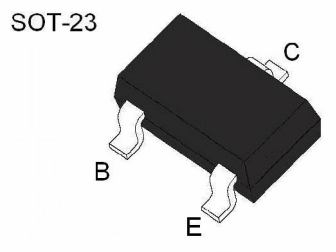
SOT-23 Bias Resistor Transistor (NPN)

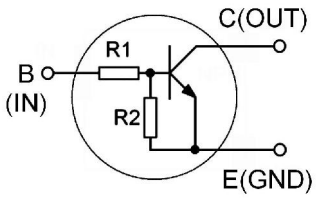
Description

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

Feature

- Simplifies circuit design
- Reduces board space and component count
- Pb−Free packages are available





Absolute Maximum Ratings (T_A=25℃)

Parameter	Symbol	Value	Unit
Collector-Base Voltage	BV_{CBO}	50	V
Collector-Emitter Voltage	BV_{CEO}	50	V
Collector Current	I_C	100	mA

Device Marking and Resistor Values

Part Number	Marking	Resistor (KΩ)	
		R1	R2
MUN2211	A8A	10	10
MUN2212	A8B	22	22
MUN2213	A8C	47	47
MUN2214	A8D	10	47
MUN2215	A8E	10	∞
MUN2216	A8F	4.7	∞
MUN2230	A8G	1.0	1.0
MUN2231	A8H	2.2	2.2
MUN2232	A8J	4.7	4.7
MUN2233	A8K	4.7	47
MUN2234	A8L	22	47
MUN2235	A8M	2.2	47
MUN2236	A8N	100	100
MUN2237	A8P	47	22
MUN2238	A8R	2.2	∞
MUN2240	A8T	47	∞
MUN2241	A8U	100	∞

Electrical Characteristics (T_A=25℃ unless otherwise specified)

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Off Characteristics							
Collector-Base Breakdown Voltage		BV_{CBO}	I_C = 10μA, I_E = 0				
Collector-Emitter Breakdown Voltage		BV_{CEO}	I_C = 2.0mA, I_B = 0				
Collector-Base cut-off current		I_{CBO}	V_{CB} = 50V, I_E = 0			100	nA
Collector-Emitter cut-off current		I_{CEO}	V_{CE} = 50V, I_E = 0			500	nA
Emitter-base cut-off current	MUN2211 MUN2212 MUN2213 MUN2214 MUN2215 MUN2216 MUN2230 MUN2231 MUN2232 MUN2233 MUN2234 MUN2235 MUN2236 MUN2237 MUN2238 MUN2240 MUN2241	I_{EBO}	V_{EB} = 6V, I_C = 0			0.5 0.2 0.1 0.2 0.9 1.9 4.3 2.3 1.5 0.18 0.13 0.2 0.05 0.13 4.0 0.2 0.1	mA
DC current gain	MUN2211 MUN2212 MUN2213 MUN2214 MUN2215 MUN2216 MUN2230 MUN2231 MUN2232 MUN2233 MUN2234 MUN2235 MUN2236 MUN2237 MUN2238 MUN2240 MUN2241	h_{FE}	V_{CE} = 10V, I_C = 5.0mA	35 60 80 80 160 160 3.0 8.0 15 80 80 80 80 50 160 160 160	60 100 140 140 350 350 5.0 15 30 200 150 140 150 150 140 350 350		
Collector-emitter saturation voltage	MUN2213/MUN2214 MUN2215/MUN2216 MUN2233/MUN2234 MUN2235/MUN2236 MUN2238/MUN2240 MUN2241	$V_{CE(sat)}$	I_C = 10mA, I_B =0.3mA			0.25	V
	MUN2211 MUN2212 MUN2237		I_C = 10mA, I_B =1.0mA			0.25	
	MUN2230 MUN2231 MUN2232		I_C = 10mA, I_B =5.0mA			0.25	

Electrical Characteristics (T_A=25℃ unless otherwise specified)

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
On Characteristics (Note 3)							
Output Voltage (on)	MUN2211 MUN2212 MUN2214 MUN2215 MUN2216 MUN2230 MUN2231 MUN2232 MUN2233 MUN2234 MUN2238	V_{OL}	V_{CC} = 5.0V,V_B = 2.5V R_L = 1.0KΩ			0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	
	MUN2213		V_{CC} = 5.0V,V_B = 3.5V R_L = 1.0KΩ			0.2	
	MUN2241		V_{CC} = 5.0V,V_B = 5.0V R_L = 1.0KΩ			0.2	
Output Voltage (off)	MUN2211 MUN2212 MUN2213 MUN2214 MUN2231 MUN2232 MUN2234 MUN2241	V_{OH}	V_{CC} = 5.0V,V_B = 0.5V R_L = 1.0KΩ	4.9			V
	MUN2230		V_{CC} = 5.0V,V_B = 0.05V R_L = 1.0KΩ				
	MUN2215 MUN2216 MUN2233 MUN2238		V_{CC} = 5.0V,V_B = 0.25V R_L = 1.0KΩ				
Input Resistor	MUN2211 MUN2212 MUN2213 MUN2214 MUN2215 MUN2216 MUN2230 MUN2231 MUN2232 MUN2233 MUN2234 MUN2235 MUN2236 MUN2237 MUN2238 MUN2241	R1		7 15.4 32.9 7.0 7.0 3.3 0.7 1.5 3.3 3.3 15.4 70 70 32.9 32.9 70	10 22 47 10 10 4.7 1 2.2 4.7 4.7 22 100 100 47 47 100	13 28.6 61.1 13 13 6.1 1.3 2.9 6.1 6.1 28.6 130 130 61.1 61.1 130	KΩ

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

Electrical Characteristics (T_A=25℃ unless otherwise specified)

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
On Characteristics (Note 4)							
Resistor Ratio	MUN2211 MUN2212 MUN2213 MUN2230 MUN2231 MUN2232 MUN2236	R1/R2		0.8	1.0	1.2	
	MUN2214			0.17	0.21	0.25	
	MUN2215 MUN2216 MUN2238 MUN2240 MUN2241			-	-	-	
	MUN2233			0.055	0.1	0.185	
	MUN2234			0.38	0.47	0.56	
	MUN2235			0.038	0.047	0.056	
	MUN2237			1.7	2.1	2.6	

4. Pulse Test: Pulse Width < 300 s, Duty Cycle < 2.0%.

Typical Characteristics

MUN2212

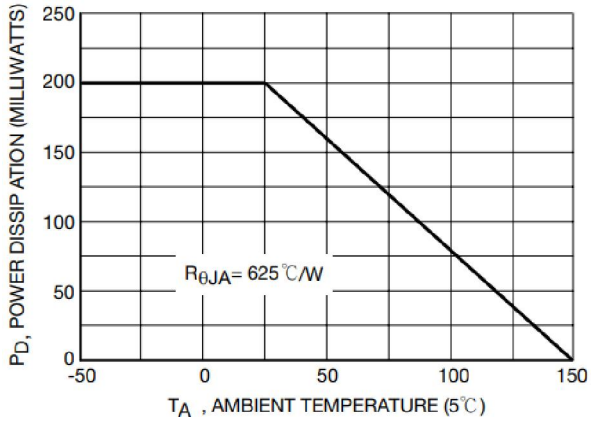


Figure 1. Derating Curve

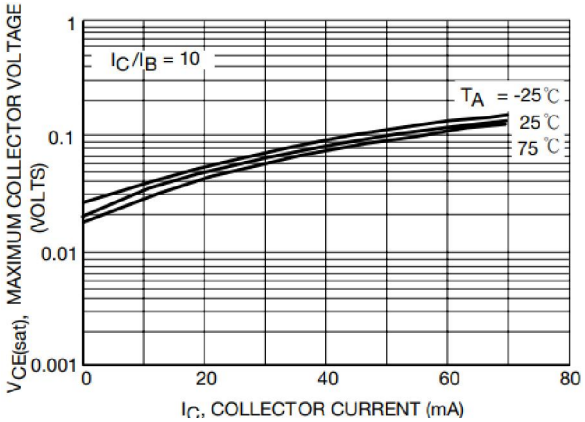


Figure 2. $V_{CE(sat)}$ vs. I_C

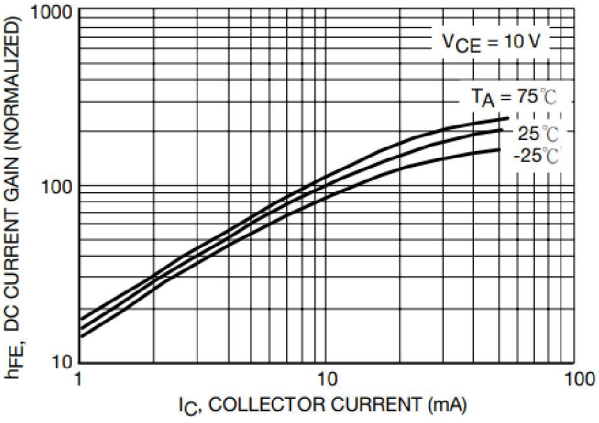


Figure 3. DC Current Gain

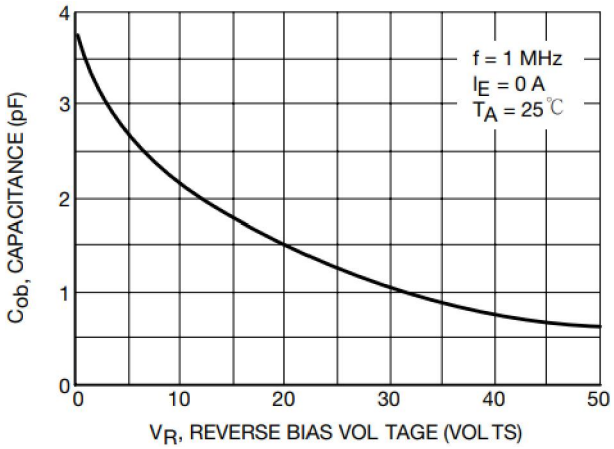


Figure 4. Output Capcitance

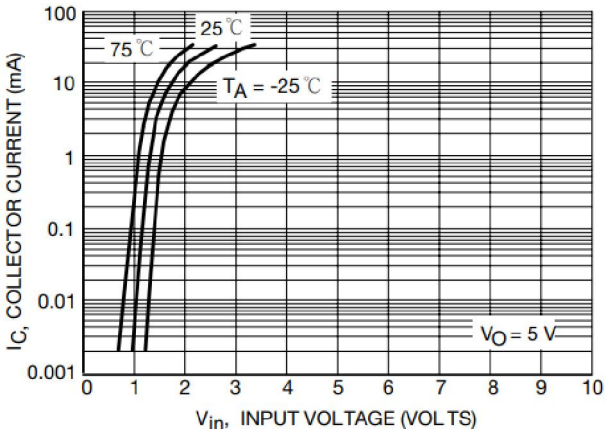


Figure 5. Output Current vs. Input Voltage

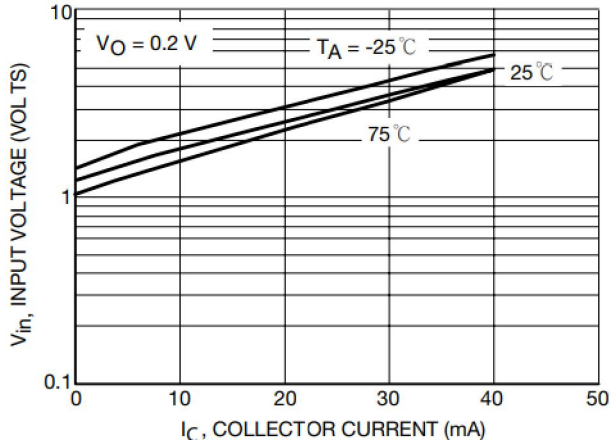


Figure 6. Input Voltage vs. Output Current

MUN2211

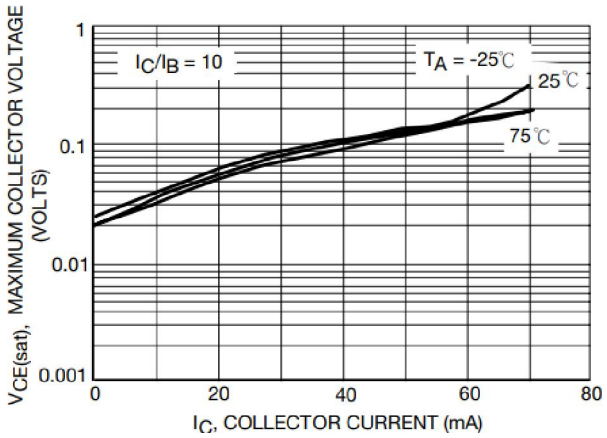


Figure 7. $V_{CE(sat)}$ vs. I_C

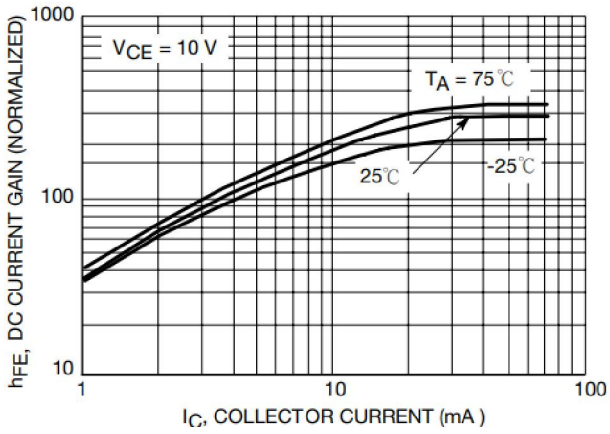


Figure 8. DC Current Gain

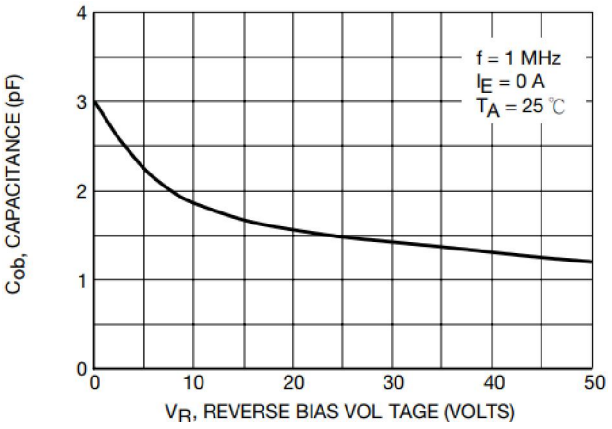


Figure 9. Output Capacitance

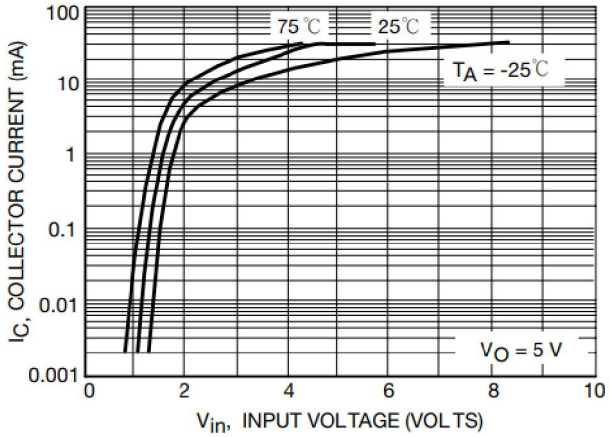


Figure 10. Output Current vs. Input Voltage

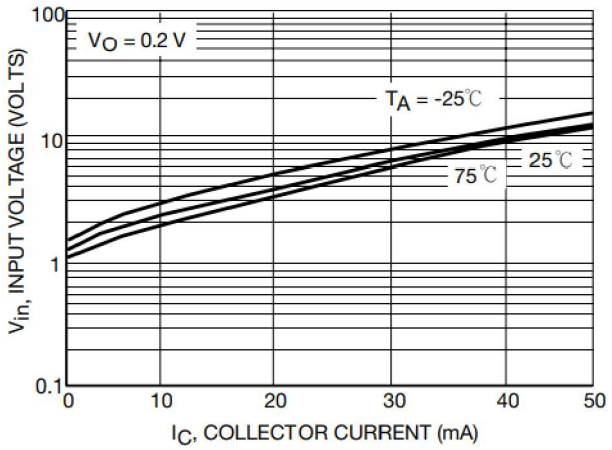


Figure 11. Input V oltage vs. Output Current

MUN2213

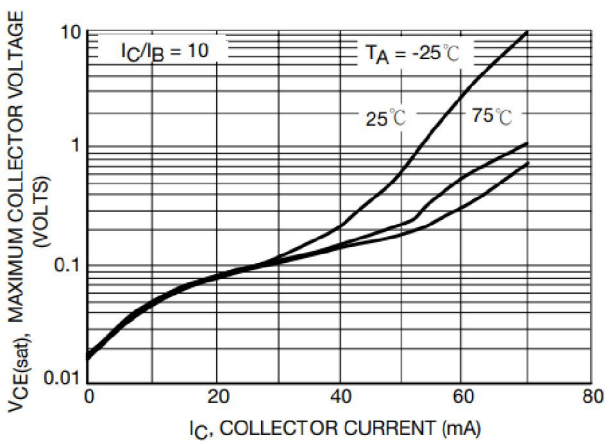


Figure 12. $V_{CE(sat)}$ vs. I_C

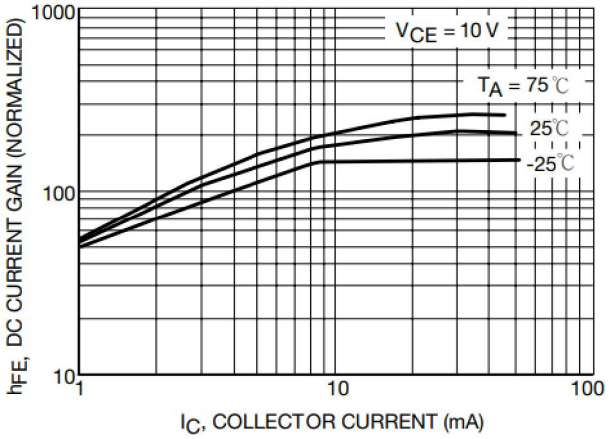


Figure 13. DC Current Gain

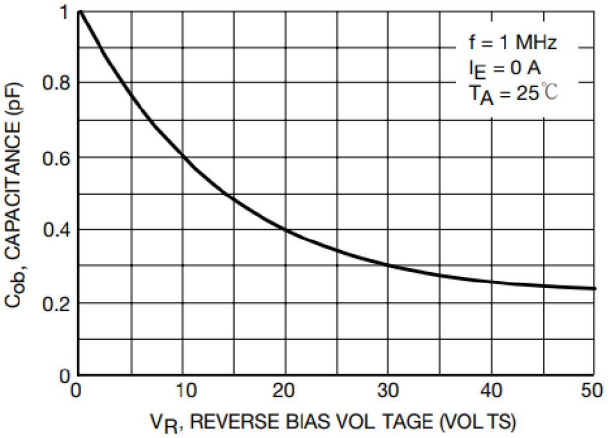


Figure 14. Output Capacitance

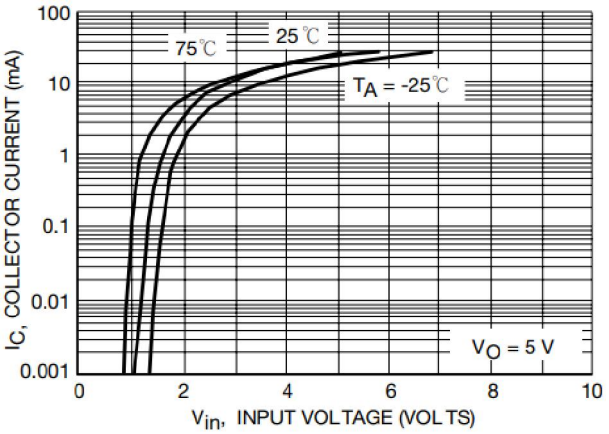


Figure 15. Output Current vs. Input Voltage

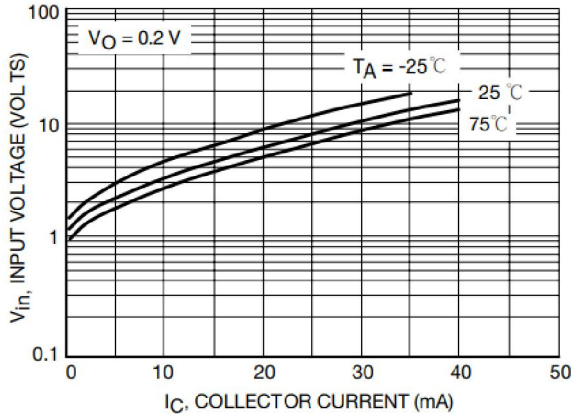


Figure 16. Input Voltage vs. Output Current

MUN2214

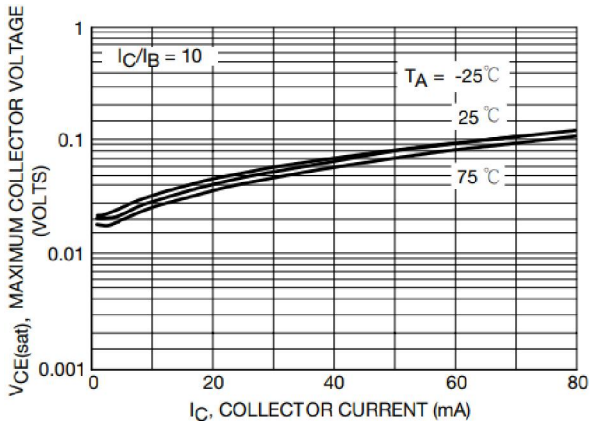


Figure 17. $V_{CE(sat)}$ vs. I_C

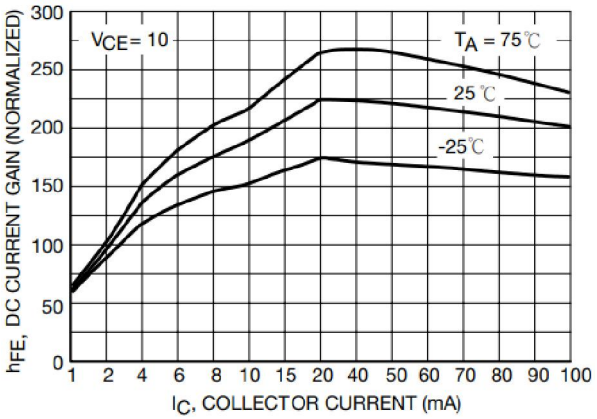


Figure 18. DC Current Gain

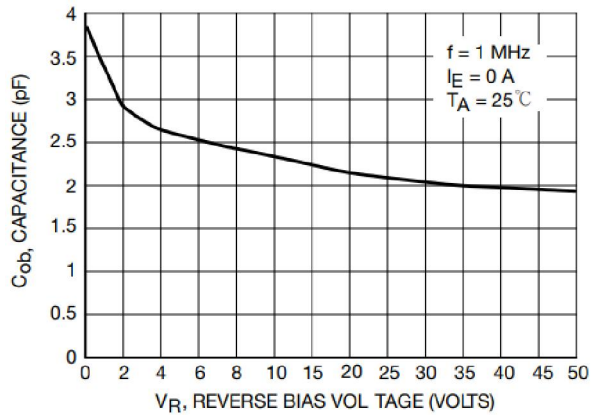


Figure 19. Output Capacitance

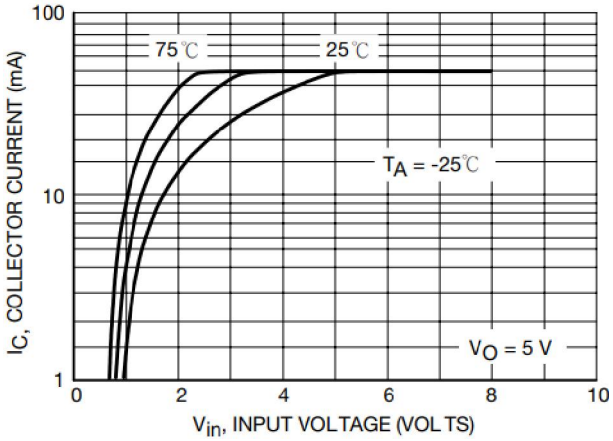


Figure 20. Output Current vs. Input Voltage

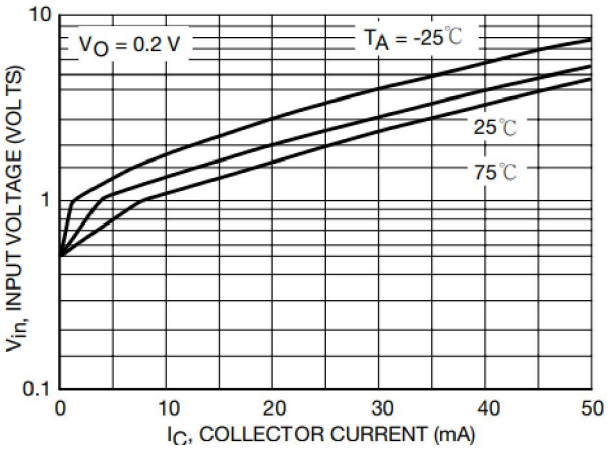


Figure 21. Input Voltage vs. Output Current

MUN2232

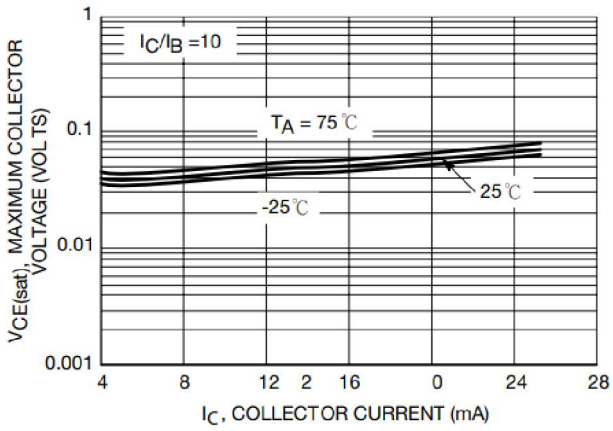


Figure 22. $V_{CE(sat)}$ vs. I_C

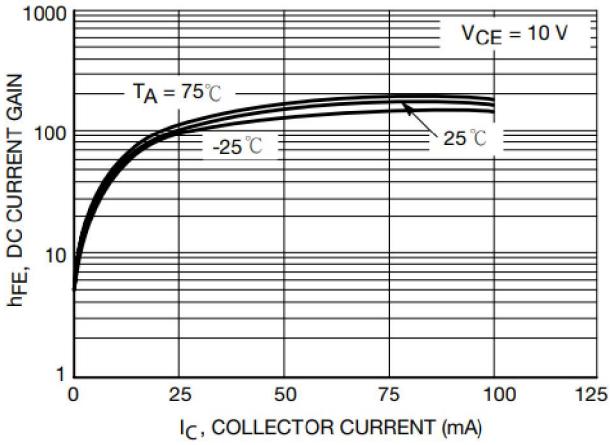


Figure 23. DC Current Gain

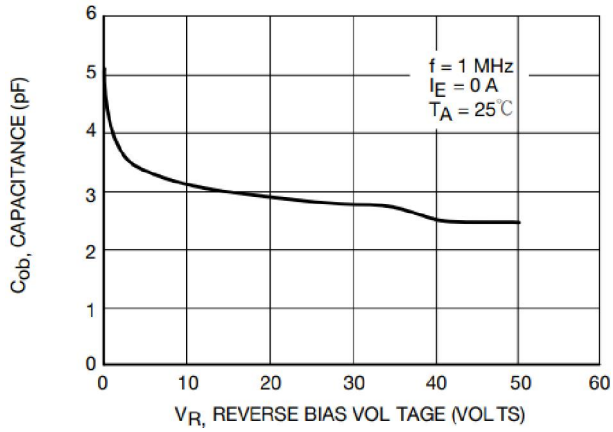


Figure 24. Output Capacitance

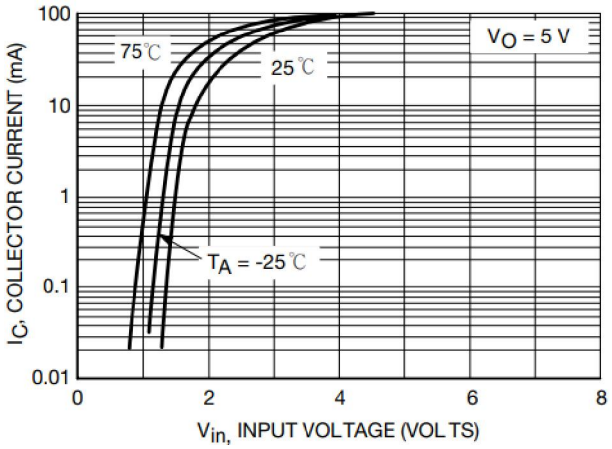


Figure 25. Output Current vs. Input Voltage

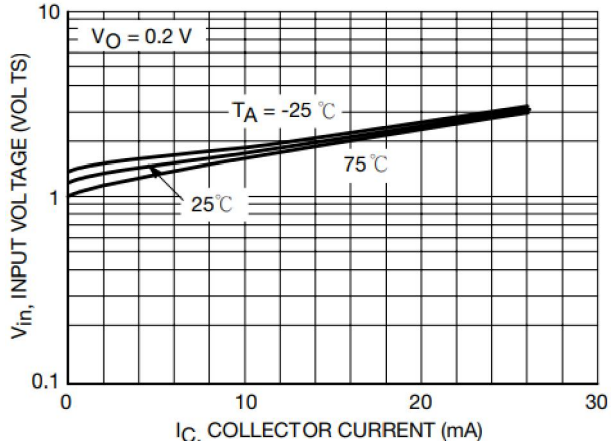


Figure 26. Input Voltage vs. Output Current

MUN2233

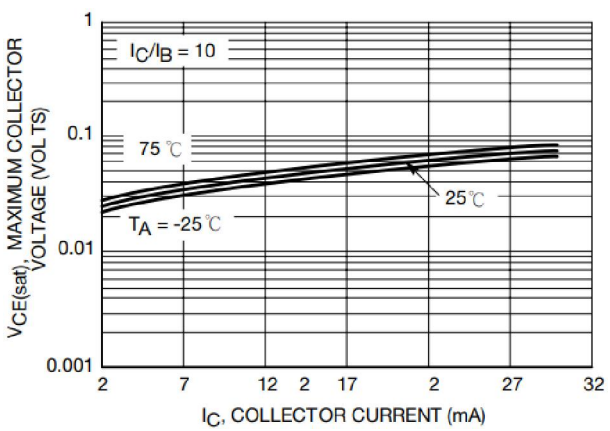


Figure 27. $V_{CE(sat)}$ vs. I_C

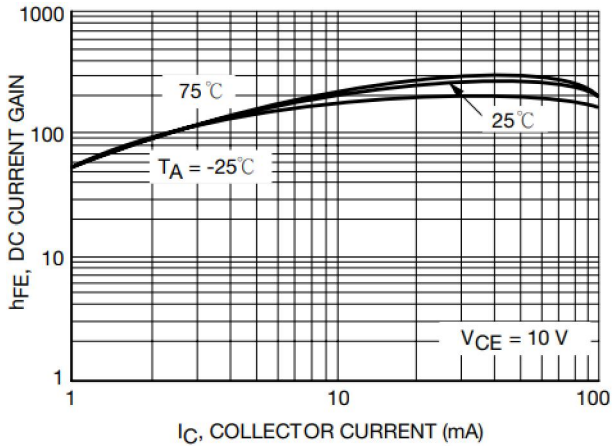
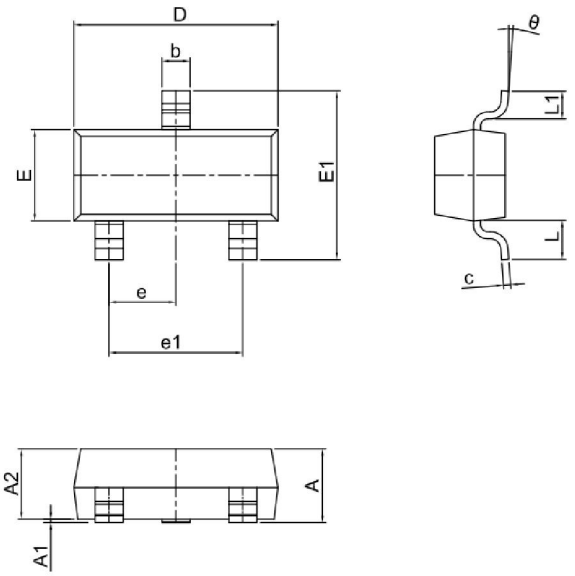


Figure 28. DC Current Gain

Package Dimensions



Symbol	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.15	0.035	0.045
A1	0.00	0.10	0.000	0.004
A2	0.90	1.05	0.035	0.041
b	0.30	0.50	0.012	0.020
c	0.08	0.15	0.003	0.006
D	2.80	3.00	0.110	0.118
E	1.20	1.40	0.047	0.055
E1	2.25	2.55	0.089	0.100
e	0.90	1.00	0.035	0.039
e1	1.80	2.00	0.071	0.079
L	0.50	0.60	0.020	0.024
L1	0.30	0.50	0.012	0.020
θ	0°	8°	0°	8°