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 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 SOT-23 package which is designed for low power surface mount applications.

The MUN2211~MUN2241 are available in SOT-23 Package.

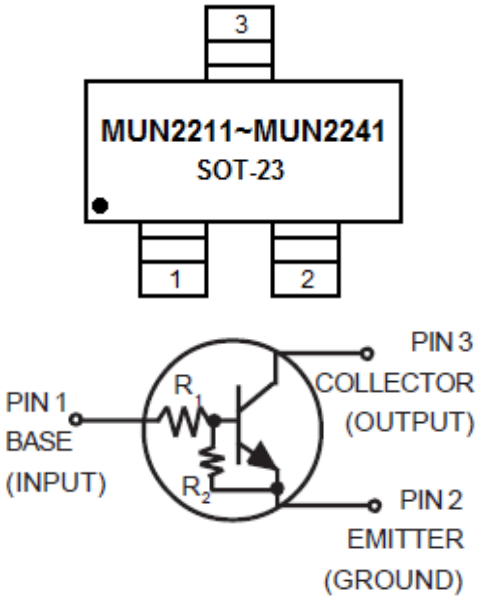
FEATURES

- Simplifies Circuit Design
- Reduces Board Space and Component Count
- The SOT-23 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 SOT-23 Package

ORDERING INFORMATION

Package Type	Part Number
SOT-23	MUN2211
	MUN2212
	MUN2213
	MUN2214
	MUN2215
	MUN2216
	MUN2230
	MUN2231
	MUN2232
	MUN2233
	MUN2234
	MUN2235
	MUN2238
	MUN2241
Note	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
P_D, Total Power Dissipation	
@ T_A = 25°C NOTE1	246mW
Derate above 25°C	1.5°C/W

NOTE1: Device mounted on a FR-4 glass epoxy printed circuit board using the minimum recommended footprint.

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance-Junction-to-Ambient NOTE1	$R_{\theta JA}$	508	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 ~ +150	°C
Maximum Temperature for Soldering Purposes,	T_L	260	°C
Time in Solder Bath		10	Sec

NOTE1: Device mounted on a FR-4 glass epoxy printed circuit board using the minimum recommended footprint.

ELECTRICAL CHARACTERISTICS

T_A = 25°C, unless otherwise noted.

Parameter	Symbol	Characteristic		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	MUN2211	-	-	0.5	mAdc
			MUN2212			0.2	
			MUN2213			0.1	
			MUN2214			0.2	
			MUN2215			0.9	
			MUN2216			1.9	
			MUN2230			4.3	
			MUN2231			2.3	
			MUN2232			1.5	
			MUN2233			0.18	
			MUN2234			0.13	
			MUN2235			0.2	
			MUN2238			4.0	
			MUN2241			0.1	
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C = 10μA, I_E = 0		50	-	-	Vdc
Collector-Emitter Breakdown Voltage NOTE2	$V_{(BR)CEO}$	I_C = 2.0mA, I_B = 0		50	-	-	Vdc

NOTE2: Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%.

T_A = 25°C, unless otherwise noted.

Parameter	Symbol	Characteristic		Min	Typ	Max	Unit
ON CHARACTERISTICS NOTE2							
DC Current Gain	h_{FE}	V_{CE} = 10V, I_C = 5.0mA	MUN2211	35	60	-	-
			MUN2212	60	100		
			MUN2213	80	140		
			MUN2214	80	140		
			MUN2215	160	350		
			MUN2216	160	350		
			MUN2230	3.0	5.0		
			MUN2231	8.0	15		
			MUN2232	15	30		
			MUN2233	80	200		
			MUN2234	80	150		
			MUN2235	80	140		
			MUN2238	160	350		
			MUN2241	160	350		
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 10mA, I_B = 0.3mA		-	-	0.25	Vdc
		I_C = 10mA, I_B = 5mA	MUN2230				
			MUN2231				
		I_C = 10mA, I_B = 1mA	MUN2215				
			MUN2216				
			MUN2232				
			MUN2233				
			MUN2234				
			MUN2235				
			MUN2238				

NOTE2: Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%.

T_A = 25°C, unless otherwise noted.

Parameter	Symbol	Characteristic		Min	Typ	Max	Unit
ON CHARACTERISTICS NOTE2							
Output Voltage (on)	V_{OL}	V_{CC} = 5.0V, V_B = 2.5V, R_L = 1.0kΩ	MUN2211	-	-	0.2	Vdc
			MUN2212				
			MUN2214				
			MUN2215				
			MUN2216				
			MUN2230				
			MUN2231				
			MUN2232				
			MUN2233				
			MUN2234				
			MUN2235				
			MUN2238				
		V_{CC} = 5.0V, V_B = 3.5V, R_L = 1.0kΩ	MUN2213				
		V_{CC} = 5.0V, V_B = 5.0V, R_L = 1.0kΩ	MUN2241				
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	MUN2230				
		V_{CC} = 5.0V, V_B = 0.25V, R_L = 1.0kΩ	MUN2215				
			MUN2216				
			MUN2233				
			MUN2238				

NOTE2: Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%.

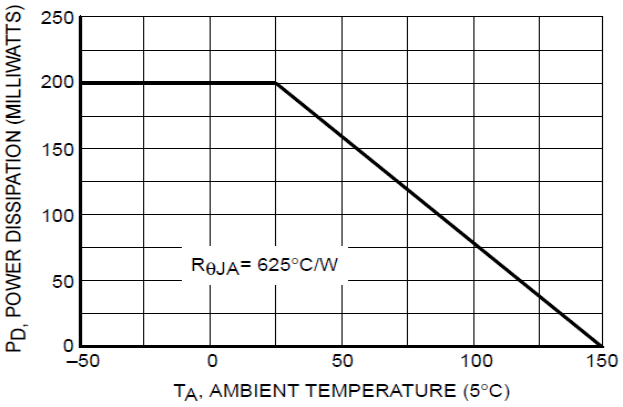
T_A = 25°C unless otherwise noted.

Parameter	Symbol	Characteristic		Min	Typ	Max	Unit
ON CHARACTERISTICS NOTE2							
Input Resistor	R_1		MUN2211	7.0	10	13	kΩ
			MUN2212	15.4	22	28.6	
			MUN2213	32.9	47	61.1	
			MUN2214	7.0	10	13	
			MUN2215	7.0	10	13	
			MUN2216	3.3	4.7	6.1	
			MUN2230	0.7	1.0	1.3	
			MUN2231	1.5	2.2	2.9	
			MUN2232	3.3	4.7	6.1	
			MUN2233	3.3	4.7	6.1	
			MUN2234	15.4	22	28.6	
			MUN2235	1.54	2.2	2.86	
			MUN2238	1.54	2.2	2.88	
			MUN2241	70	100	130	
Resistor Ratio	R_1/R_2		MUN2211	0.8	1.0	1.2	
			MUN2212				
			MUN2213				
			MUN2214	0.17	0.21	0.25	
			MUN2215	-	-	-	
			MUN2216				
			MUN2238				
			MUN2241	-	-	-	
			MUN2230	0.8	1.0	1.2	
			MUN2231				
			MUN2232				
			MUN2233	0.055	0.1	0.185	
			MUN2234	0.38	0.47	0.56	
			MUN2235	0.038	0.047	0.056	

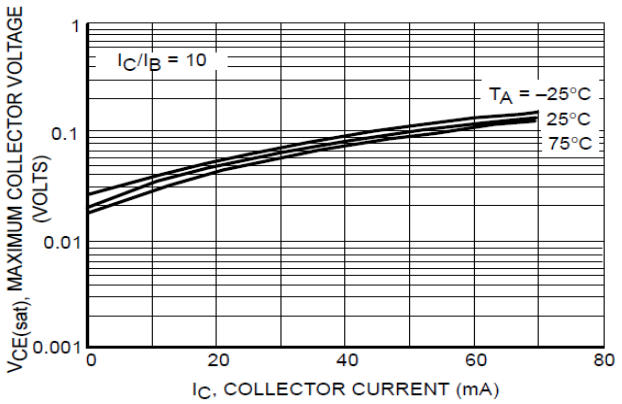
NOTE3: Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%.

TYPICAL PERFORMANCE CHARACTERISTICS

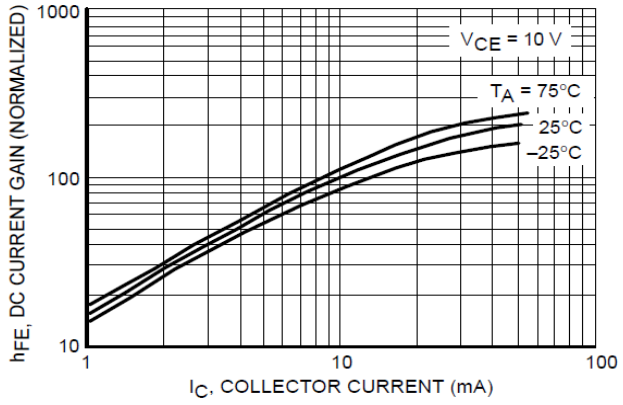
1. Derating Curve



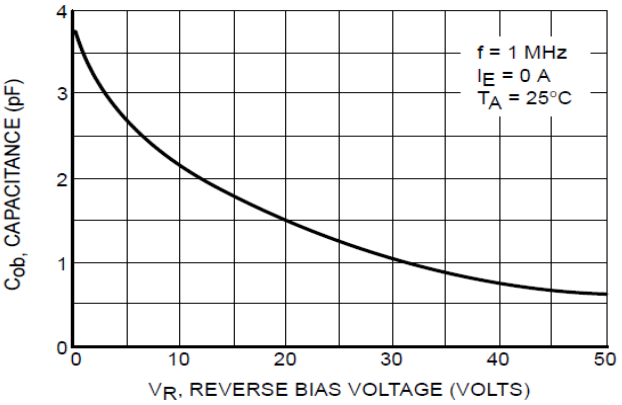
2. $V_{CE(sat)}$ vs. I_C



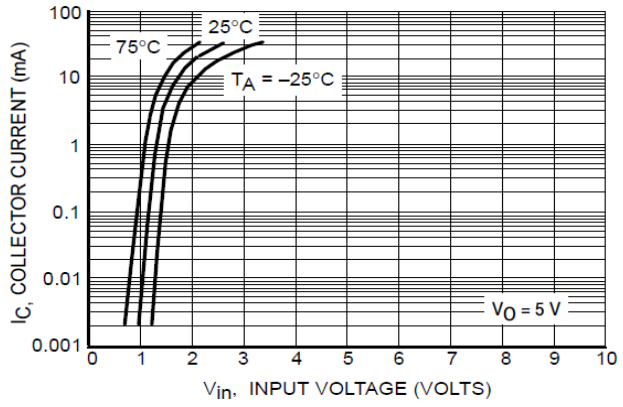
3. DC Current Gain



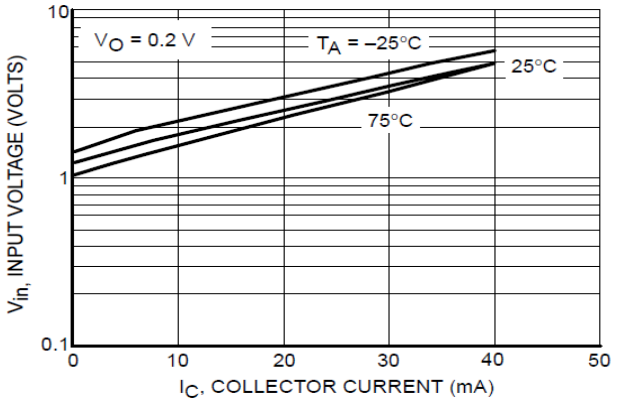
4. Output Capacitance



5. Output Current vs. Input Voltage

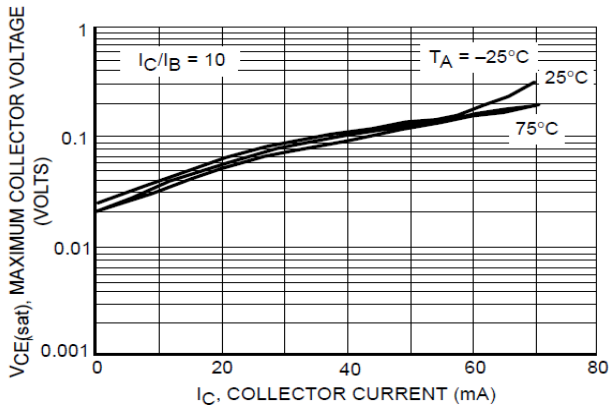


6. Input Voltage vs. Output Current

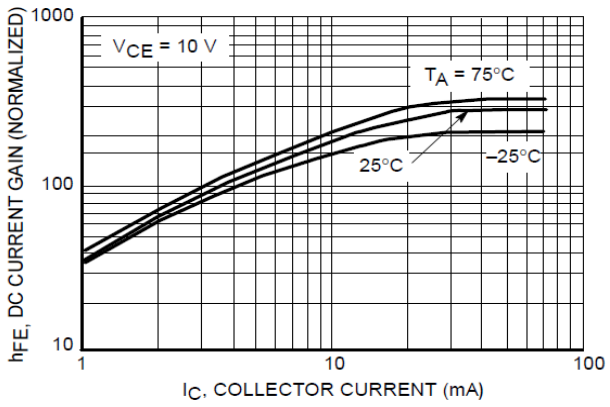


MUN2212

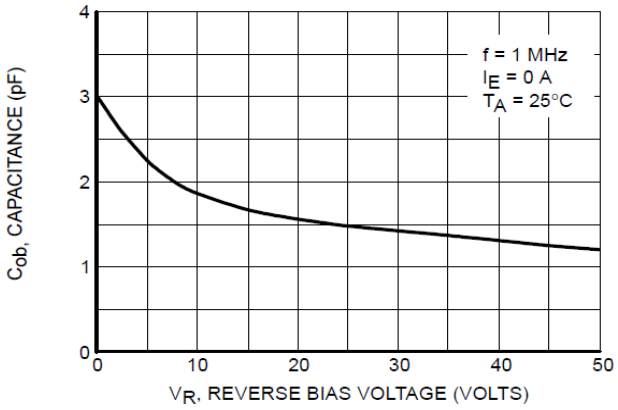
7. $V_{CE(sat)}$ vs. I_C



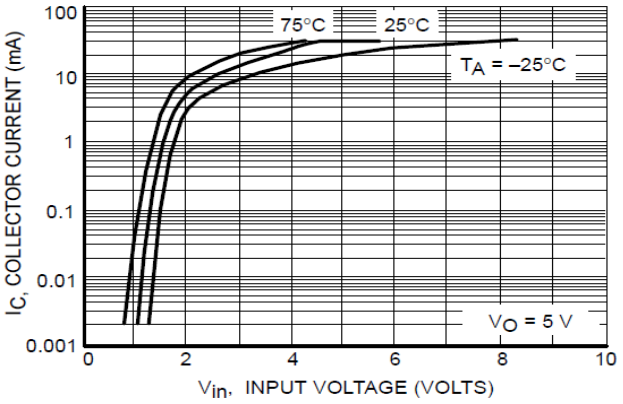
8. DC Current Gain



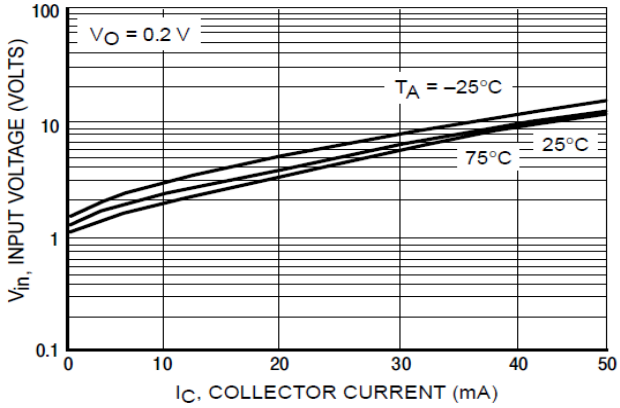
9. Output Capacitance



10. Output Current vs. Input Voltage

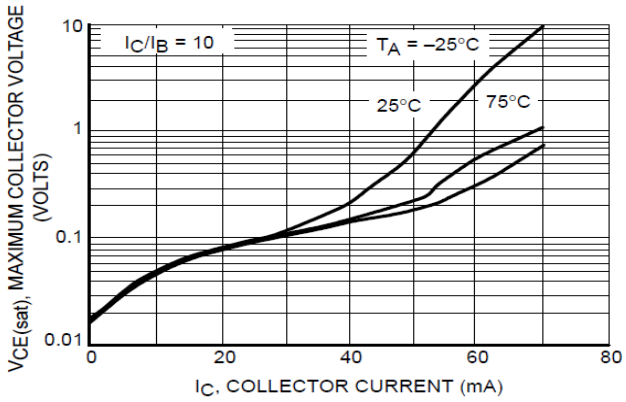


11. Input Voltage vs. Output Current

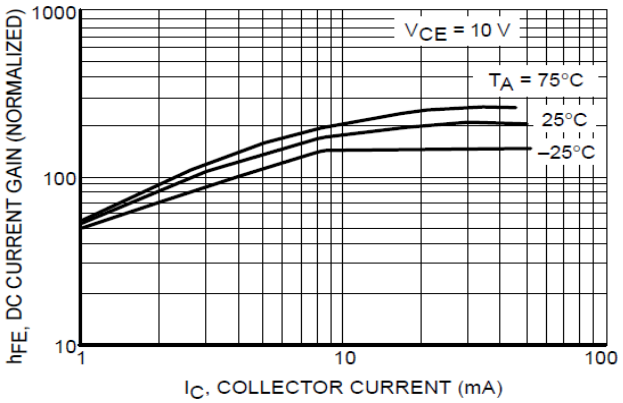


MUN2213

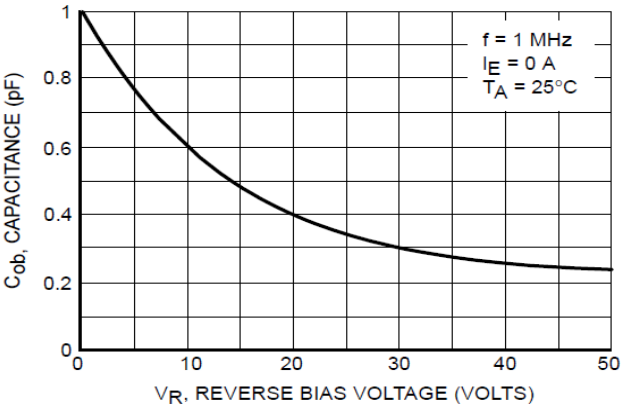
12. $V_{CE(sat)}$ vs. I_C



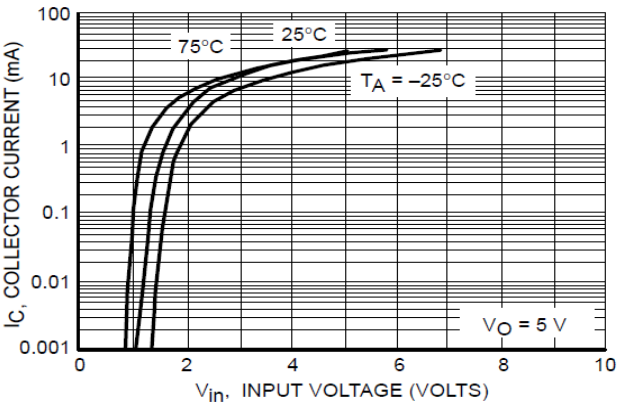
13. DC Current Gain



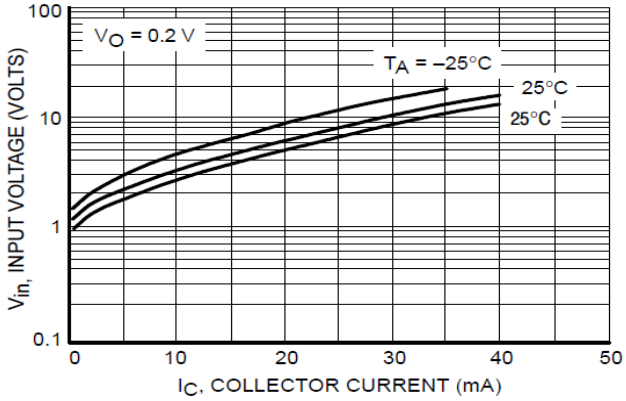
14. Output Capacitance



15. Output Current vs. Input Voltage

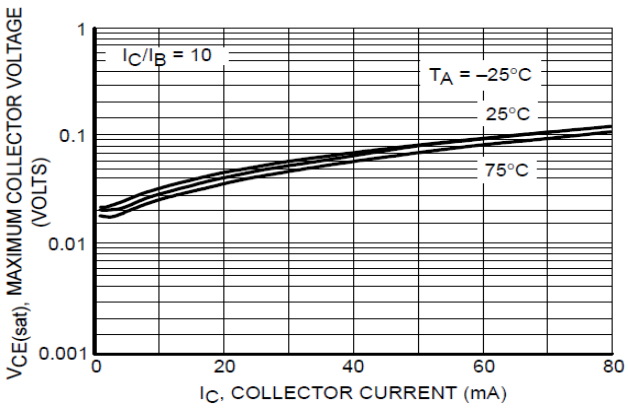


16. Input Voltage vs. Output Current

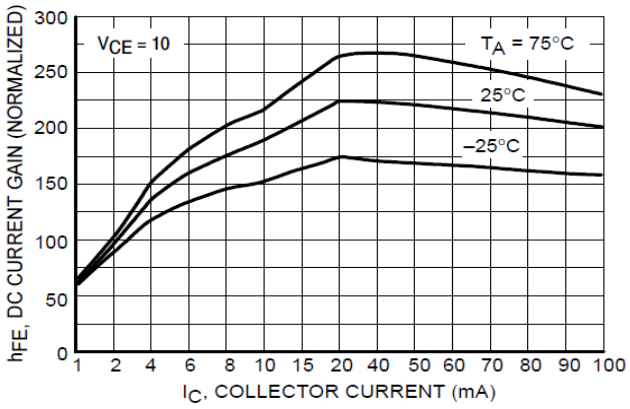


MUN2214

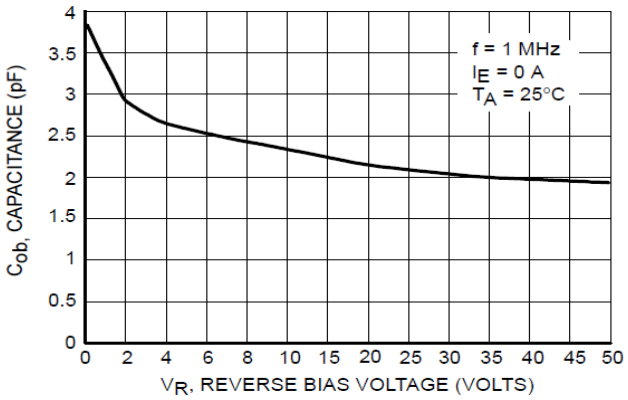
17. $V_{CE(sat)}$ vs. I_C



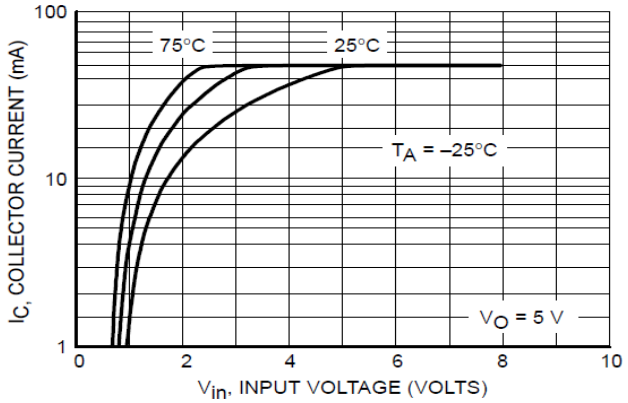
18. DC Current Gain



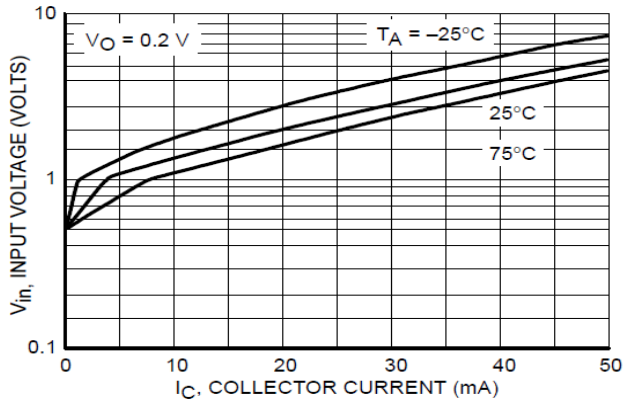
19. Output Capacitance



20. Output Current vs. Input Voltage

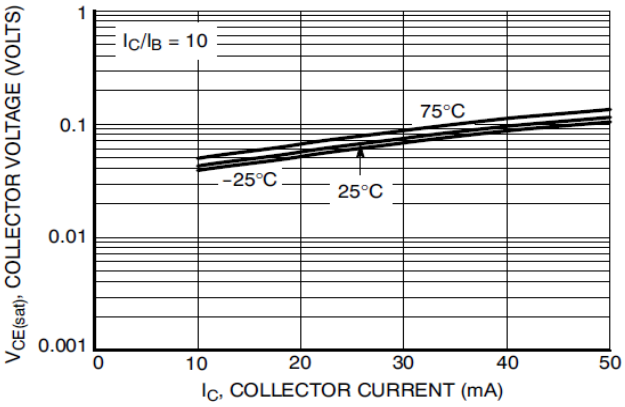


21. Input Voltage vs. Output Current

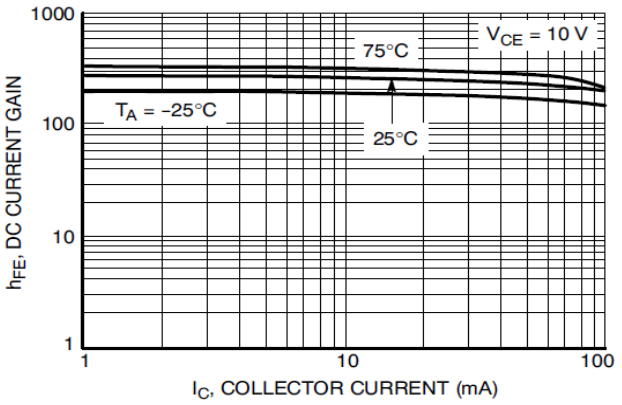


MUN2215

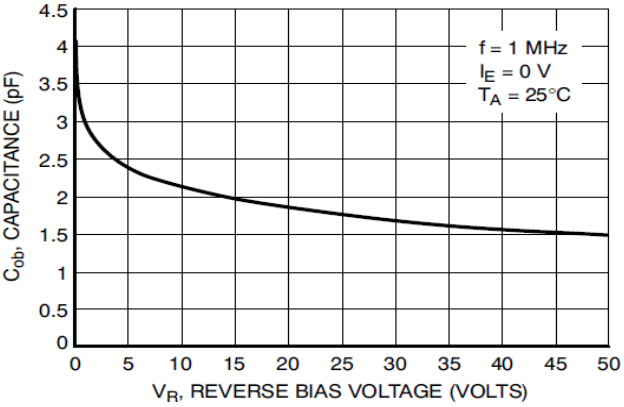
22. $V_{CE(sat)}$ versus I_C



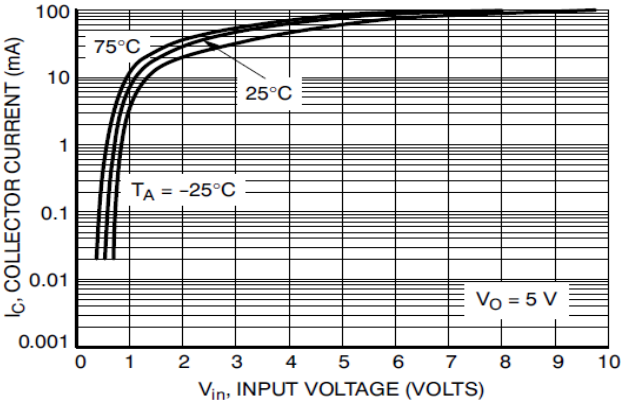
23. DC Current Gain



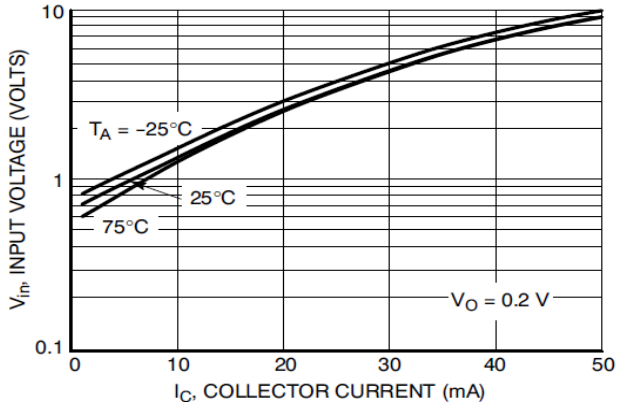
24. Output Capacitance



25. Output Current versus Input Voltage

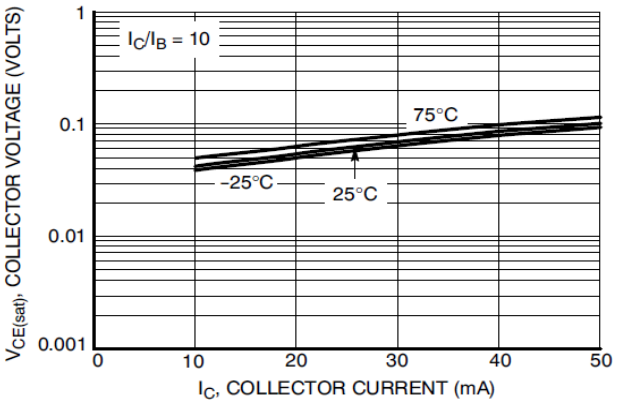


26. Input Voltage versus Output Current

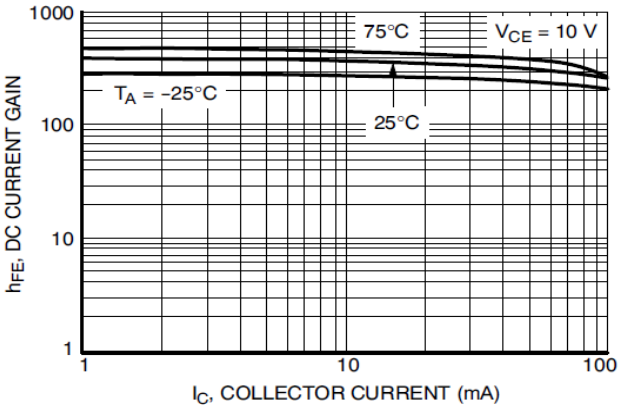


MUN2216

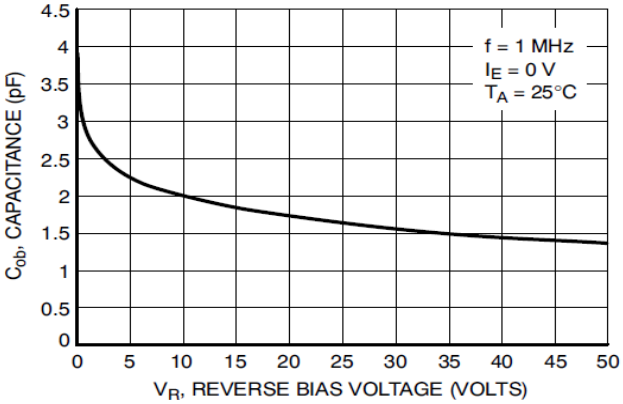
27. $V_{CE(sat)}$ versus I_C



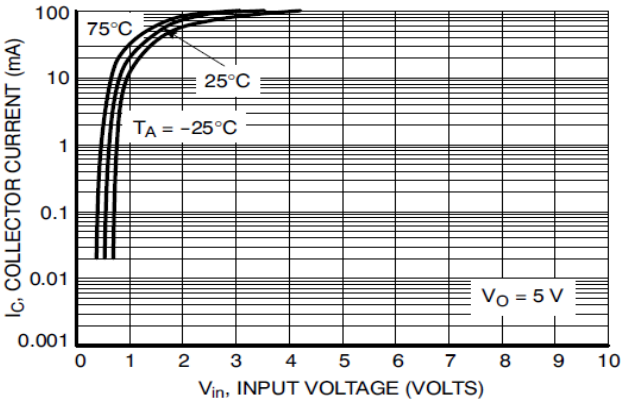
28. DC Current Gain



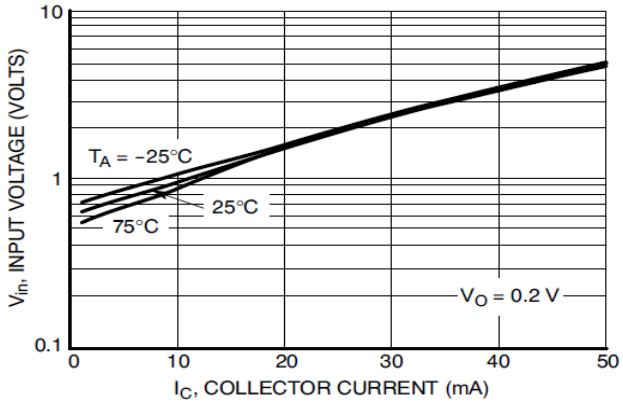
29. Output Capacitance



30. Output Current versus Input Voltage

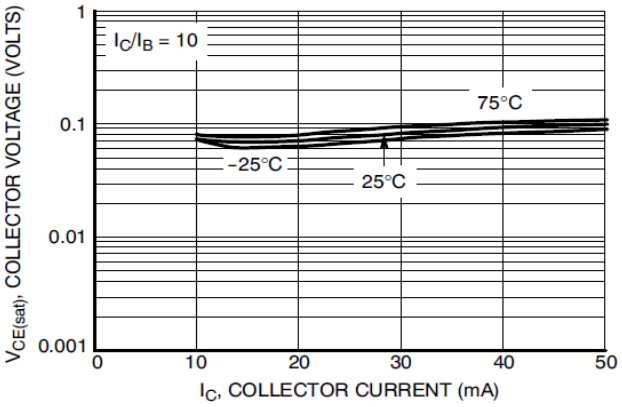


31. Input Voltage versus Output Current

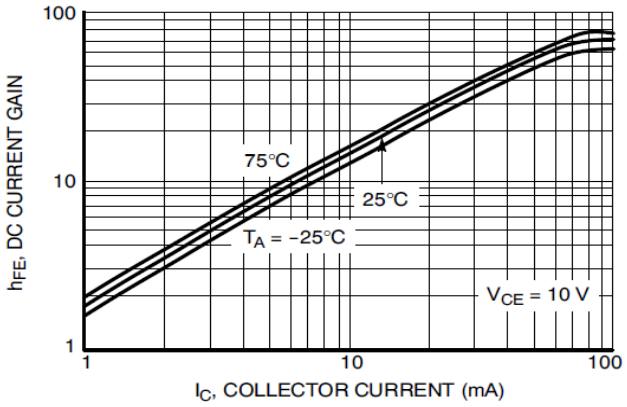


MUN2230

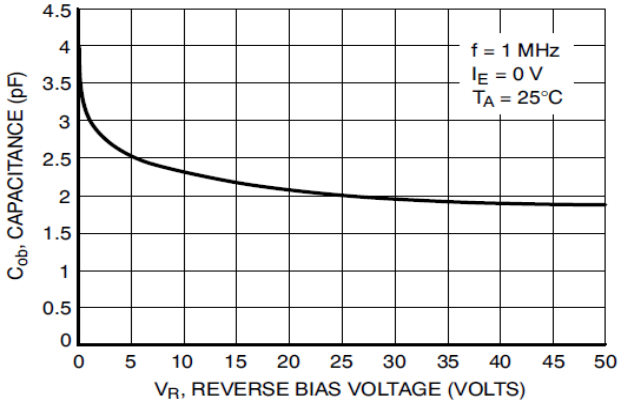
32. $V_{CE(sat)}$ versus I_C



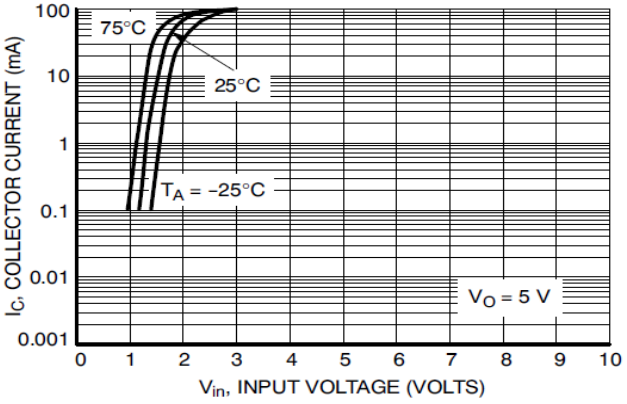
33. DC Current Gain



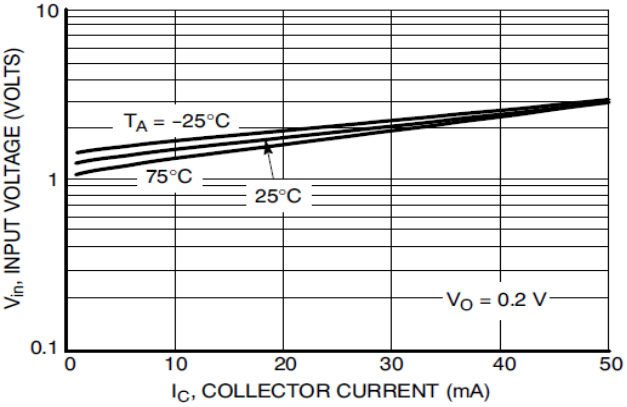
34. Output Capacitance



35. Output Current versus Input Voltage

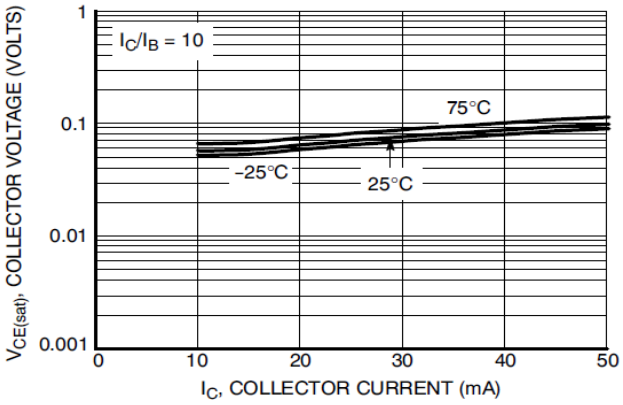


36. Input Voltage versus Output Current

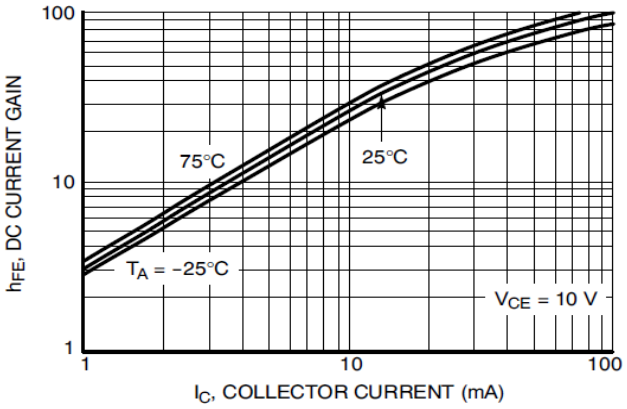


MUN2231

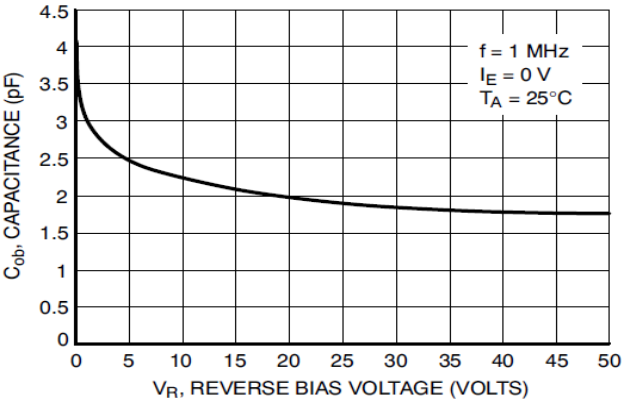
37. $V_{CE(sat)}$ versus I_C



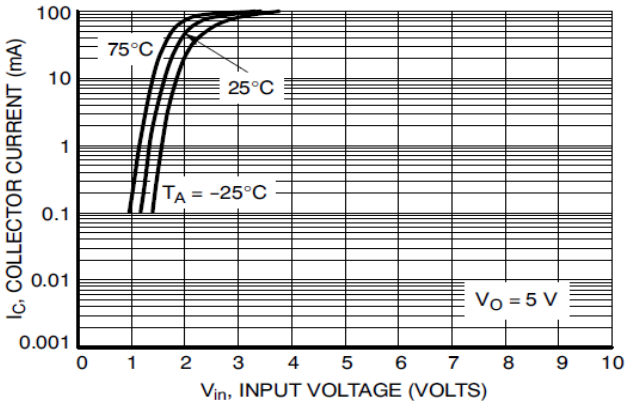
38. DC Current Gain



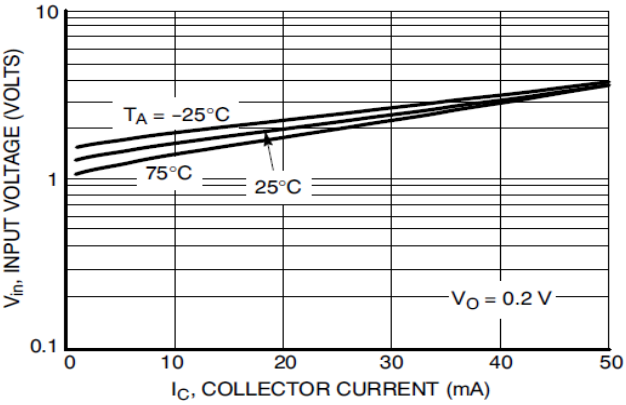
39. Output Capacitance



40. Output Current versus Input Voltage

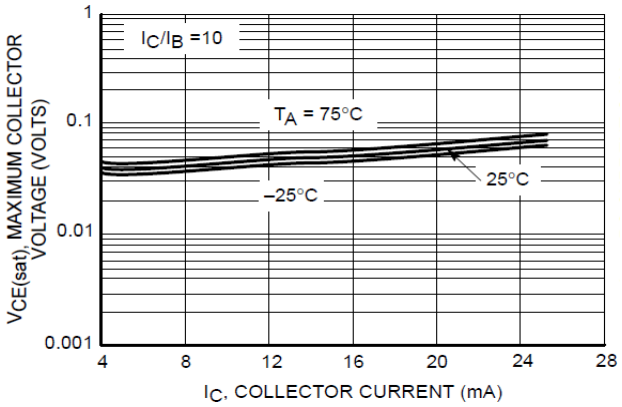


41. Input Voltage versus Output Current

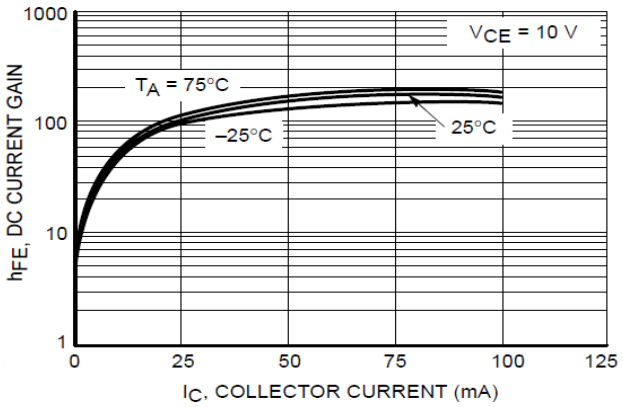


MUN2232

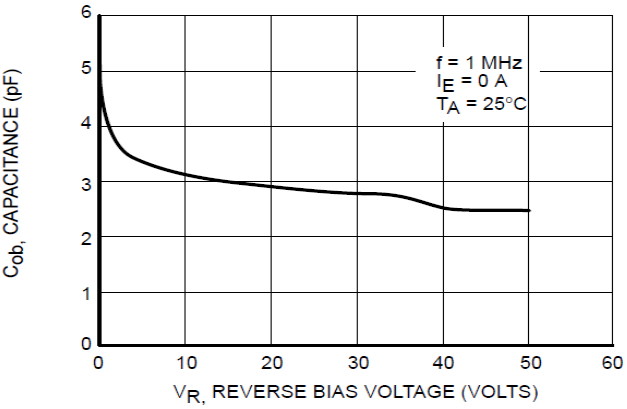
42. $V_{CE(sat)}$ vs. I_C



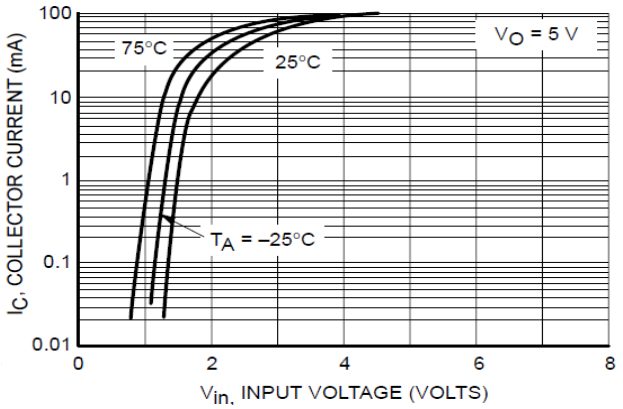
43. DC Current Gain



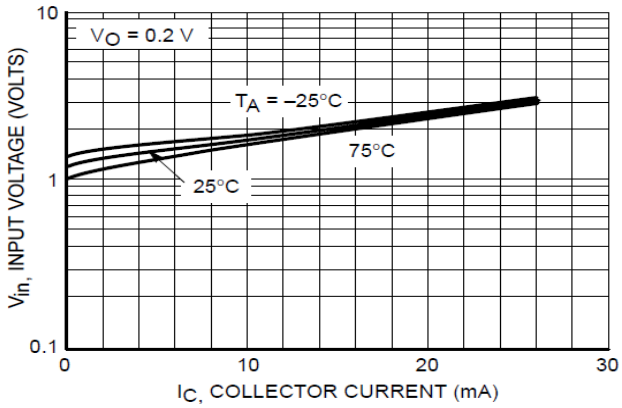
44. Output Capacitance



45. Output Current vs. Input Voltage

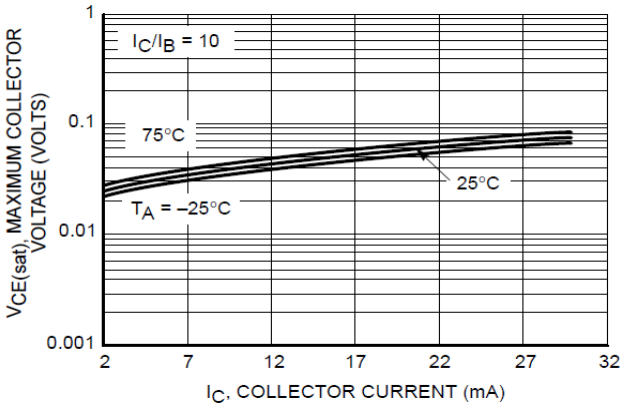


46. Output Voltage vs. Input Current

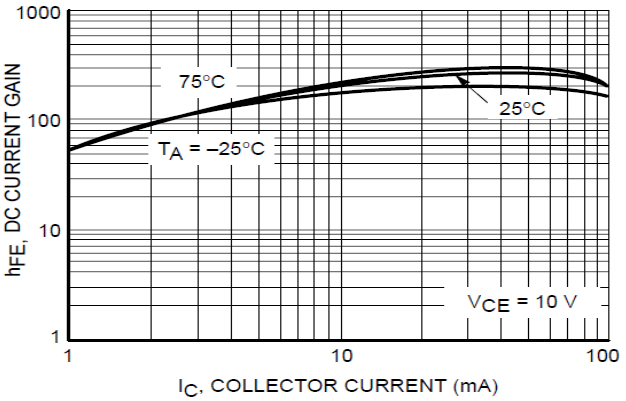


MUN2233

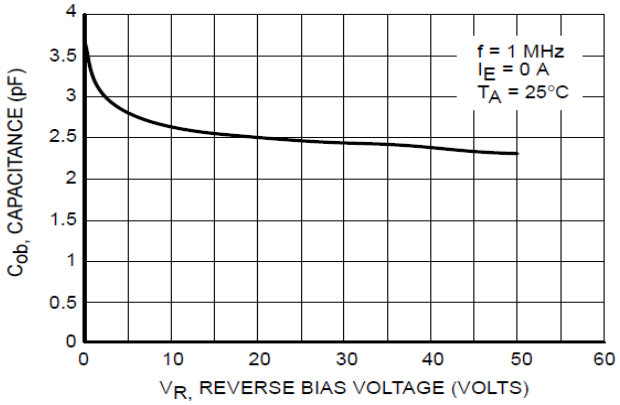
47. $V_{CE(sat)}$ vs. I_C



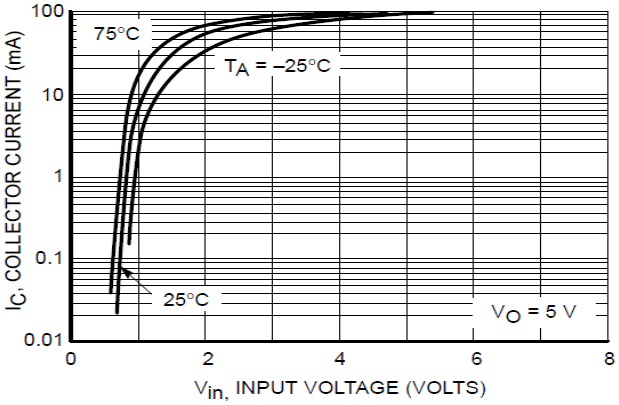
48. DC Current Gain



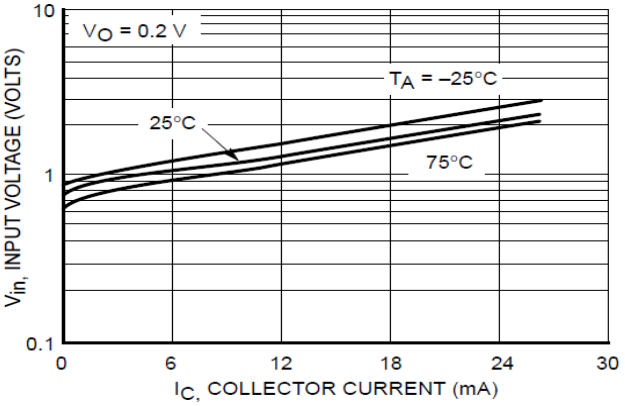
49. Figure 49. Output Capacitance



50. Figure 50. Output Current vs. Input Voltage

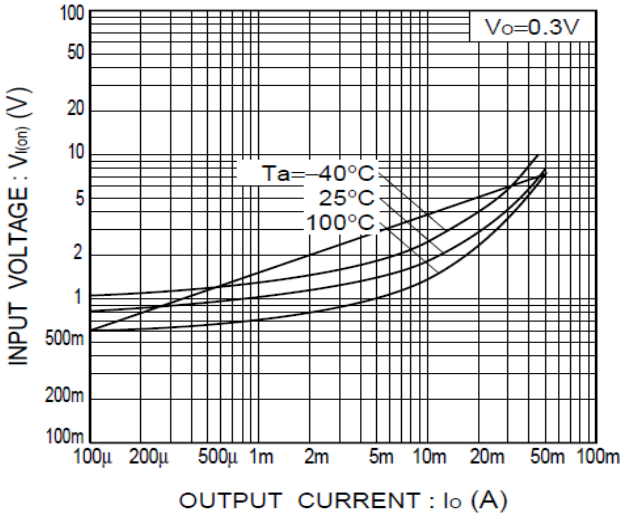


51. Input Voltage vs. Output Current

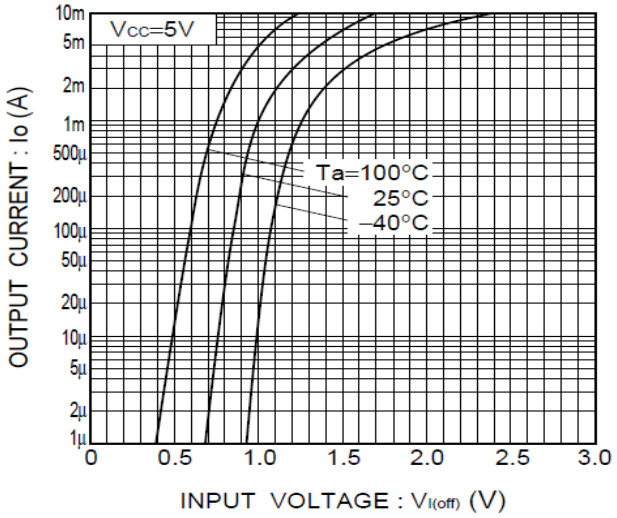


MUN2234

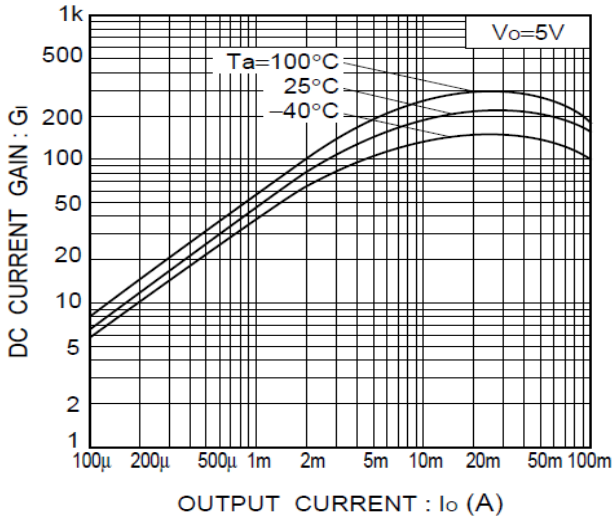
52. Input voltage vs. output current (ON characteristics)



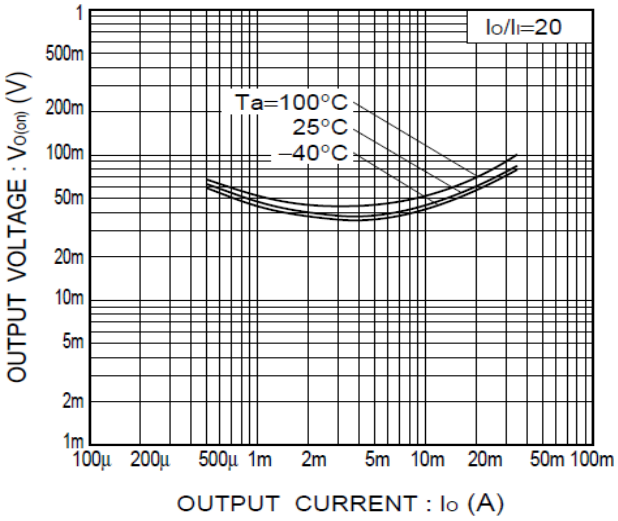
53. Output current vs. input voltage (OFF characteristics)



54. DC current gain vs. output current

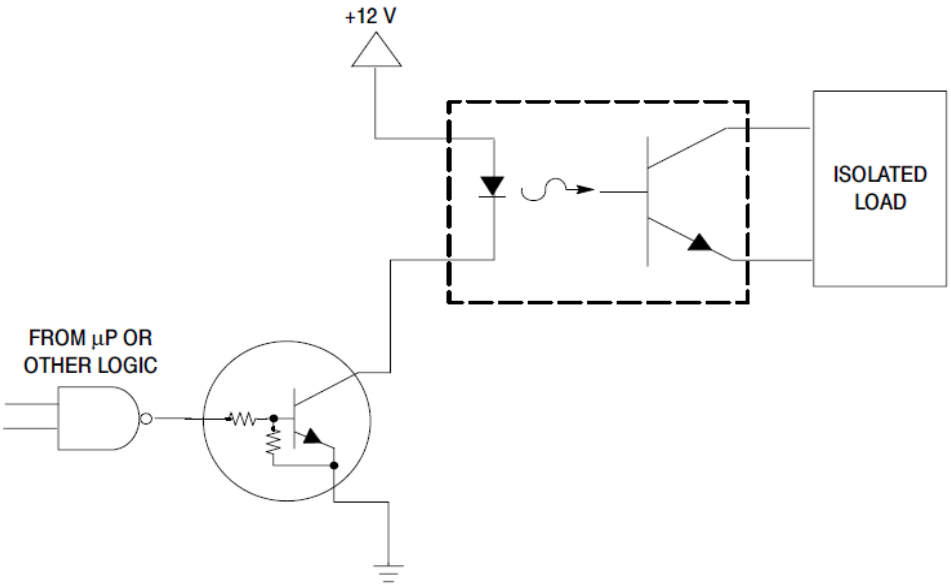


55. Output voltage vs. output current

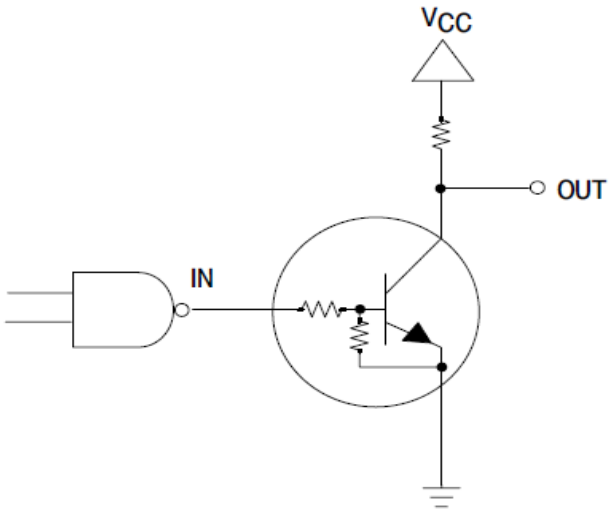


NPN BRTs

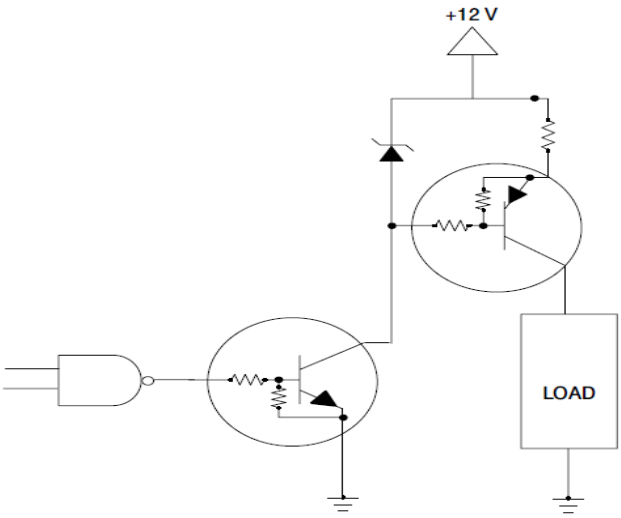
56. Level Shifter: Connects 12 or 24 Volt Circuits to Logic



57. Open Collector Inverter: Inverts the Input Signal

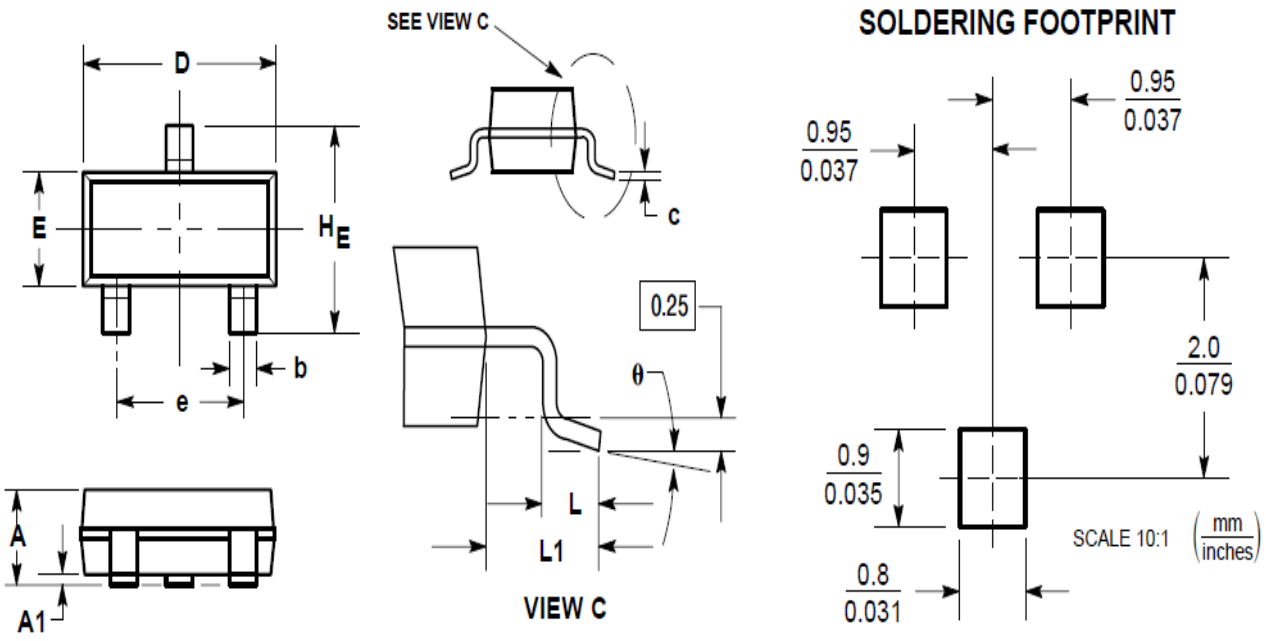


58. Inexpensive, Unregulated Current Source



PACKAGE INFORMATION

Dimension in SOT-23 Package (Unit: mm)



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.035	0.044	0.89	1.11
A1	0.001	0.004	0.01	0.10
b	0.015	0.020	0.37	0.50
c	0.003	0.007	0.09	0.18
D	0.110	0.120	2.80	3.04
E	0.047	0.055	2.30	1.40
e	0.070	0.081	1.78	2.04
L	0.004	0.012	0.10	0.30
L1	0.014	0.029	0.35	0.69
H_E	0.083	0.104	2.10	2.64

IMPORTANT NOTICE

AiT Components (AiT) reserves the right to make changes to any its product, specifications, to discontinue any integrated circuit product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

AiT Components' integrated circuit products are not designed, intended, authorized, or warranted to be suitable for use in life support applications, devices or systems or other critical applications. Use of AiT products in such applications is understood to be fully at the risk of the customer. As used herein may involve potential risks of death, personal injury, or servere property, or environmental damage. In order to minimize risks associated with the customer's applications, the customer should provide adequate design and operating safeguards.

AiT Components assumes to no liability to customer product design or application support. AiT warrants the performance of its products of the specifications applicable at the time of sale.