	0.60	0.65
e	–	0.64	–
e1	–	0.34	–
L	0.19	0.24	0.29
L1	0.22	0.27	0.32
b	0.10	0.15	0.20
b1	0.44	0.49	0.54
A	0.43	0.48	0.53
A1	0	–	0.05
All Dimensions in mm			

Suggested Pad Layout



Dimensions	Value (in mm)
c	0.70
X	1.10
X1	0.40
X2	0.40
Y	0.20
Y1	0.55