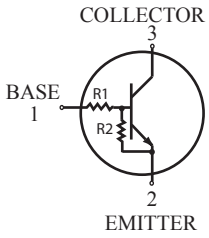
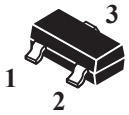
WEITRON

MMUN2211 Series

Bias Resistor Transistor
NPN Silicon

Lead(Pb)-Free





SOT-23

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	VCEO	50	Vdc
Collector-Base Voltage	VCBO	50	Vdc
Collector Current-Continuous	Ic	100	mAdc

THERMAL CHARACTERISTICS

Characteristics	Symbol	Value	Unit
Total Device Dissipation FR-5 Board (1) T_A = 25°C Derate above 25°C	PD	 246 1.6	 mW mW / °C
Thermal Resistance, Junction to Ambient (1)	$R_{\theta JA}$	625	°C/W
Junction and Storage, Temperature	TJ,Tstg	-65 to +150	°C

1. FR-4 @ minimun pad

Device Marking and Resistor Values

Device	Marking	R1(k)	R2(k)	Device	Marking	R1(k)	R2(k)
MMUN2211	A8A, 24	10	10	MMUN2232	A8J	4.7	4.7
MMUN2212	A8B	22	22	MMUN2233	A8K	4.7	47
MMUN2213	A8C, 26	47	47	MMUN2234	A8L	22	47
MMUN2214	A8D	10	47	MMUN2235	A8M	2.2	47
MMUN2215	A8E	10	∞	MMUN2238	A8R	2.2	∞
MMUN2216	A8F	4.7	∞	MMUN2241	A8U	100	∞
MMUN2230	A8G	1.0	1.0				
MMUN2231	A8H	2.2	2.2				

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)		I_{EBO}				mAdc
	MMUN2211		-	-	0.5	
	MMUN2212		-	-	0.2	
	MMUN2213		-	-	0.1	
	MMUN2214		-	-	0.2	
	MMUN2215		-	-	0.9	
	MMUN2216		-	-	1.9	
	MMUN2230		-	-	4.3	
	MMUN2231		-	-	2.3	
	MMUN2232		-	-	1.5	
	MMUN2233		-	-	0.18	
	MMUN2234		-	-	0.13	
	MMUN2235		-	-	0.2	
	MMUN2238		-	-	4.0	
	MMUN2241		-	-	0.1	
Collector-Base Breakdown Voltage (I_C = 10 mA, 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
ON CHARACTERISTICS (Note 2.)						
DC Current Gain (V_{CE}= 10 V, I_C = 5.0 mA)	MMUN2211	h_{FE}	35	60	-	
	MMUN2212		60	100	-	
	MMUN2213		80	140	-	
	MMUN2214		80	140	-	
	MMUN2215		160	350	-	
	MMUN2216		160	350	-	
	MMUN2230		3.0	5.0	-	
	MMUN2231		8.0	15	-	
	MMUN2232		15	30	-	
	MMUN2233		80	200	-	
	MMUN2234		80	150	-	
	MMUN2235		80	140	-	
	MMUN2238		160	350	-	
	MMUN2241		160	350	-	
Collector-Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.3 mA) (I_C = 10 mA, I_B = 5 mA) MMUN2230/MMUN2231 (I_C = 10 mA, I_B = 1 mA) MMUN2215/MMUN2216/MMUN2232 MMUN2233/MMUN2234/MMUN2235/MMUN2238		$V_{CE(sat)}$	-	-	0.25	Vdc
Output Voltage (on) (V_{CC}= 5.0 V, V_B= 2.5 V, R_L= 1.0 kΩ)	MMUN2211	V_{OL}	-	-	0.2	Vdc
	MMUN2212		-	-	0.2	
	MMUN2213		-	-	0.2	
	MMUN2214		-	-	0.2	
	MMUN2215		-	-	0.2	
	MMUN2216		-	-	0.2	
	MMUN2230		-	-	0.2	
	MMUN2231		-	-	0.2	
	MMUN2232		-	-	0.2	
	MMUN2233		-	-	0.2	
	MMUN2234		-	-	0.2	
	MMUN2235		-	-	0.2	
(V_{CC}= 5.0 V, V_B= 3.5 V, R_L= 1.0 kΩ)	MMUN2238		-	-	0.2	
(V_{CC}= 5.0 V, V_B= 5.0 V, R_L= 1.0 kΩ)	MMUN2241		-	-	0.2	

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

ELECTRICAL CHARACTERISTICS (T_A= 25℃ unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS (Note 2) (Continued)					
Output Voltage (off) (V_{CC}= 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ) (V_{CC}= 5.0 V, V_B= 0.050 V, R_L = 1.0 kΩ) MMUN2230 (V_{CC}= 5.0 V, V_B= 0.25 V, R_L = 1.0 kΩ) MMUN2215 MMUN2216 MMUN2233 MMUN2238	V_{OH}	4.9	-	-	Vdc
Input Resistor	R_1				kΩ
MMUN2211		7.0	10	13	
MMUN2212		15.4	22	28.6	
MMUN2213		32.9	47	61.1	
MMUN2214		7.0	10	13	
MMUN2215		7.0	10	13	
MMUN2216		3.3	4.7	6.1	
MMUN2230		0.7	1.0	1.3	
MMUN2231		1.5	2.2	2.9	
MMUN2232		3.3	4.7	6.1	
MMUN2233		3.3	4.7	6.1	
MMUN2234		15.4	22	28.6	
MMUN2235		1.54	2.2	2.86	
MMUN2238		1.54	2.2	2.86	
MMUN2241		70	100	100	
Resistor Ratio	R_1/R_2				
MMUN2211/MMUN2212/MMUN2213		0.8	1.0	1.2	
MMUN2214		0.17	0.21	0.25	
MMUN2215/MMUN2216/MMUN2238		-	-	-	
MMUN2241		-	-	-	
MMUN2230/MMUN2231/MMUN2232		0.8	1.0	1.2	
MMUN2233		0.055	0.1	0.185	
MMUN2234		0.38	0.47	0.56	
MMUN2235		0.038	0.047	0.056	

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

TYPICAL ELECTRICAL CHARACTERISTICS

MMUN2211

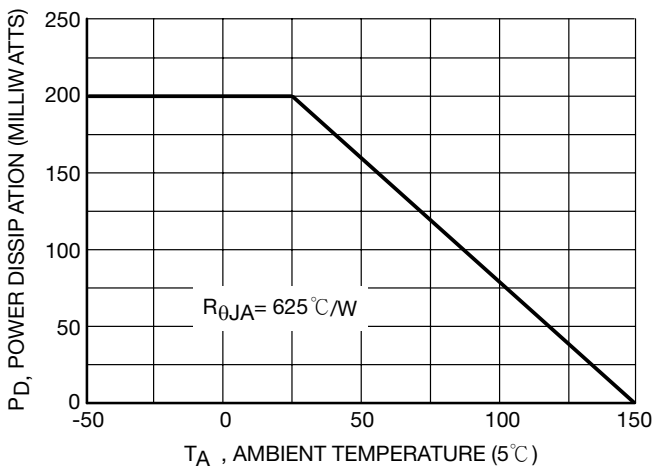


Figure 1. Derating Curve

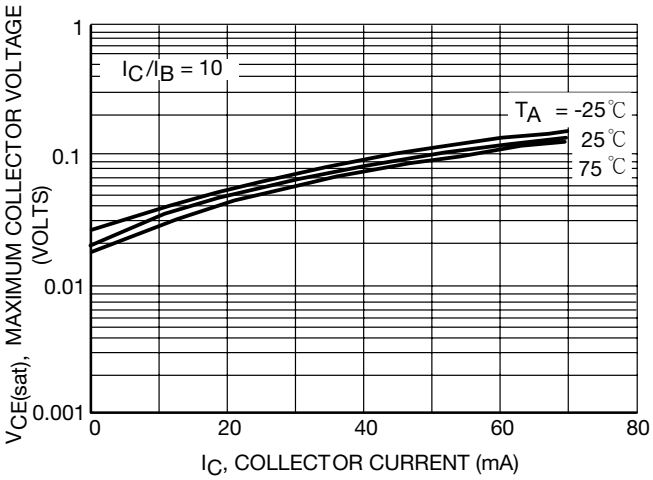


Figure 2. $V_{CE(sat)}$ vs. I_C

TYPICAELECTRICAL CHARACTERISTICS

MMUN2212

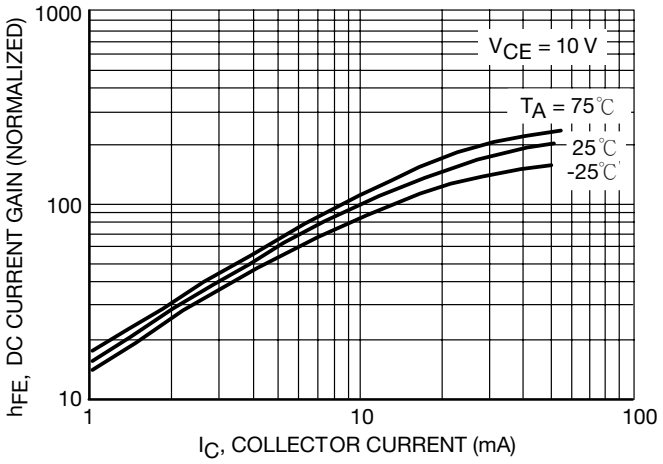


Figure 3. DC Current Gain

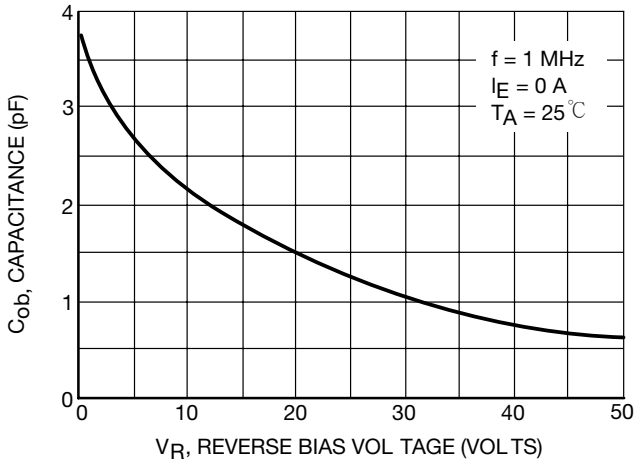


Figure 4. Output Capcitance

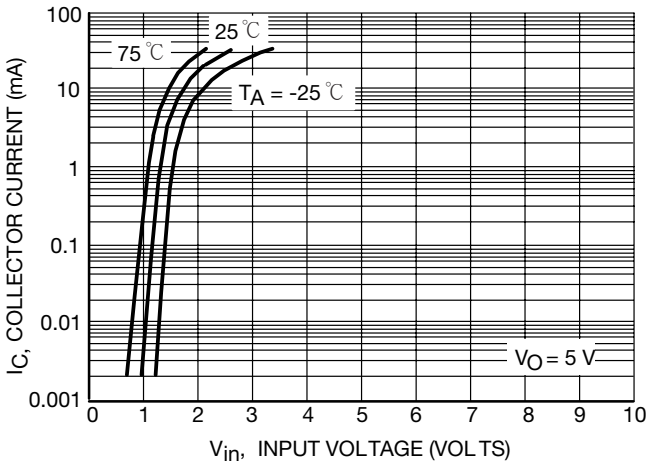


Figure 5. Output Current vs. Input Voltage

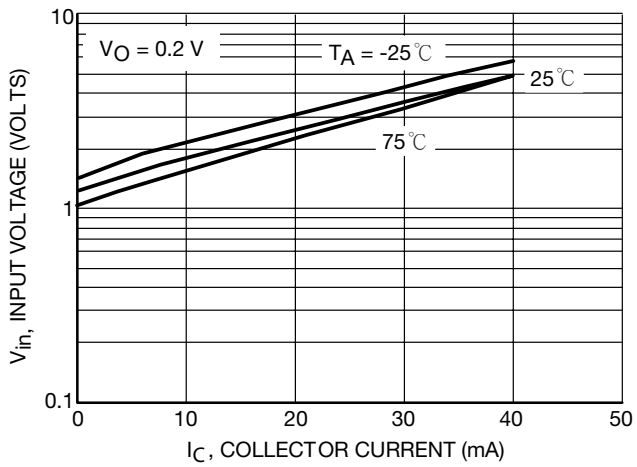


Figure 6. Input Voltage vs. Output Current

MMUN2211

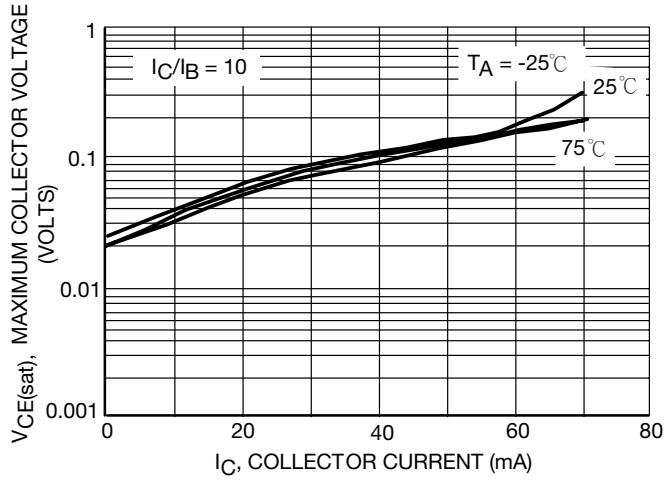


Figure 7. $V_{CE(sat)}$ vs. I_C

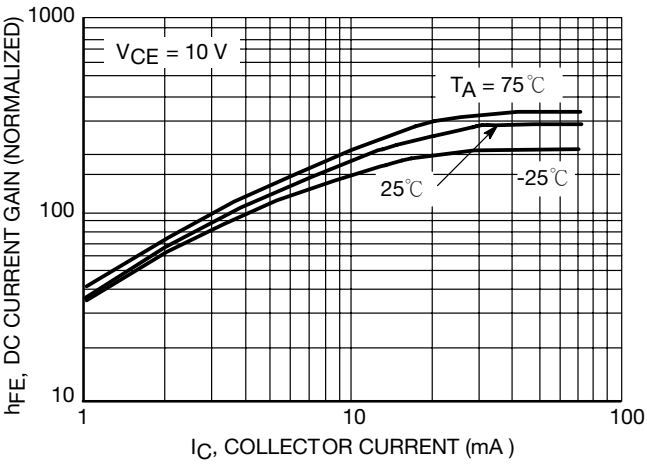


Figure 8. DC Current Gain

TYPICAL ELECTRICAL CHARACTERISTICS

MMUN2212

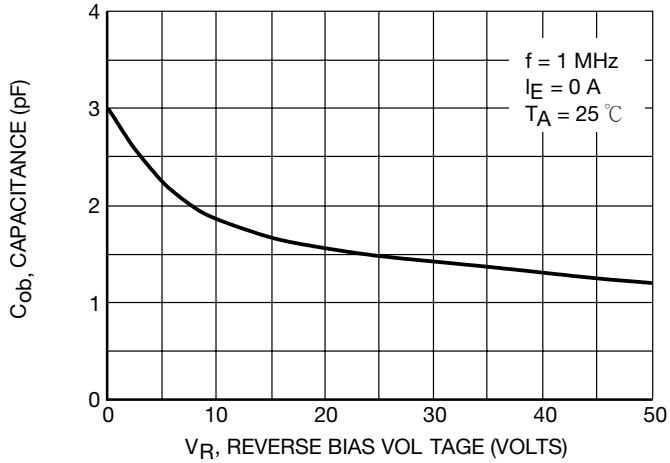


Figure 9. Output Capacitance

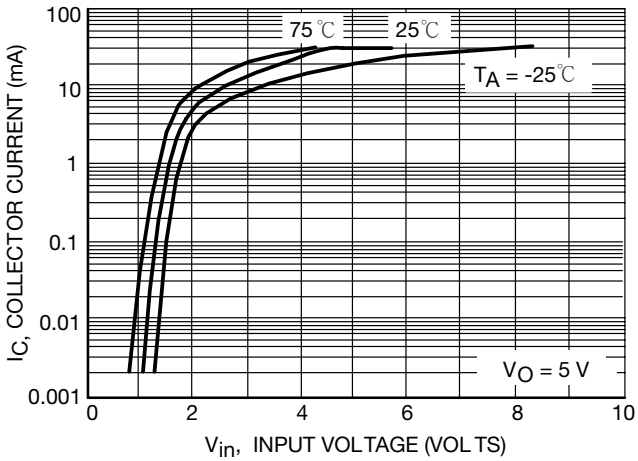


Figure 10. Output Current vs. Input Voltage

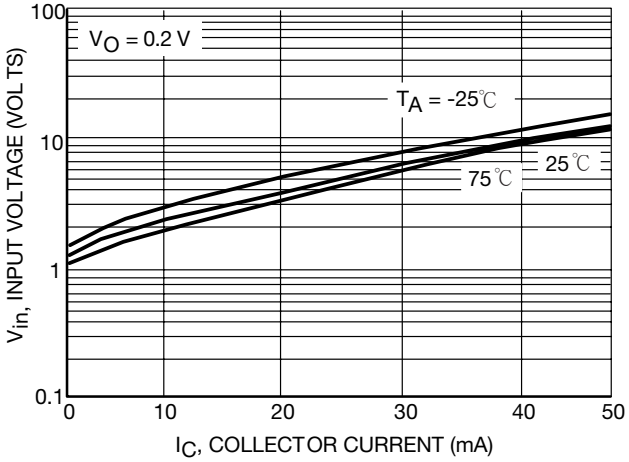


Figure 11. Input V oltage vs. Output Current

MMUN2213

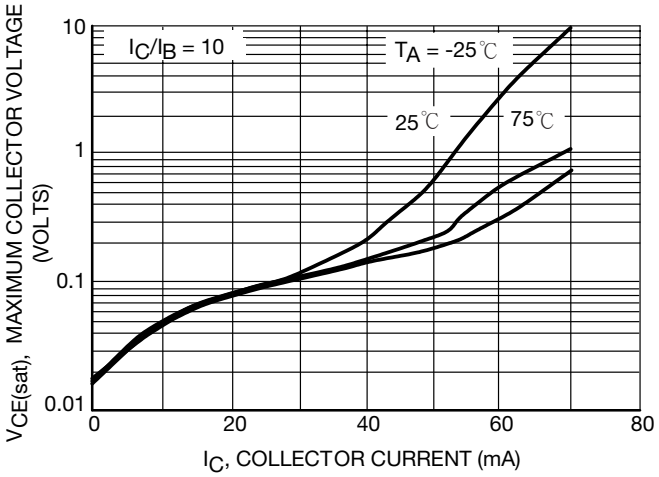


Figure 12. $V_{CE(sat)}$ vs. I_C

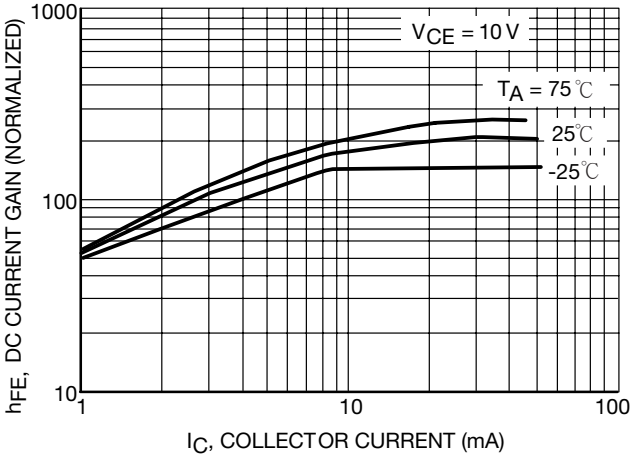


Figure 13. DC Current Gain

TYPICAL ELECTRICAL CHARACTERISTICS

MMUN2213

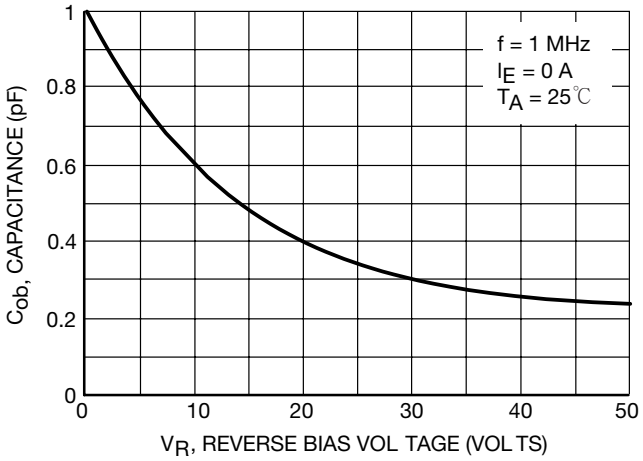


Figure 14. Output Capacitance

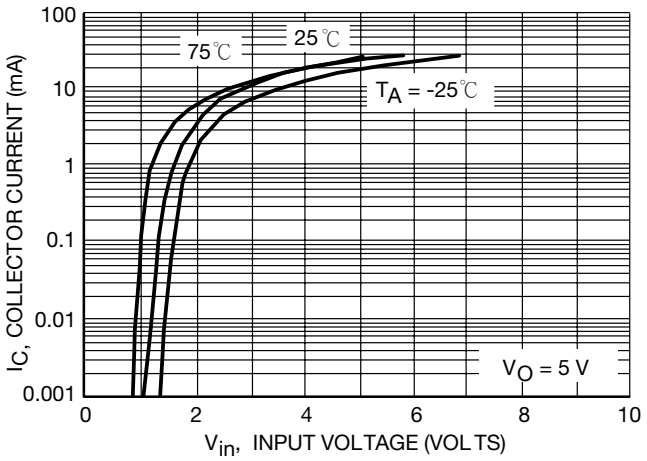


Figure 15. Output Current vs. Input Voltage

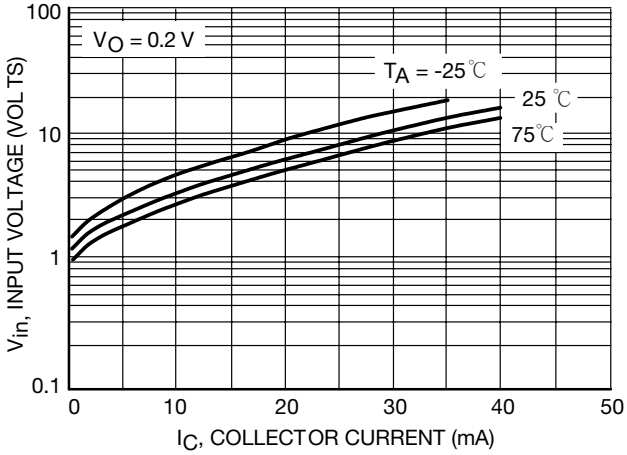


Figure 16. Input Voltage vs. Output Current

MMUN2214

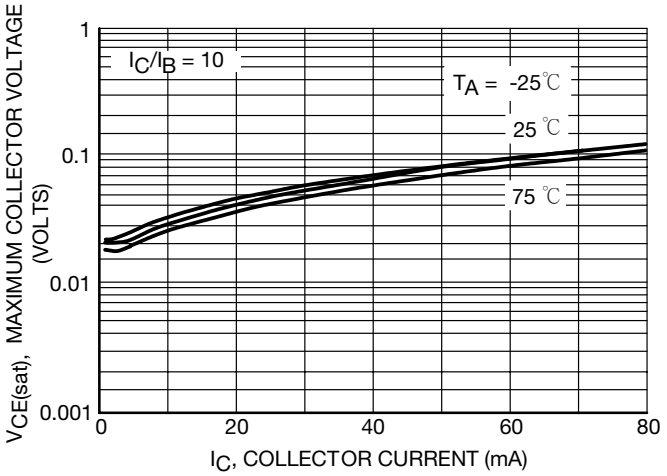


Figure 17. $V_{CE(sat)}$ vs. I_C

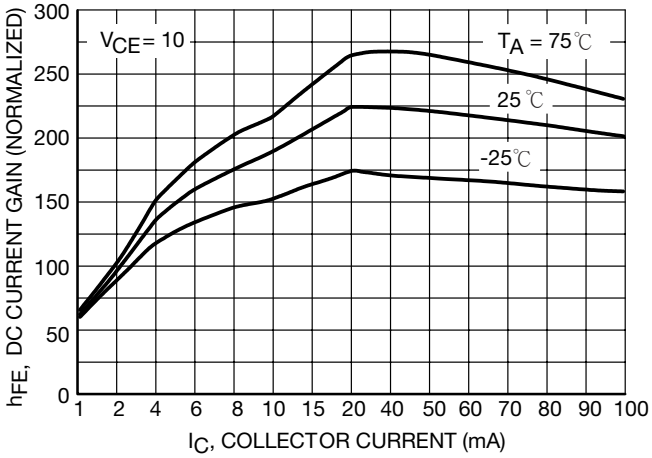


Figure 18. DC Current Gain

TYPICAL ELECTRICAL CHARACTERISTICS

MMUN2214

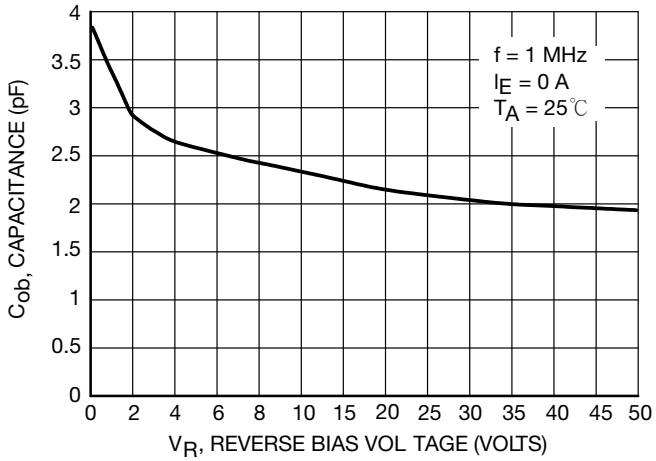


Figure 19. Output Capacitance

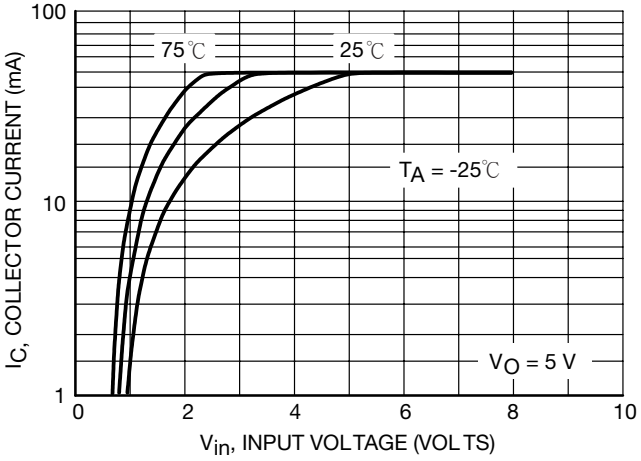


Figure 20. Output Current vs. Input Voltage

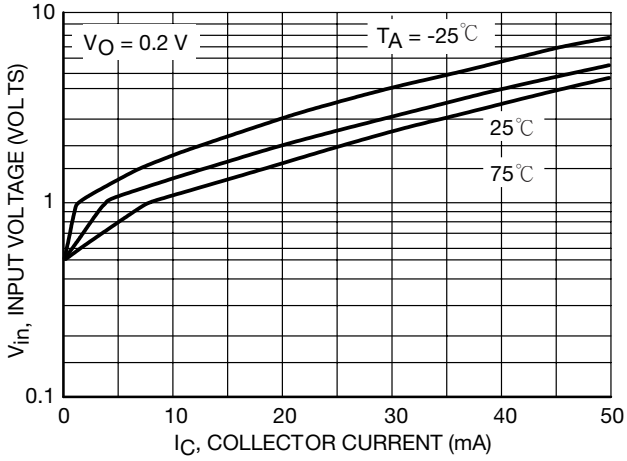


Figure 21. Input Voltage vs. Output Current

MMUN2232

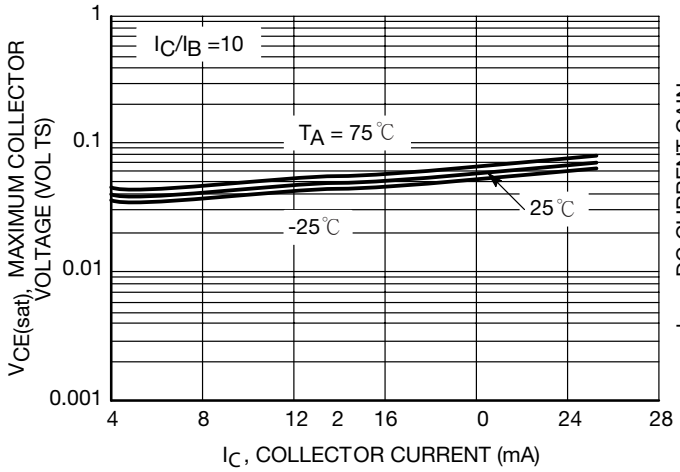


Figure 22. $V_{CE(sat)}$ vs. I_C

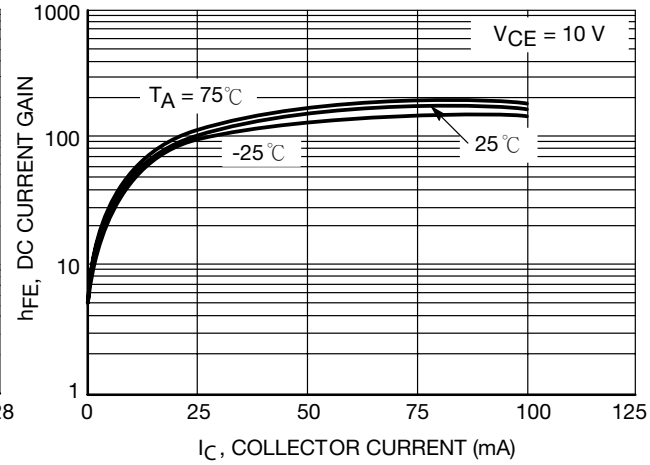


Figure 23. DC Current Gain

TYPICAL ELECTRICAL CHARACTERISTICS

MMUN2232

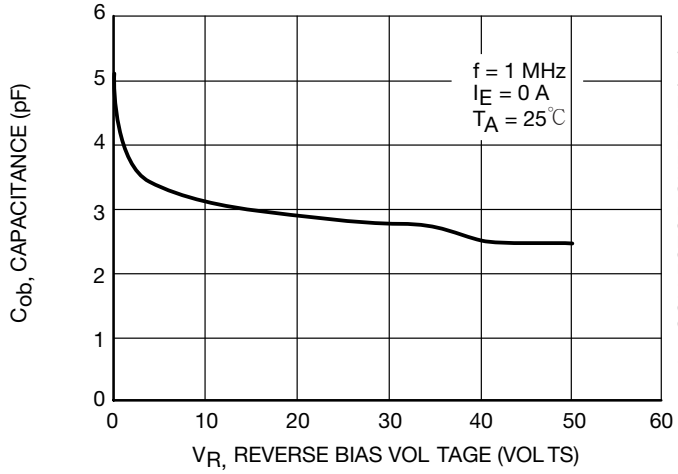


Figure 24. Output Capacitance

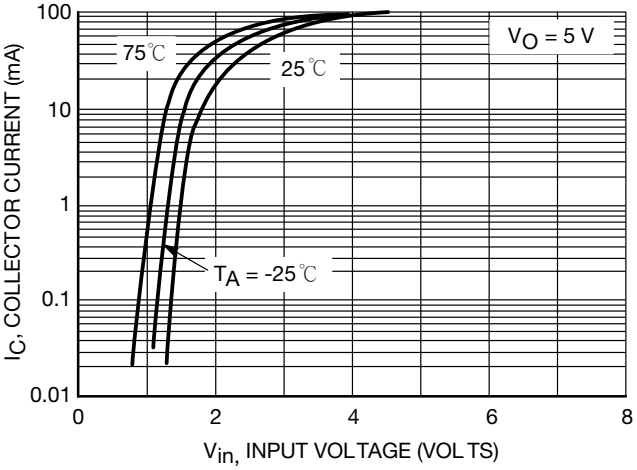


Figure 25. Output Current vs. Input Voltage

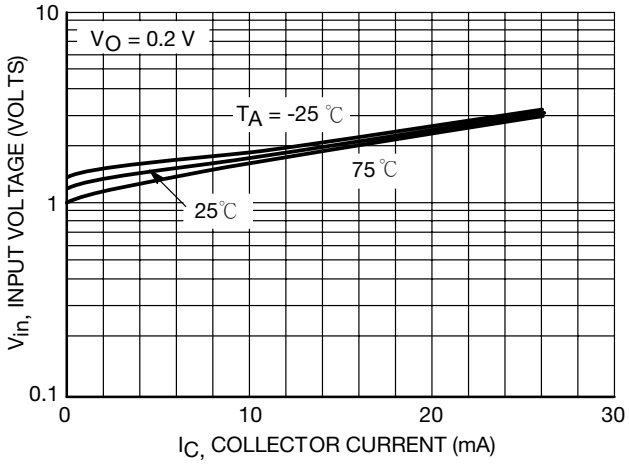


Figure 26. Output Voltage vs. Input Current

MMUN2233

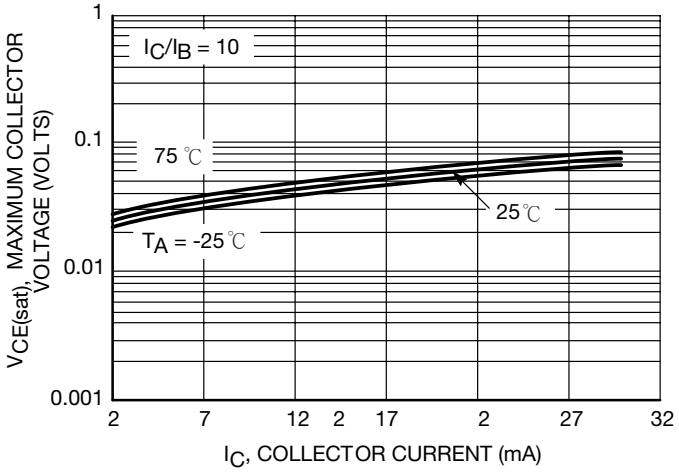


Figure 27. $V_{CE(sat)}$ vs. I_C

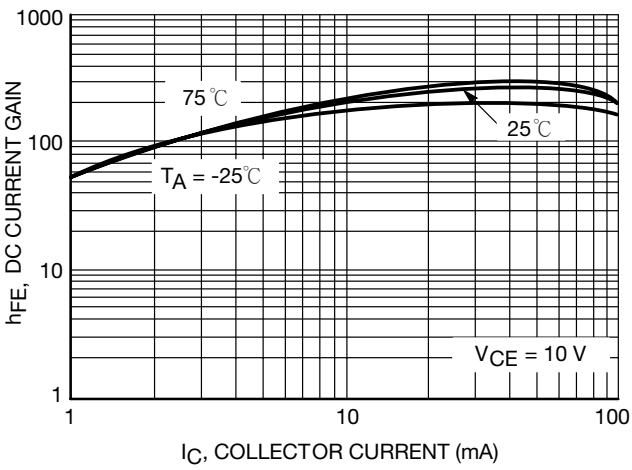


Figure 28. DC Current Gain

MMUN2211 Series

TYPICAL APPLICATIONS FOR NPN BRTs

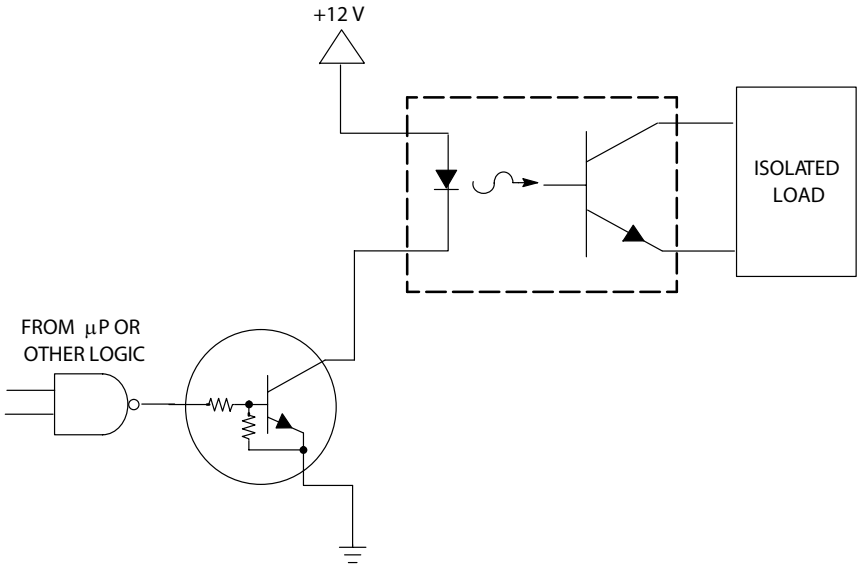


Figure 32. Level Shifter: Connects 12 or 24 Volt Circuits to Logic

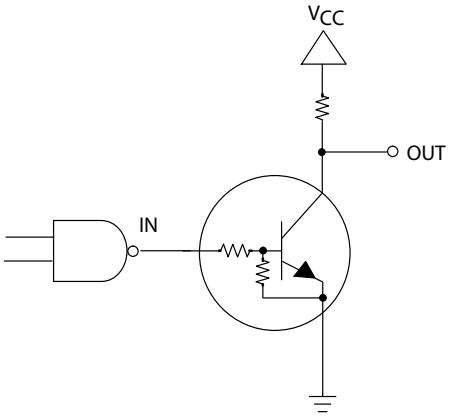


Figure 33. Open Collector Inverter: Inverts the Input Signal

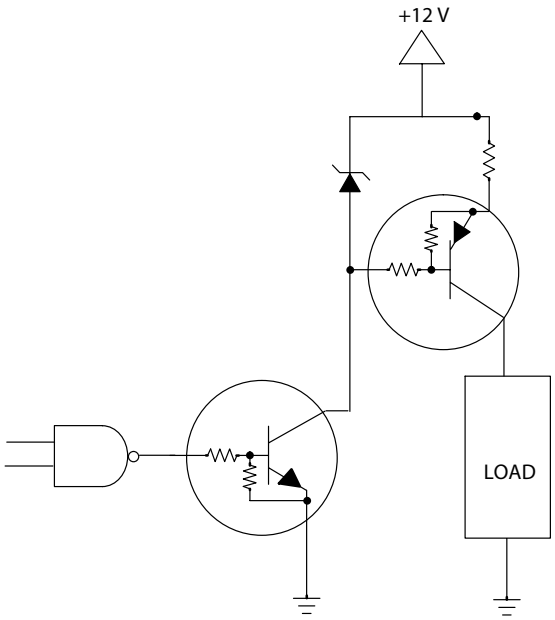
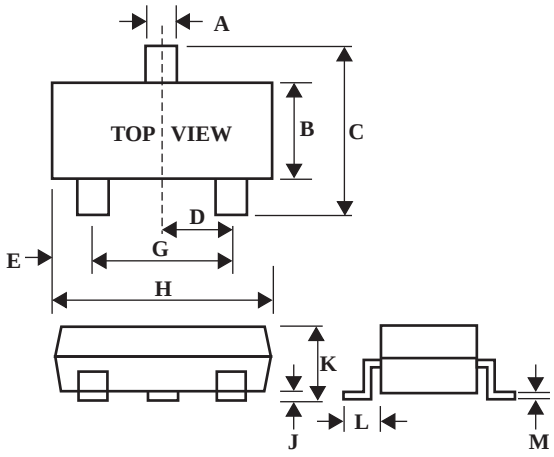


Figure 34. Inexpensive, Unregulated Current Source

SOT-23 Package Outline Dimension



SOT-23		
Dim	**Min**	**Max**
A	0.35	0.51
B	1.19	1.40
C	2.10	3.00
D	0.85	1.05
E	0.46	1.00
G	1.70	2.10
H	2.70	3.10
J	0.01	0.13
K	0.89	1.10
L	0.30	0.61
M	0.076	0.25