

Features

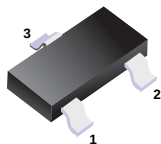
Simplifies Circuit Design

Reduces Board Space and Component Count

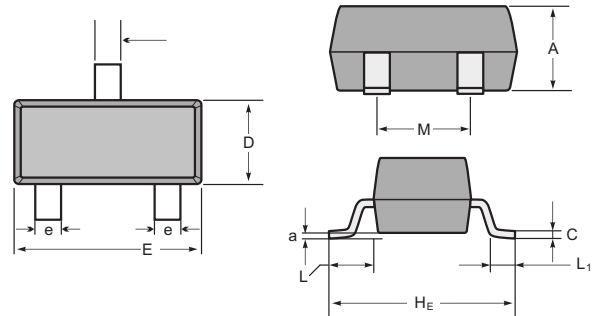
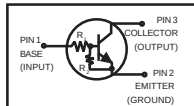
The SOT-23 package can be soldered using wave or reflow. The modified gull-winged leads absorb thermal stress during soldering eliminating the possibility of damage to the die.

Available in 8 mm embossed tape and reel. Use the Device Number to order the 7 inch/3000 unit reel. Replace "T1" with "T3" in the Device Number to order the 13 inch/10,000 unit reel.

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



■ Simplified outline(SOT-23)



SOT-23 mechanical data

UNIT		A	C	D	E	H _E	e	M	L	L ₁	a
mm	max	1.1	0.15	1.4	3.0	2.6	0.5	1.95	0.55 (ref)	0.36 (ref)	0.0
	min	0.9	0.08	1.2	2.8	2.2	0.3	1.7			0.15
mil	max	43	6	55	118	102	20	77	22 (ref)	14 (ref)	0.0
	min	35	3	47	110	87	12	67			6

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
Total Power Dissipation @ T _A = 25°C (Note 1.) Derate above 25°C	P _D	200 1.6	mW mW/°C
Thermal Resistance – Junction-to-Ambient (surface mounted)	R _{θJA}	625	°C/W
Operating and Storage Temperature Range	T _J , T _{stg}	-65 to +150	°C
Maximum Temperature for Soldering Purposes, Time in Solder Bath	T _L	260 10	°C Sec

MMUN2211 - MMUN2241

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

Characteristic	Symbol	Min	Typ	Max	Unit
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}	—	—	0.5	mAdc
MMUN2211L		—	—	0.2	
MMUN2212L		—	—	0.1	
MMUN2213L		—	—	0.2	
MMUN2214L		—	—	0.9	
MMUN2215L		—	—	1.9	
MMUN2216L		—	—	4.3	
MMUN2230L		—	—	2.3	
MMUN2231L		—	—	1.5	
MMUN2232L		—	—	0.18	
MMUN2233L		—	—	0.13	
MMUN2234L		—	—	0.2	
MMUN2235L		—	—	4.0	
MMUN2238L		—	—	0.1	
MMUN2241L		—	—		
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

ON CHARACTERISTICS (Note 2.)

DC Current Gain (V _{CE} = 10 V, I _C = 5.0 mA)	MMUN2211L MMUN2212L MMUN2213L MMUN2214L MMUN2215L MMUN2216L MMUN2230L MMUN2231L MMUN2232L MMUN2233L MMUN2234L MMUN2235L MMUN2238L MMUN2241L	h _{FE}	35 60 80 80 160 160 3.0 8.0 15 80 80 80 160 160	60 100 140 140 350 350 5.0 15 30 200 150 140 350 350	— — — — — — — — — — — — — —	
Collector-Emitter Saturation Voltage (I _C = 10 mA, I _B = 0.3 mA) (I _C = 10 mA, I _B = 5 mA) MMUN2230L/MMUN2231L (I _C = 10 mA, I _B = 1 mA) MMUN2215L/MMUN2216L MMUN2232L/MMUN2233L/MMUN2234L / MMUN2235L/MMUN2238L		V _{CE(sat)}	—	—	0.25	Vdc

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

MMUN2211L - MMUN2241L

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) (Continued)

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS (Note 3.)						
Output Voltage (on) ($V_{CC} = 5.0\text{ V}$, $V_B = 2.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	MMUN2211L MMUN2212L MMUN2213L MMUN2214L MMUN2215L MMUN2216L MMUN2230L MMUN2231L MMUN2232L MMUN2233L MMUN2234L MMUN2235L ($V_{CC} = 5.0\text{ V}$, $V_B = 3.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) MMUN2238L ($V_{CC} = 5.0\text{ V}$, $V_B = 5.0\text{ V}$, $R_L = 1.0\text{ k}\Omega$) MMUN2241L	V_{OL}	– – – – – – – – – – – – – –	– – – – – – – – – – – – – –	0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	Vdc
Output Voltage (off) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.050\text{ V}$, $R_L = 1.0\text{ k}\Omega$) MMUN2230L ($V_{CC} = 5.0\text{ V}$, $V_B = 0.25\text{ V}$, $R_L = 1.0\text{ k}\Omega$) MMUN2215L MMUN2216L MMUN2233L MMUN2238L		V_{OH}	4.9	–	–	Vdc
Input Resistor	MMUN2211L MMUN2212L MMUN2213L MMUN2214L MMUN2215L MMUN2216L MMUN2230L MMUN2231L MMUN2232L MMUN2233L MMUN2234L MMUN2235L MMUN2238L MMUN2241L	R_1	7.0 15.4 32.9 7.0 7.0 3.3 0.7 1.5 3.3 3.3 15.4 1.54 1.54 70	10 22 47 10 10 4.7 1.0 2.2 4.7 4.7 22 2.2 2.2 100	13 28.6 61.1 13 13 6.1 1.3 2.9 6.1 6.1 28.6 2.86 2.88 130	$k\Omega$
Resistor Ratio	MMUN2211L /MMUN2212L /MMUN2213L MMUN2214L MMUN2215L /MMUN2216L /MMUN2238L MMUN2241L MMUN2230L /MMUN2231L /MMUN2232L MMUN2233L MMUN2234L MMUN2235L	R_1/R_2	0.8 0.17 – – 0.8 0.055 0.38 0.038	1.0 0.21 – – 1.0 0.1 0.47 0.047	1.2 0.25 – – 1.2 0.185 0.56 0.056	

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

RATING AND CHARACTERISTIC CURVES (MMUN2211L - MMUN2241L)

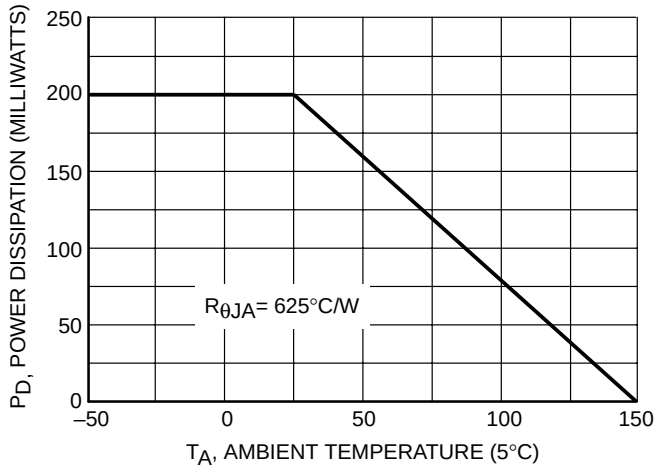


Figure 1. Derating Curve

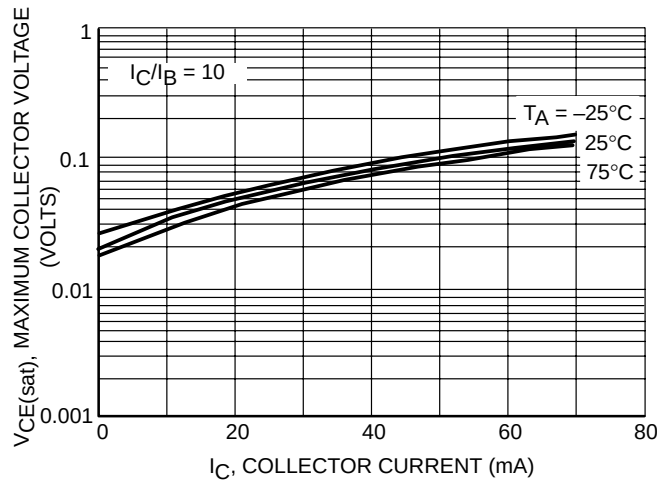


Figure 2. $V_{CE(sat)}$ vs. I_C

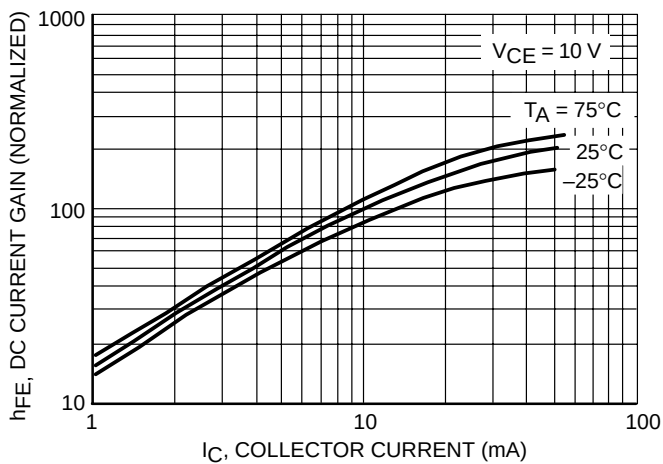


Figure 3. DC Current Gain

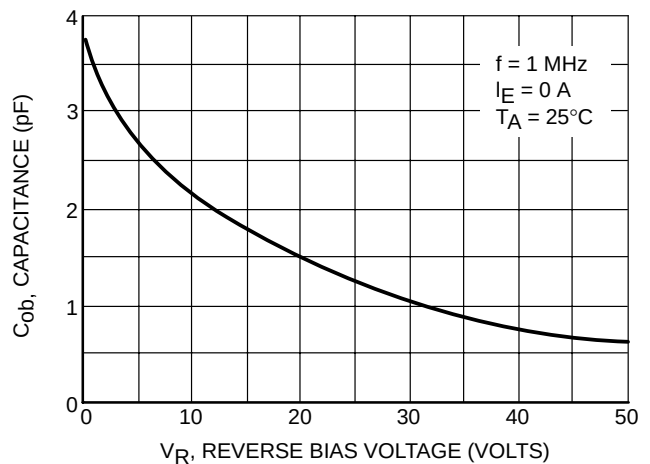


Figure 4. Output Capacitance

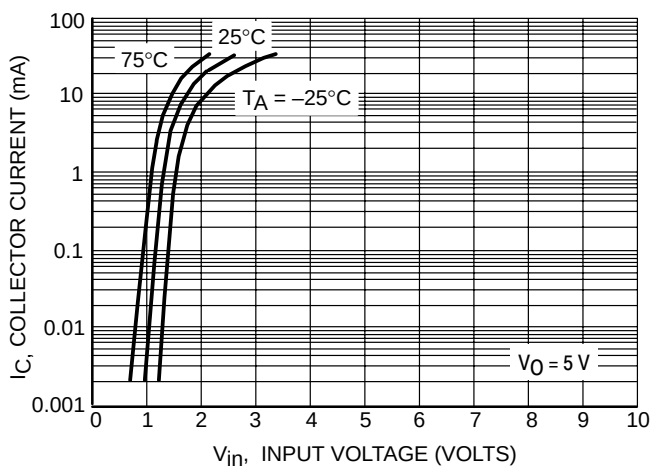


Figure 5. Output Current vs. Input Voltage

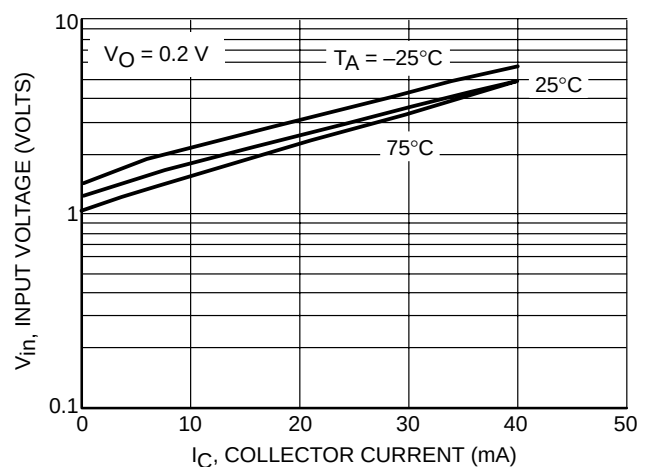


Figure 6. Input Voltage vs. Output Current

RATING AND CHARACTERISTIC CURVES (MMUN2211L - MMUN2241L)

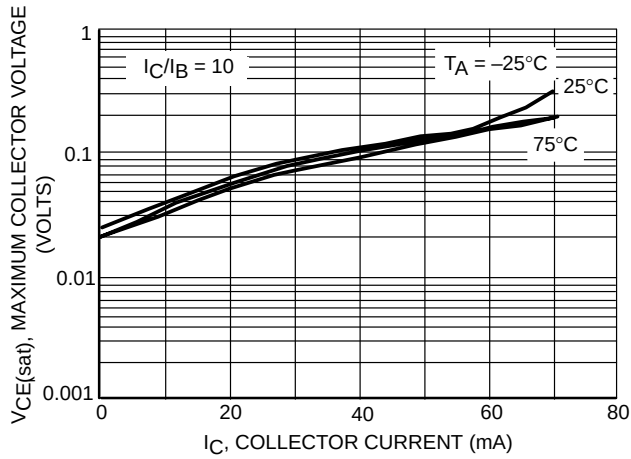


Figure 7. $V_{CE(sat)}$ vs. I_C

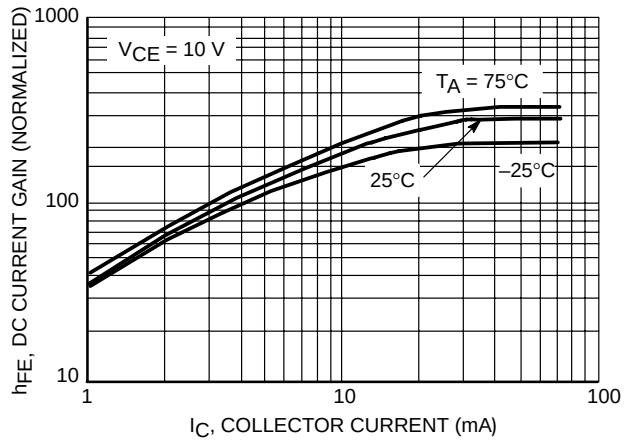


Figure 8. DC Current Gain

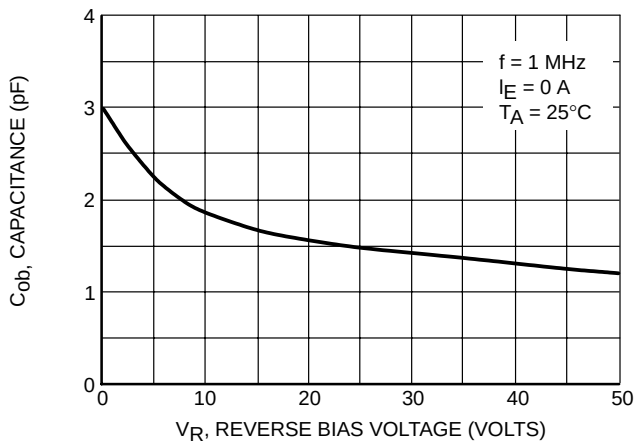


Figure 9. Output Capacitance

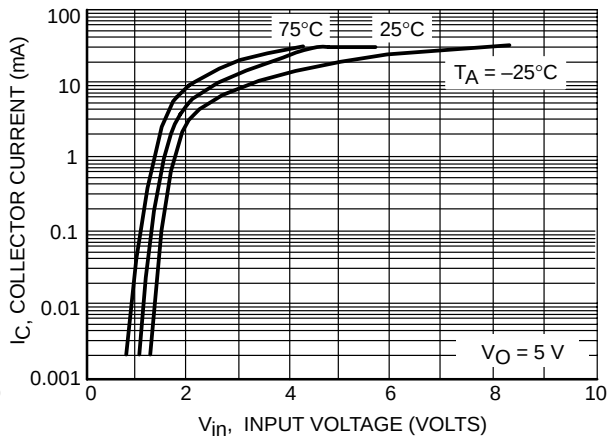


Figure 10. Output Current vs. Input Voltage

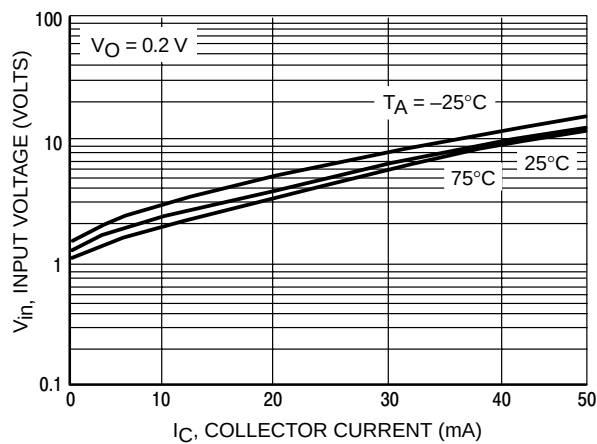


Figure 11. Input Voltage vs. Output Current

RATING AND CHARACTERISTIC CURVES (MMUN2211L - MMUN2241L)

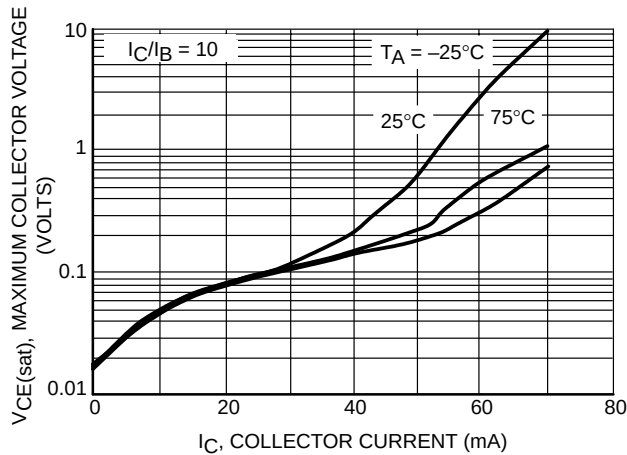


Figure 12. $V_{CE(sat)}$ vs. I_C

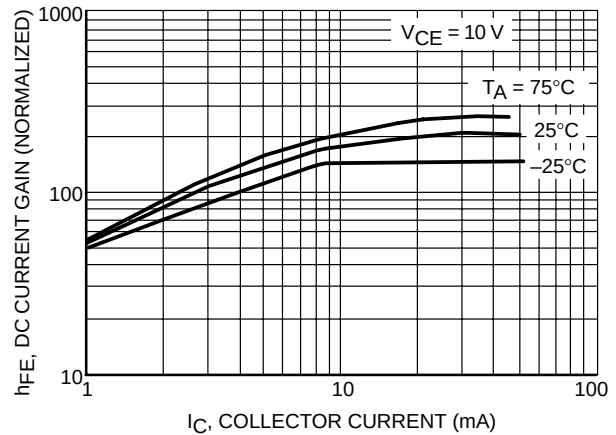


Figure 13. DC Current Gain

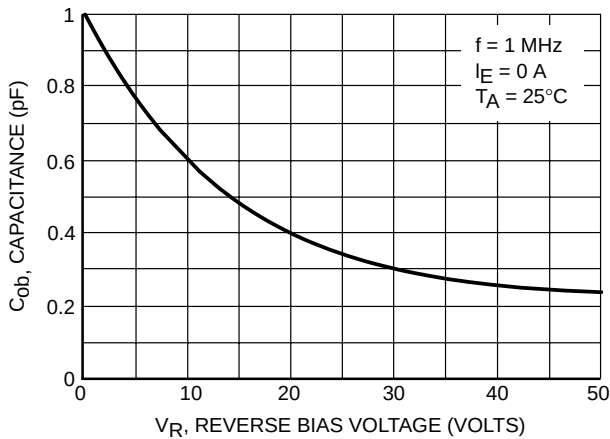


Figure 14. Output Capacitance

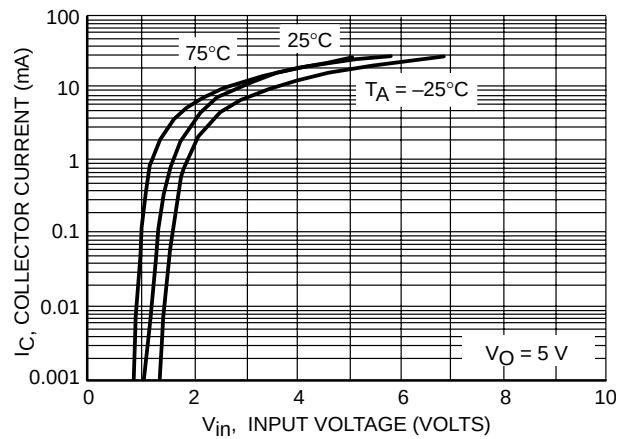


Figure 15. Output Current vs. Input Voltage

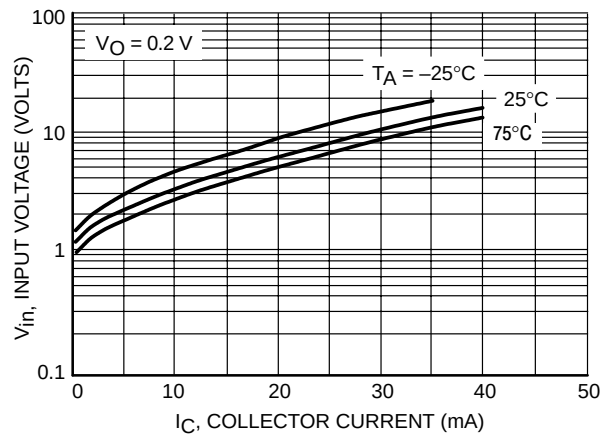


Figure 16. Input Voltage vs. Output Current

RATING AND CHARACTERISTIC CURVES (MMUN2211L - MMUN2241L)

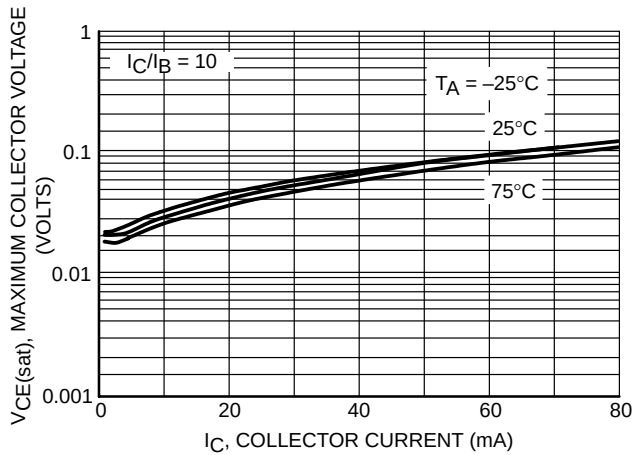


Figure 17. $V_{CE(sat)}$ vs. I_C

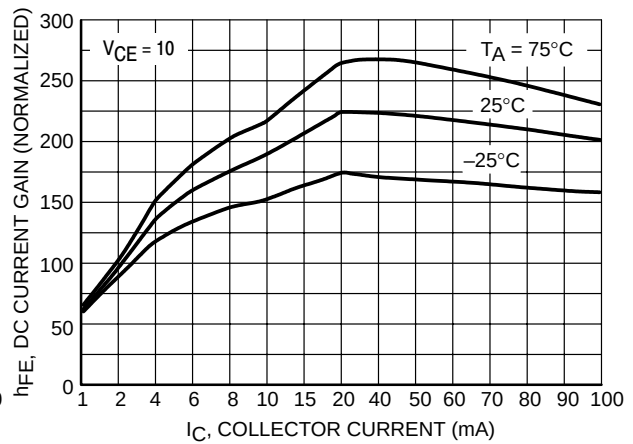


Figure 18. DC Current Gain

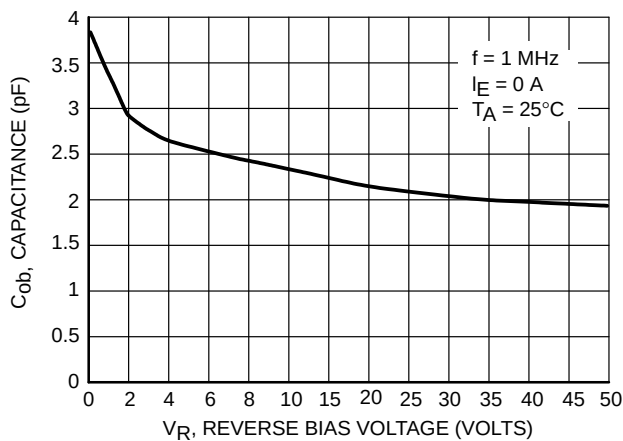


Figure 19. Output Capacitance

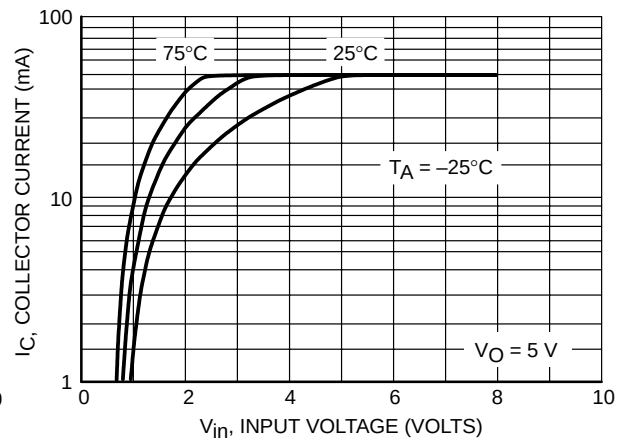


Figure 20. Output Current vs. Input Voltage

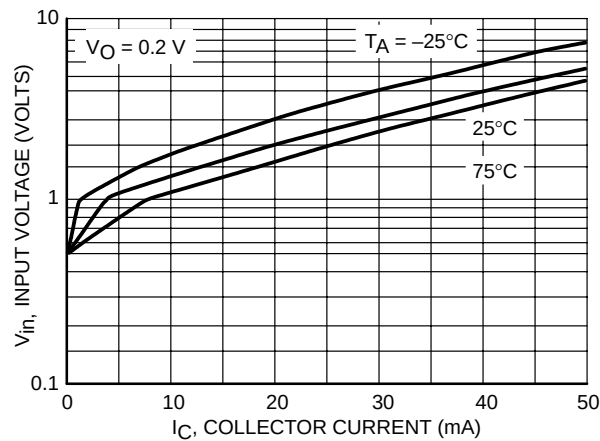


Figure 21. Input Voltage vs. Output Current

RATING AND CHARACTERISTIC CURVES (MMUN2211L - MMUN2241L)

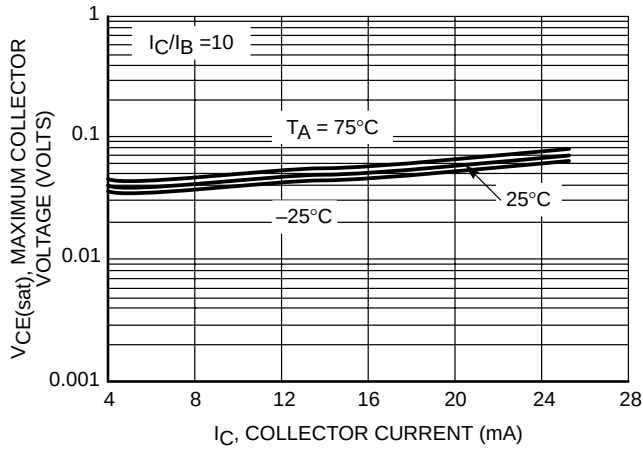


Figure 22. $V_{CE(sat)}$ vs. I_C

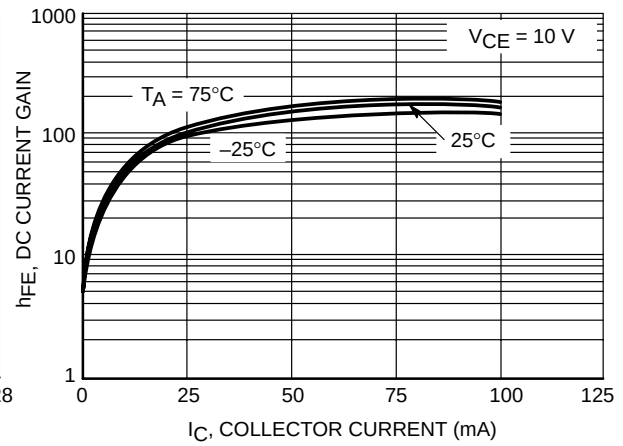


Figure 23. DC Current Gain

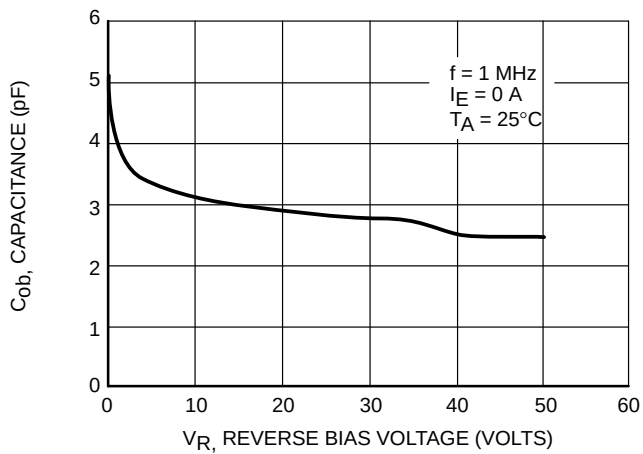


Figure 24. Output Capacitance

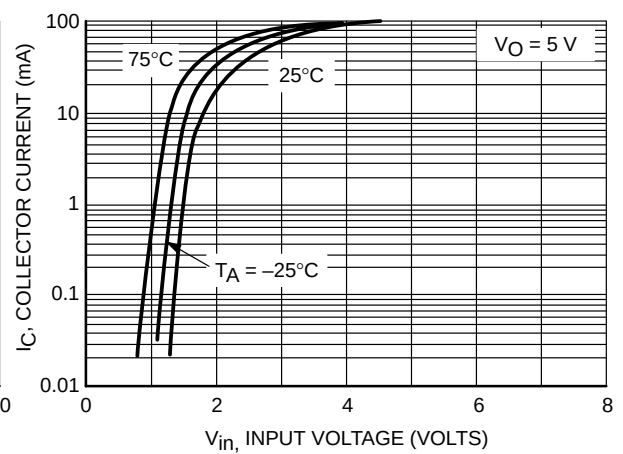


Figure 25. Output Current vs. Input Voltage

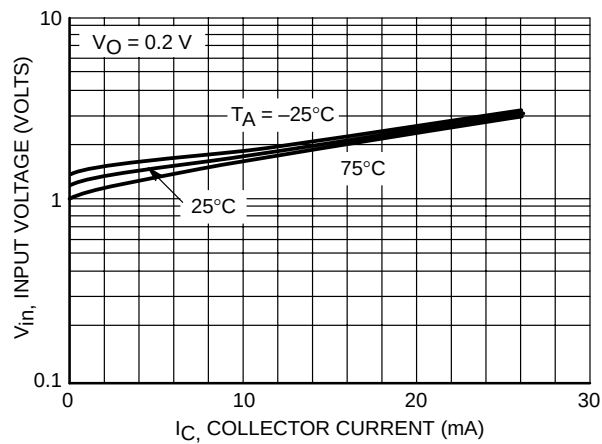


Figure 26. Output Voltage vs. Input Current

RATING AND CHARACTERISTIC CURVES (MMUN2211L - MMUN2241L)

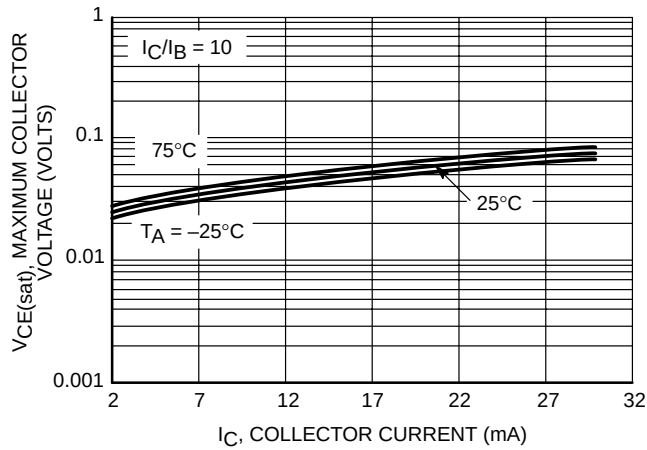


Figure 27. $V_{CE(sat)}$ vs. I_C

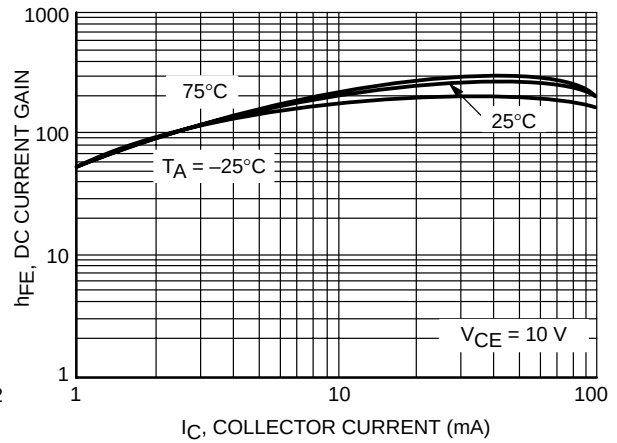


Figure 28. DC Current Gain

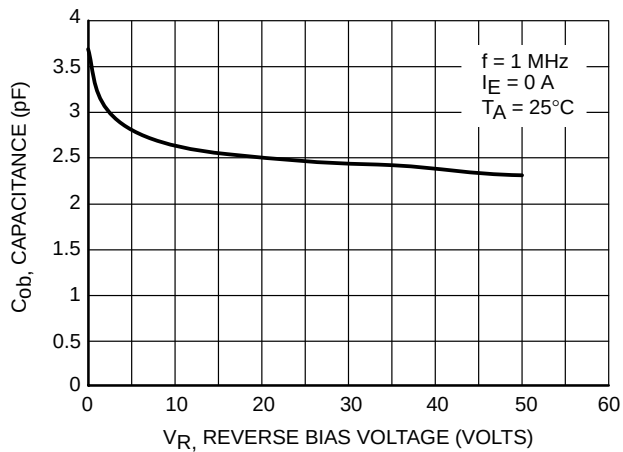


Figure 29. Output Capacitance

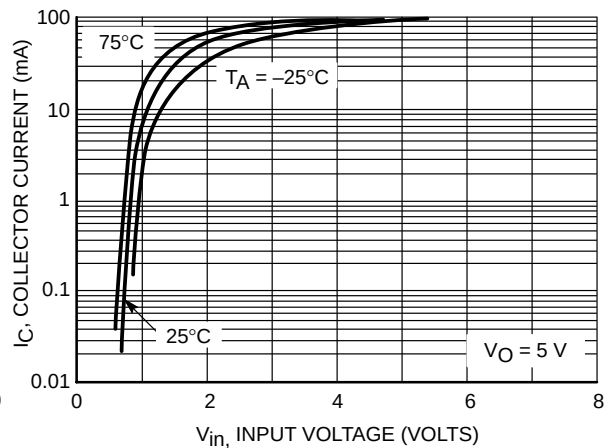


Figure 30. Output Current vs. Input Voltage

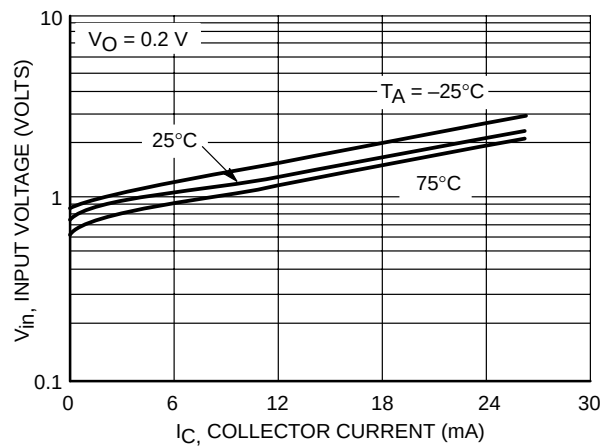


Figure 31. Input Voltage vs. Output Current

TYPICAL APPLICATIONS FOR NPN BJT's

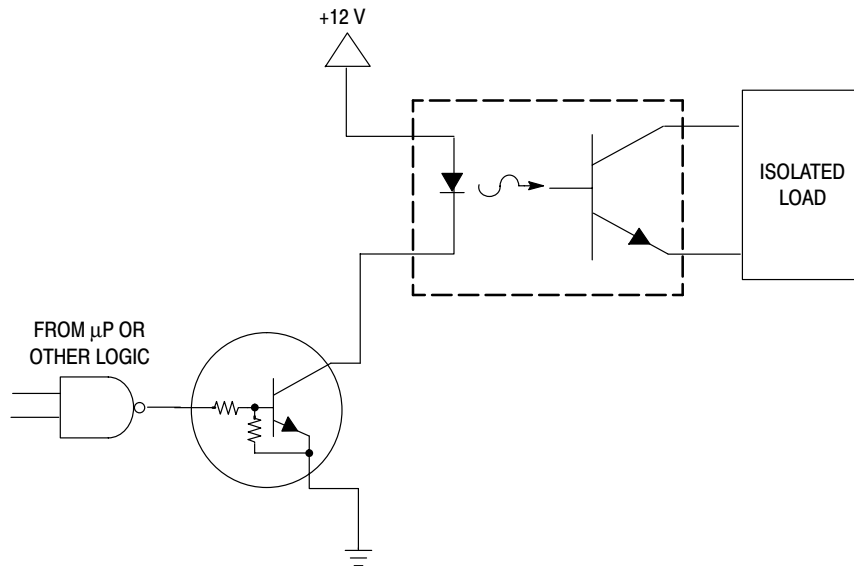


Figure 32. Level Shifter: Connects 12 or 24 Volt Circuits to Logic

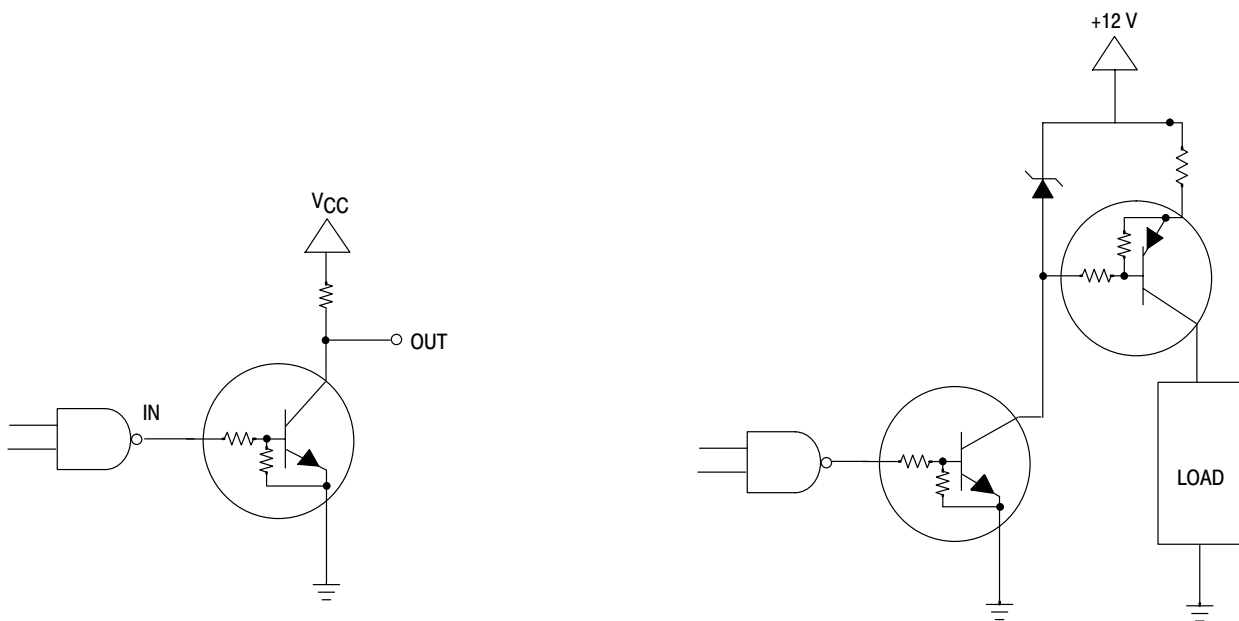


Figure 33. Open Collector Inverter: Inverts the Input Signal

Figure 34. Inexpensive, Unregulated Current Source