DESCRIPTION

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–70 package which is designed for low power surface mount applications.

The MUN5211~MUN5237 are available in SC–70 package.

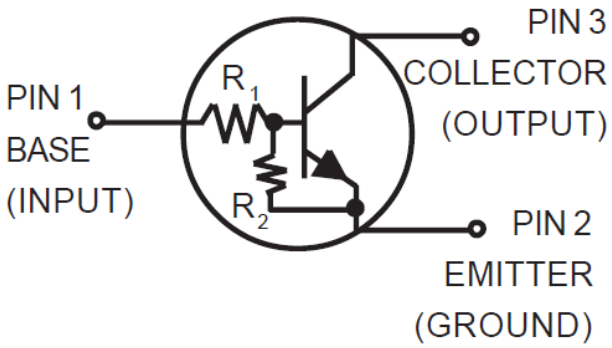
FEATURES

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- The SC–70 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.
- Available in SC–70 package

ORDERING INFORMATION

Package Type	Part Number
SC–70	MUN5211
	MUN5212
	MUN5213
	MUN5214
	MUN5215
	MUN5216
	MUN5230
	MUN5231
	MUN5232
	MUN5233
	MUN5234
	MUN5235
	MUN5236
	MUN5237
Note	SPQ: 3,000pcs/Reel
AiT provides all RoHS Compliant Products	

PIN DESCRIPTION



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	Max	Unit
Total Device Dissipation	P_D	202NOTE1	mW
T_A = 25°C		310NOTE2	
Derate above 25°C		1.6NOTE1	mW/°C
		2.5NOTE2	
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	618NOTE1	°C/W
		403NOTE2	
Thermal Resistance Junction-to-Lead	$R_{\theta JL}$	280NOTE1	°C/W
		332NOTE2	
Junction and Storage Temperature Range	T_J, T_{STG}	–55 to +150	°C

NOTE1: FR–4 @ Minimum Pad
NOTE2: FR–4 @ 1.0 x 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} = 50V, I_E = 0		-	-	100	nAdc
Collector-Emitter Cutoff Current	I_{CEO}	V_{CE} = 50V, I_B = 0		-	-	500	nAdc
Emitter-Base Cutoff Current	I_{EBO}	V_{EB}= 6.0V, I_C = 0	MUN5211	-	-	0.5	mAdc
			MUN5212			0.2	
			MUN5213			0.1	
			MUN5214			0.2	
			MUN5215			0.9	
			MUN5216			1.9	
			MUN5230			4.3	
			MUN5231			2.3	
			MUN5232			1.5	
			MUN5233			0.18	
			MUN5234			0.13	
			MUN5235			0.2	
			MUN5236			0.05	
			MUN5237			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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
ON CHARACTERISTICS NOTE3							
DC Current Gain	h_{FE}	V_{CE}=10V,I_C=5.0mA	MUN5211	35	60	-	-
			MUN5212	60	100		
			MUN5213	80	140		
			MUN5214	80	140		
			MUN5215	160	350		
			MUN5216	160	350		
			MUN5230	3.0	5.0		
			MUN5231	8.0	15		
			MUN5232	15	30		
			MUN5233	80	200		
			MUN5234	80	150		
			MUN5235	80	140		
			MUN5236	80	150		
			MUN5237	80	140		
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=10mA, I_B=0.3mA		-	-	0.25	Vdc
		I_C=10mA, I_B=5mA	MUN5230				
			MUN5231				
		I_C=10mA, I_B=1mA	MUN5215				
			MUN5216				
			MUN5232				
			MUN5233				
			MUN5234				

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
ON CHARACTERISTICS NOTE3							
Output Voltage (on)	V_{OL}	V_{CC}=5.0V, V_B=2.5V, R_L=1.0kΩ	MUN5211	-	-	0.2	Vdc
			MUN5212				
			MUN5214				
			MUN5215				
			MUN5216				
			MUN5230				
			MUN5231				
			MUN5232				
			MUN5233				
			MUN5234				
			MUN5235				
		V_{CC}=5.0V, V_B=3.5V, R_L=1.0kΩ	MUN5213				
		V_{CC}=5.0V, V_B=5.5V, R_L=1.0kΩ	MUN5236				
		V_{CC}=5.0V, V_B=4.0V, R_L=1.0kΩ	MUN5237				
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=0.050V, R_L=1.0kΩ	MUN5230				
		V_{CC}=5.0V, V_B=0.25V, R_L=1.0kΩ	MUN5215				
			MUN5216				
			MUN5233				
Input Resistor	R_1		MUN5211	7.0	10	13	kΩ
			MUN5212	15.4	22	28.6	
			MUN5213	32.9	47	61.1	
			MUN5214	7.0	10	13	
			MUN5215	7.0	10	13	
			MUN5216	3.3	4.7	6.1	
			MUN5230	0.7	1.0	1.3	
			MUN5231	1.5	2.2	2.9	
			MUN5232	3.3	4.7	6.1	
			MUN5233	3.3	4.7	6.1	
			MUN5234	15.4	22	28.6	
			MUN5235	1.54	2.2	2.86	
			MUN5236	70	100	130	
			MUN5237	32.9	47	61.1	

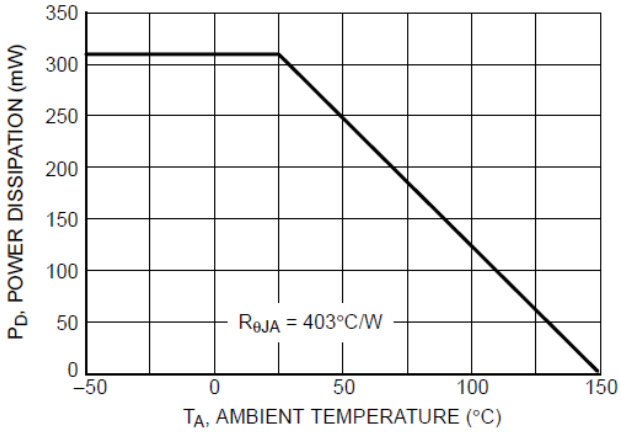
Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
ON CHARACTERISTICS NOTE3							
	R_2		MUN5211	-	10	-	kΩ
			MUN5212		22		
			MUN5213		47		
			MUN5214		47		
			MUN5215		∞		
			MUN5216		∞		
			MUN5230		1		
			MUN5231		2.2		
			MUN5232		4.7		
			MUN5233		47		
			MUN5234		47		
			MUN5235		47		
			MUN5236		100		
			MUN5237		22		
Resistor Ratio	R_1/R_2		MUN5211	0.8	1.0	1.2	-
			MUN5212				
			MUN5213				
			MUN5236				
			MUN5214	0.17	0.21	0.25	
			MUN5215	-	-	-	
			MUN5216				
			MUN5230	0.8	1.0	1.2	
			MUN5231				
			MUN5232				
			MUN5233	0.055	0.1	0.185	
			MUN5234	0.38	0.47	0.56	
			MUN5235	0.038	0.047	0.056	
			MUN5237	1.7	2.1	2.6	

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

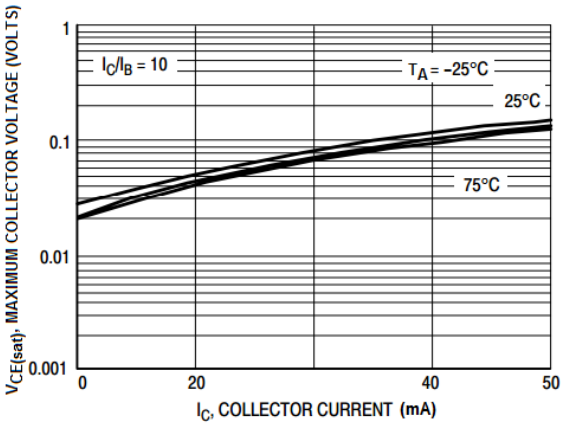
TYPICAL CHARACTERISTICS

MUN5211

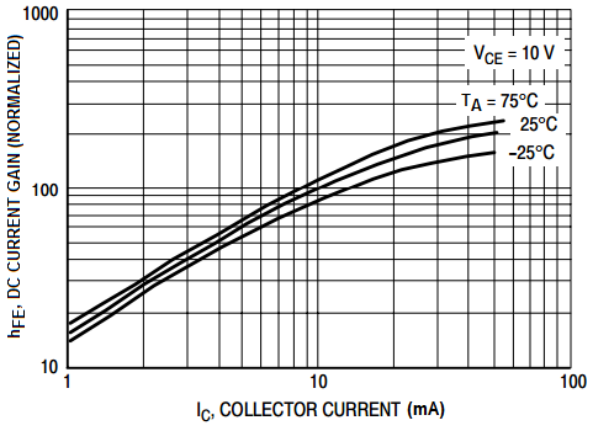
1. Derating Curve



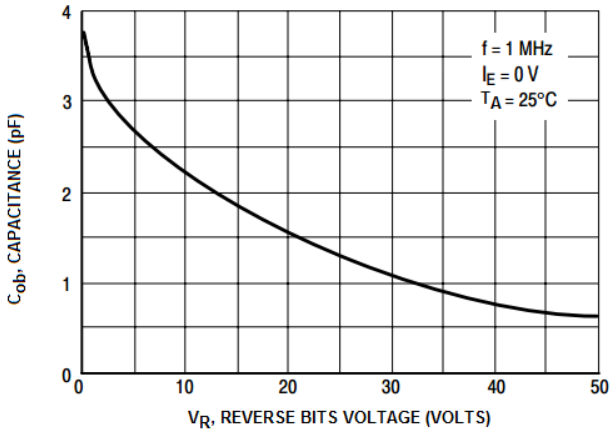
2. $V_{CE(sat)}$ vs. I_C



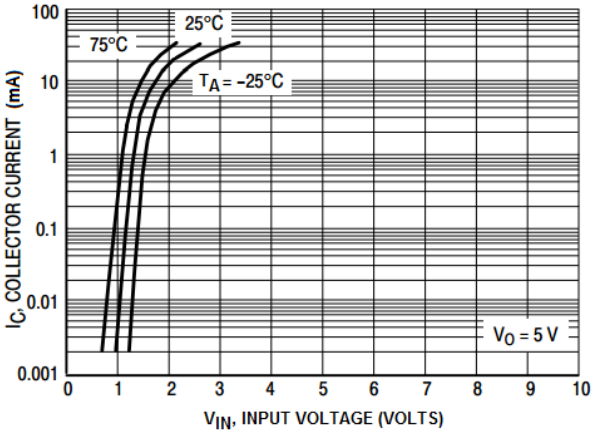
3. DC Current Gain



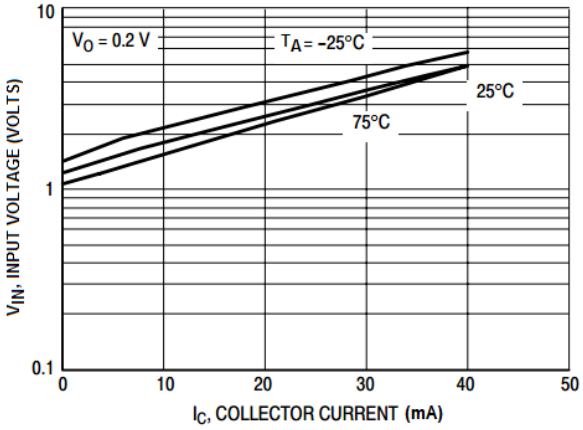
4. Output Capacitance



5. Output Current vs. Input Voltage

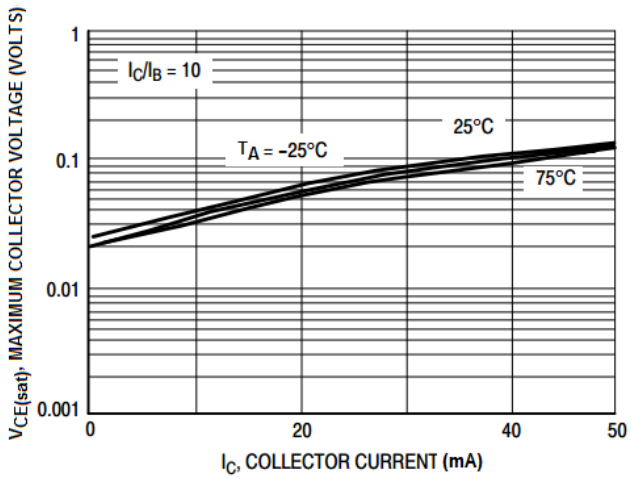


6. Input Voltage vs. Output Current

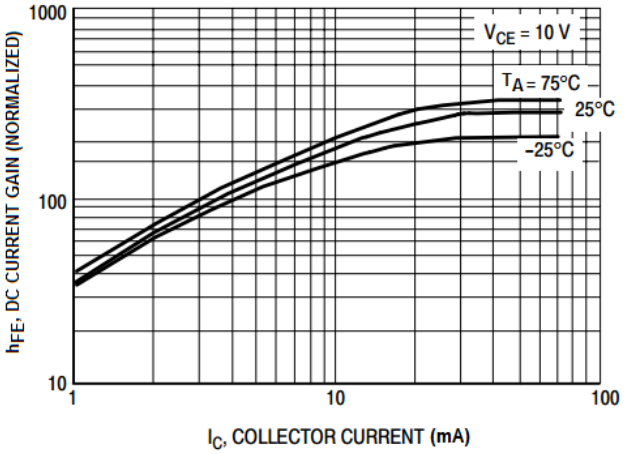


MUN5212

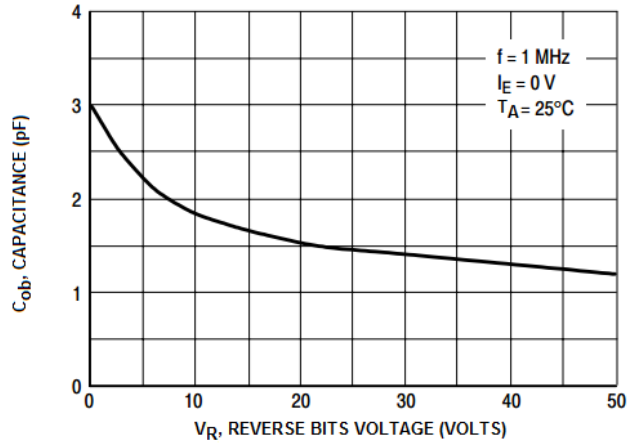
7. $V_{CE(sat)}$ vs. I_C



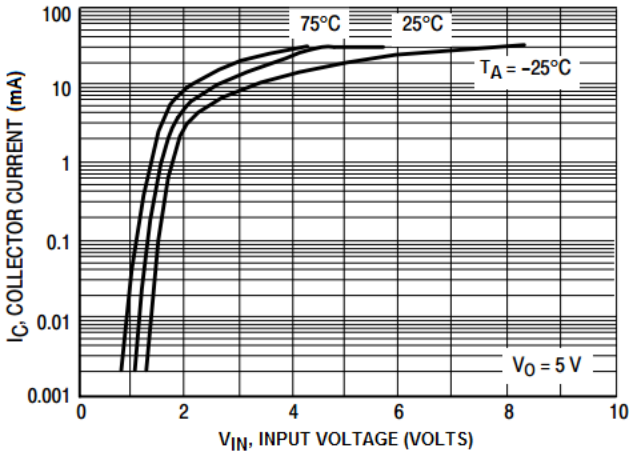
8. DC Current Gain



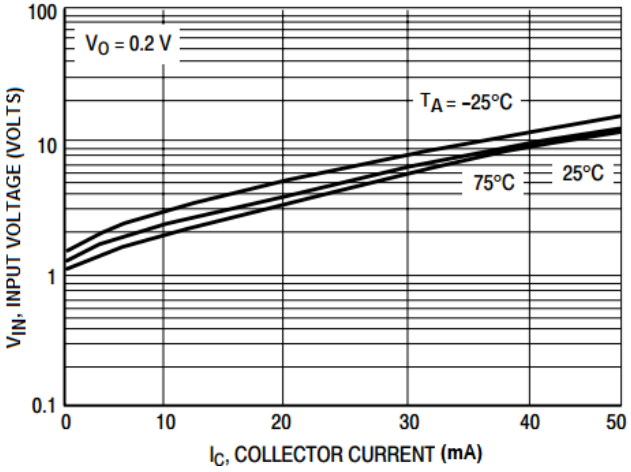
9. Output Capacitance



10. Output Current vs. Input Voltage

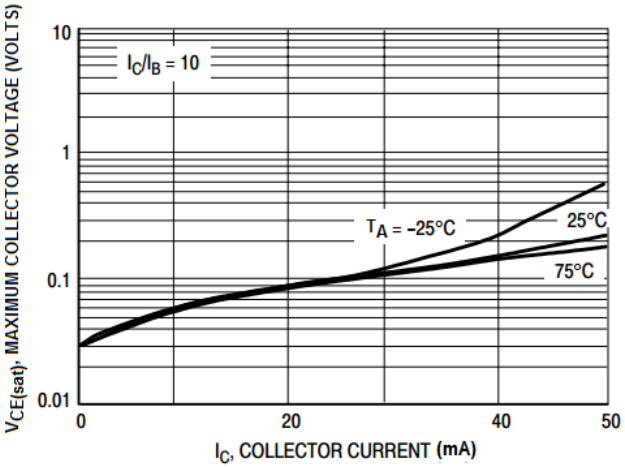


11. Input Voltage vs. Output Current

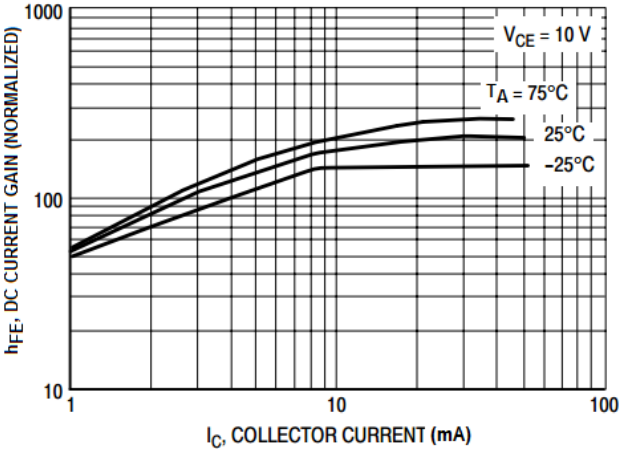


MUN5213

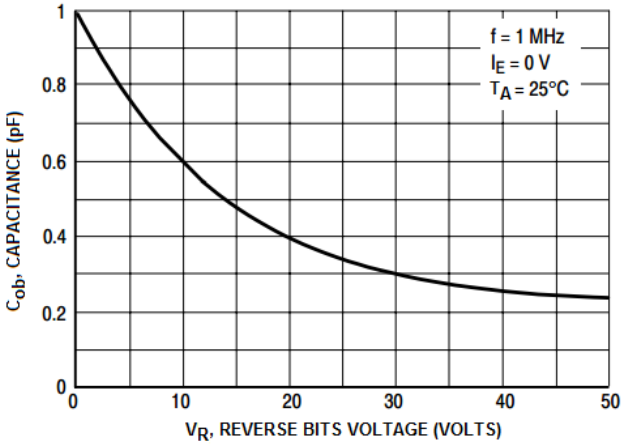
12. $V_{CE(sat)}$ vs. I_C



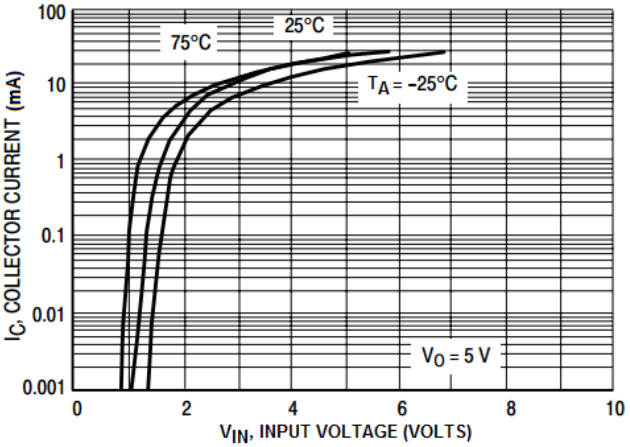
13. DC Current Gain



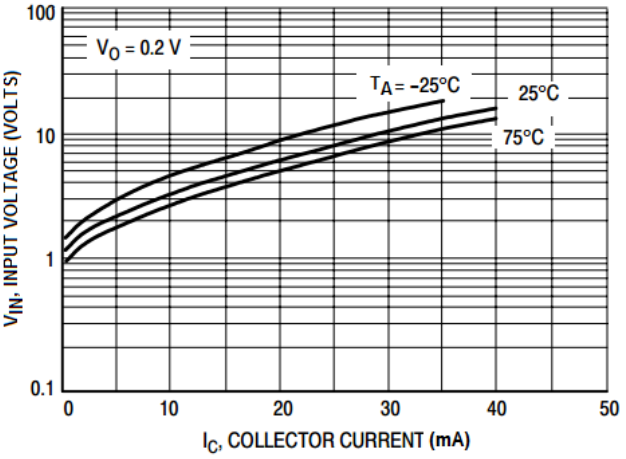
14. Output Capacitance



15. Output Current vs. Input Voltage

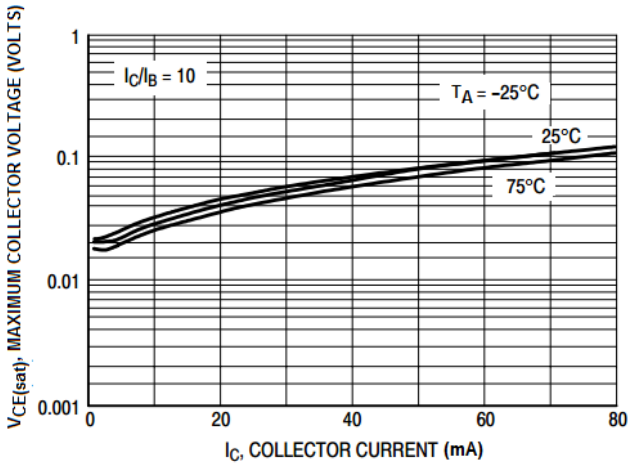


16. Input Voltage vs. Output Current

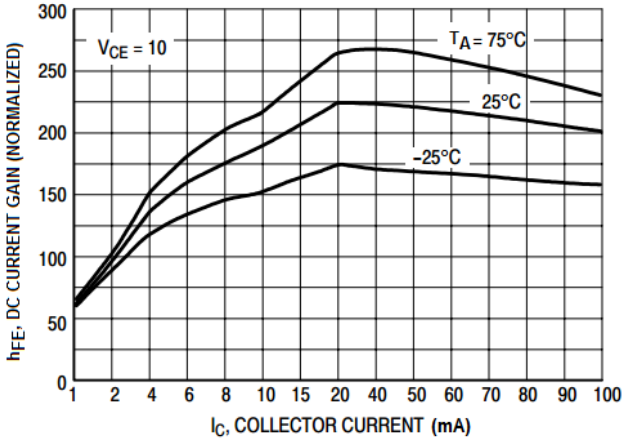


MUN5214

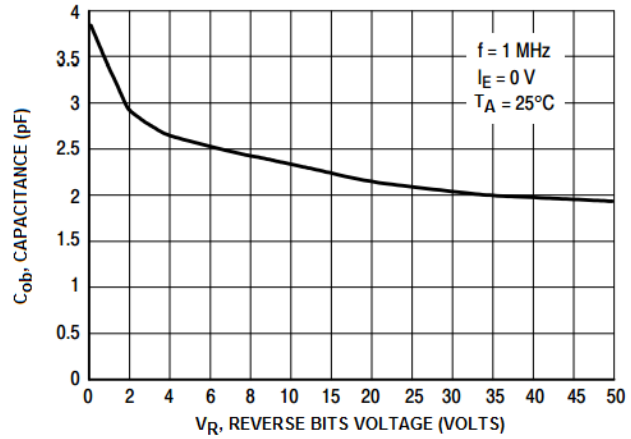
17. $V_{CE(sat)}$ vs. I_C



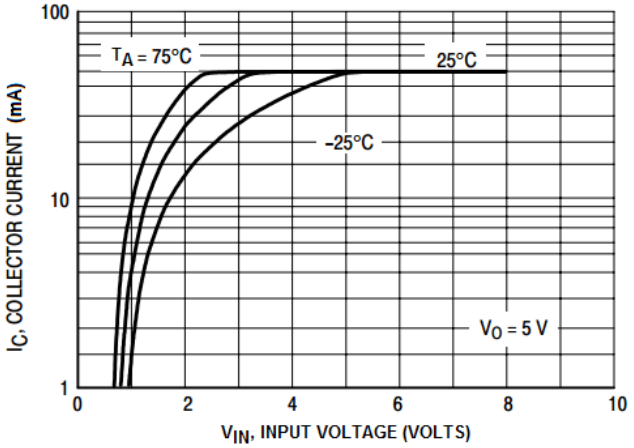
18. DC Current Gain



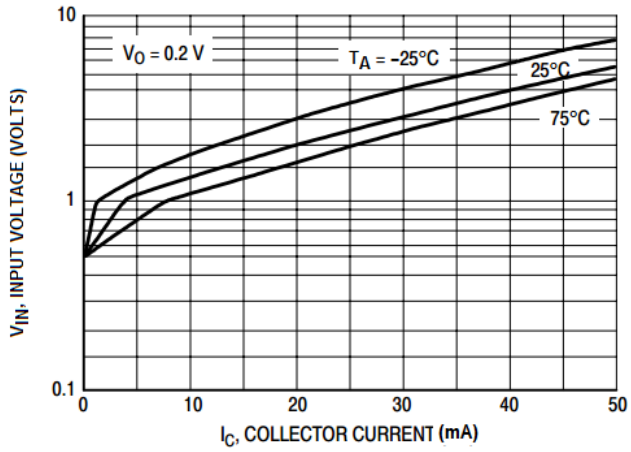
19. Output Capacitance



20. Output Current vs. Input Voltage

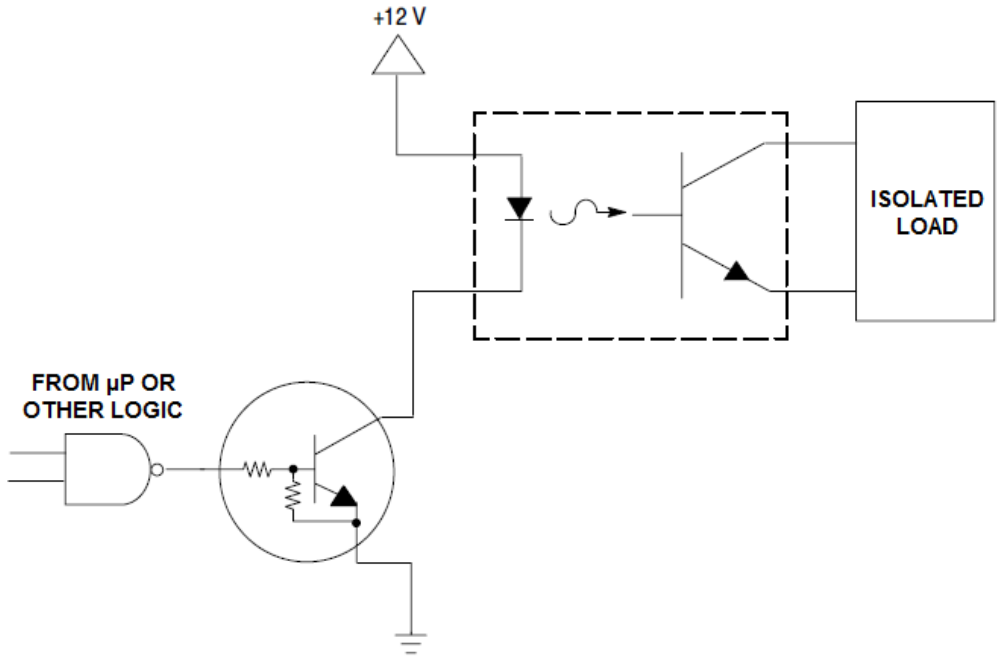


21. Input Voltage vs. Output Current

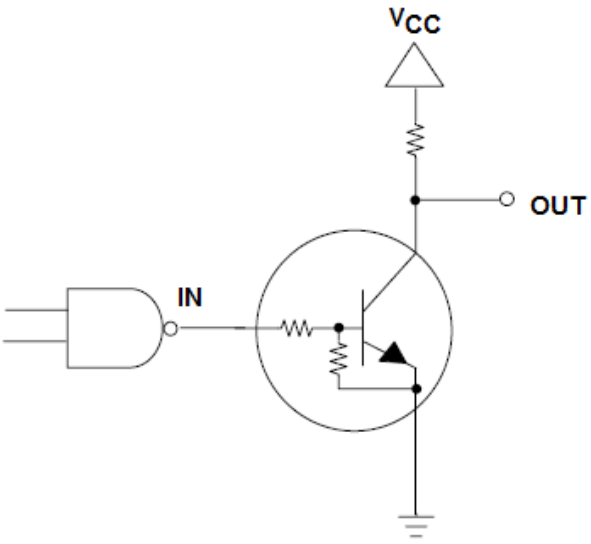


TYPICAL APPLICATIONS FOR NPN BRTs

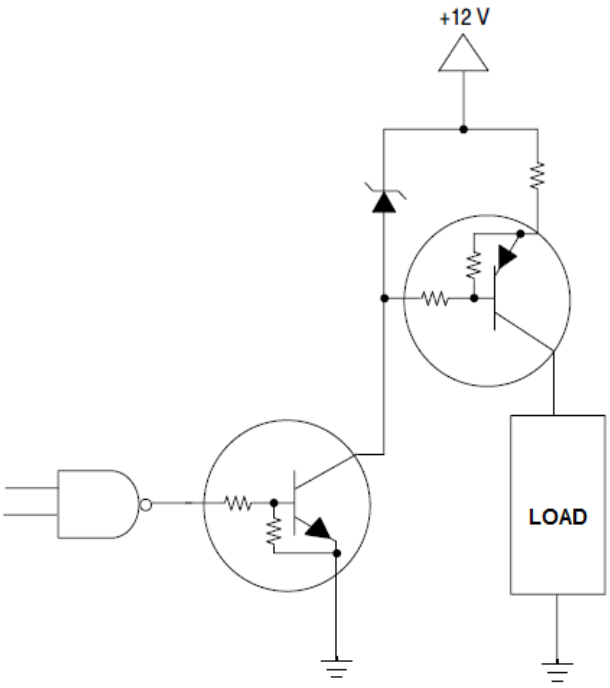
22. Level Shifter: Connects 12 or 24 Volt Circuits to Logic



23. Open Collector Inverter: Inverts the Input Signal

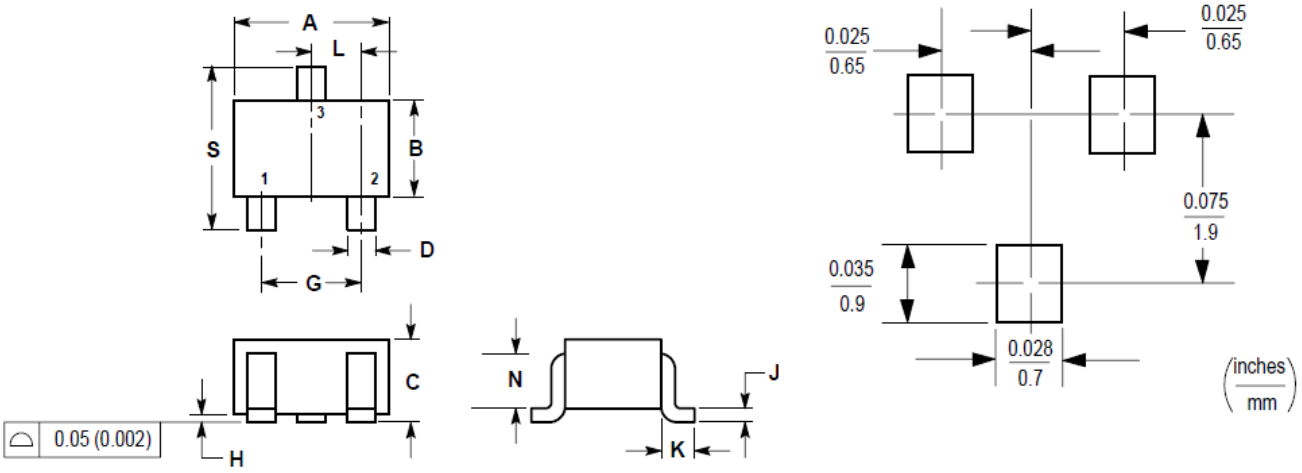


24. Inexpensive, Unregulated Current Source



PACKAGE INFORMATION

Dimension in SC-70 Package (Unit: mm)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.80	2.20	0.071	0.087
B	1.15	1.35	0.045	0.053
C	0.80	1.00	0.032	0.040
D	0.30	0.40	0.012	0.016
G	1.20	1.40	0.047	0.055
H	0.00	0.10	0.000	0.004
J	0.10	0.25	0.004	0.010
K	0.425REF		0.017REF	
L	0.650BSC		0.026BSC	
N	0.700REF		0.028REF	
S	2.00	2.40	0.079	0.095

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