



Dual Bias Resistor Transistors

NPN and PNP Silicon Surface Mount

Transistors with Monolithic Bias

Resistor 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. These digital transistors are designed to replace a single device and its external resistor bias network. The BRT eliminates these individual components by integrating them into a single device. In the MUN5311DW1T1 series, two complementary BRT devices are housed in the SOT-363 package which is ideal for low power surface mount applications where board space is at a premium.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7 inch/3000 Unit Tape and Reel

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q 1 and Q 2, - minus sign for Q 1 (PNP) omitted)

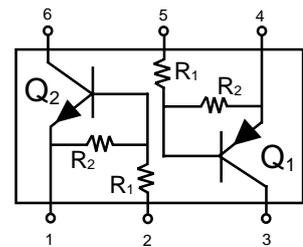
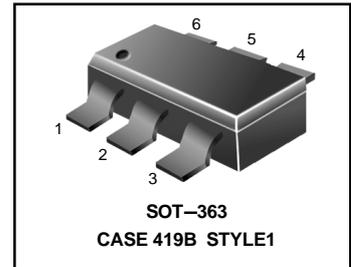
Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	50	Vdc
Collector-Emitter Voltage	V_{CEO}	50	Vdc
Collector Current	I_C	100	mAdc

THERMAL CHARACTERISTICS

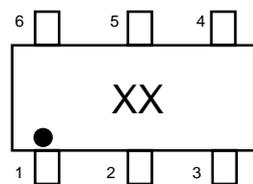
Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$	P_D	187 (Note 1.) 256 (Note 2.)	mW
Derate above 25°C		1.5 (Note 1.) 2.0 (Note 2.)	mW/ $^\circ\text{C}$
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	670 (Note 1.) 490 (Note 2.)	$^\circ\text{C}/\text{W}$
Characteristic (Both Junctions Heated)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$	P_D	250 (Note 1.) 385 (Note 2.)	mW
Derate above 25°C		2.0 (Note 1.) 3.0 (Note 2.)	mW/ $^\circ\text{C}$
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	493 (Note 1.) 325 (Note 2.)	$^\circ\text{C}/\text{W}$
Thermal Resistance – Junction-to-Lead	$R_{\theta JL}$	188 (Note 1.) 208 (Note 2.)	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

1. FR-4 @ Minimum Pad 2. FR-4 @ 1.0 x 1.0 inch Pad

MUN5311DW1T1
Series



MARKING DIAGRAM



xx = Device Marking
(See Page 2)

DEVICE MARKING INFORMATION

See specific marking information in the device marking table on page 2 of this data sheet.

MUN5311DW1T1 Series

DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R ₁ (K)	R ₂ (K)	Shipping
MUN5311DW1T1	SOT-363	11	10	10	3000/Tape & Reel
MUN5312DW1T1	SOT-363	12	22	22	3000/Tape & Reel
MUN5313DW1T1	SOT-363	13	47	47	3000/Tape & Reel
MUN5314DW1T1	SOT-363	14	10	47	3000/Tape & Reel
MUN5315DW1T1 (Note 3.)	SOT-363	15	10	∞	3000/Tape & Reel
MUN5316DW1T1 (Note 3.)	SOT-363	16	4.7	∞	3000/Tape & Reel
MUN5330DW1T1 (Note 3.)	SOT-363	30	1.0	1.0	3000/Tape & Reel
MUN5331DW1T1 (Note 3.)	SOT-363	31	2.2	2.2	3000/Tape & Reel
MUN5332DW1T1 (Note 3.)	SOT-363	32	4.7	4.7	3000/Tape & Reel
MUN5333DW1T1 (Note 3.)	SOT-363	33	4.7	47	3000/Tape & Reel
MUN5334DW1T1 (Note 3.)	SOT-363	34	22	47	3000/Tape & Reel
MUN5335DW1T1 (Note 3.)	SOT-363	35	2.2	47	3000/Tape & Reel

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q₁ and Q₂, – minus sign for Q₁ (PNP) omitted)

Characteristic	Symbol	Min	Typ	Max	Unit
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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)	MUN5311DW1T1	I _{EBO}	–	–	0.5	mAdc
	MUN5312DW1T1		–	–	0.2	
	MUN5313DW1T1		–	–	0.1	
	MUN5314DW1T1		–	–	0.2	
	MUN5315DW1T1		–	–	0.9	
	MUN5316DW1T1		–	–	1.9	
	MUN5330DW1T1		–	–	4.3	
	MUN5331DW1T1		–	–	2.3	
	MUN5332DW1T1		–	–	1.5	
	MUN5333DW1T1		–	–	0.18	
MUN5334DW1T1		–	–	0.13		
MUN5335DW1T1		–	–	0.2		
Collector-Base Breakdown Voltage (I _C = 10 μA, I _E = 0)	V _{(BR)CBO}	50	–	–	Vdc	
Collector-Emitter Breakdown Voltage (Note 4.) (I _C = 2.0 mA, I _B = 0)	V _{(BR)CEO}	50	–	–	Vdc	

3. New resistor combinations. Updated curves to follow in subsequent data sheets.

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

MUN5311DW1T1 Series

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q₁ and Q₂, – minus sign for Q₁ (PNP) omitted)
(Continued)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS (Note 5.)					
DC Current Gain (V _{CE} = 10 V, I _C = 5.0 mA)	MUN5311DW1T1	h _{FE}	35	60	–
	MUN5312DW1T1		60	100	–
	MUN5313DW1T1		80	140	–
	MUN5314DW1T1		80	140	–
	MUN5315DW1T1		160	350	–
	MUN5316DW1T1		160	350	–
	MUN5330DW1T1		3.0	5.0	–
	MUN5331DW1T1		8.0	15	–
	MUN5332DW1T1		15	30	–
	MUN5333DW1T1		80	200	–
	MUN5334DW1T1		80	150	–
	MUN5335DW1T1		80	140	–
Collector-Emitter Saturation Voltage (I _C = 10 mA, I _B = 0.3 mA)	V _{CE(sat)}	–	–	0.25	Vdc
(I _C = 10 mA, I _B = 5 mA)	MUN5330DW1T1/MUN5331DW1T1				
(I _C = 10 mA, I _B = 1 mA)	MUN5315DW1T1/MUN5316DW1T1 MUN5332DW1T1/MUN5333DW1T1/MUN5334DW1T1				
Output Voltage (on) (V _{CC} = 5.0V, V _B = 2.5V, R _L = 1.0 kΩ)	V _{OL}				Vdc
	MUN5311DW1T1	–	–	0.2	
	MUN5312DW1T1	–	–	0.2	
	MUN5314DW1T1	–	–	0.2	
	MUN5315DW1T1	–	–	0.2	
	MUN5316DW1T1	–	–	0.2	
	MUN5330DW1T1	–	–	0.2	
	MUN5331DW1T1	–	–	0.2	
	MUN5332DW1T1	–	–	0.2	
	MUN5333DW1T1	–	–	0.2	
	MUN5334DW1T1	–	–	0.2	
	MUN5335DW1T1	–	–	0.2	
(V _{CC} = 5.0V, V _B = 3.5 V, R _L = 1.0kΩ)	MUN5313DW1T1	–	–	0.2	

MUN5311DW1T1 Series

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q₁ and Q₂, – minus sign for Q₁ (PNP) omitted)
(Continued)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS (Note 5.)					
Output Voltage (off) (V _{CC} =5.0V, V _B =0.5V, R _L =1.0kΩ) (V _{CC} =5.0V, V _B =0.050V, R _L =1.0kΩ) MUN5330DW1T1 (V _{CC} =5.0V, V _B =0.25V, R _L =1.0kΩ) MUN5315DW1T1 MUN5316DW1T1 MUN5333DW1T1	V _{OH}	4.9	–	–	Vdc
Input Resistor MUN5311DW1T1 MUN5312DW1T1 MUN5313DW1T1 MUN5314DW1T1 MUN5315DW1T1 MUN5316DW1T1 MUN5330DW1T1 MUN5331DW1T1 MUN5332DW1T1 MUN5333DW1T1 MUN5334DW1T1 MUN5335DW1T1	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	10 22 47 10 10 4.7 1.0 2.2 4.7 4.7	13 28.6 61.1 13 13 6.1 1.3 2.9 6.1 6.1 28.6 2.86	kΩ
Resistor Ratio MUN5311DW1T1/MUN5312DW1T1/MUN5313DW1T1 MUN5314DW1T1 MUN5315DW1T1/MUN5316DW1T1 MUN5330DW1T1/MUN5331DW1T1/MUN5332DW1T1 MUN5333DW1T1 MUN5334DW1T1 MUN5335DW1T1	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	

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

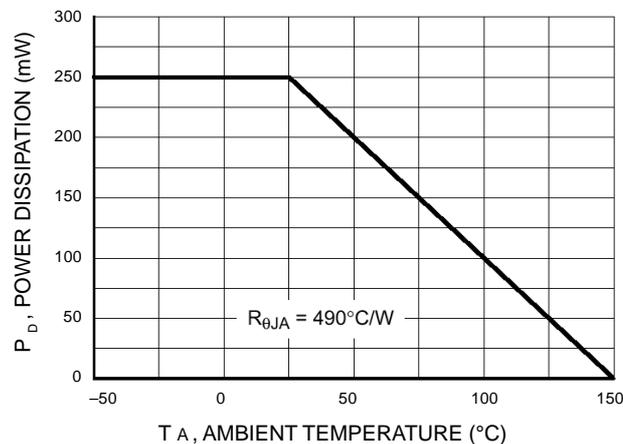
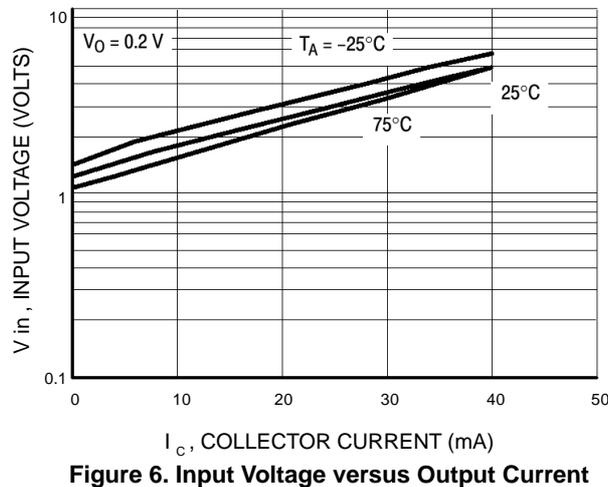
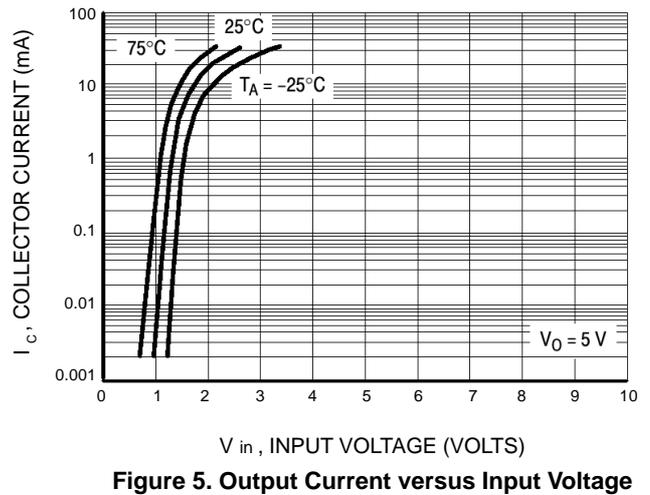
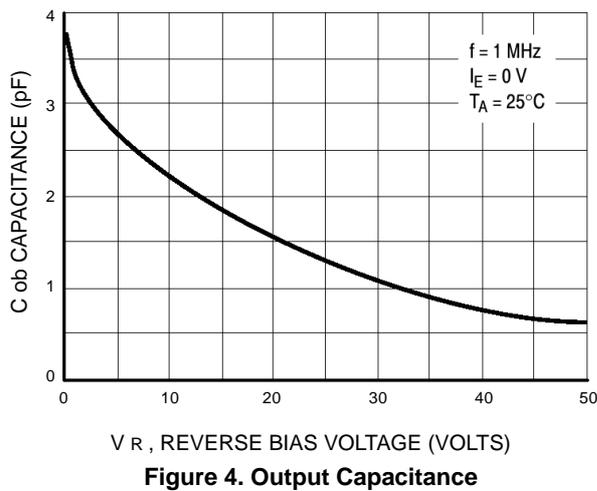
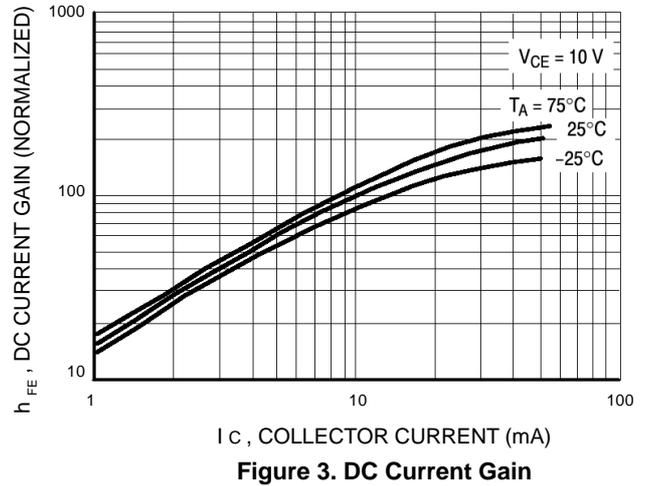
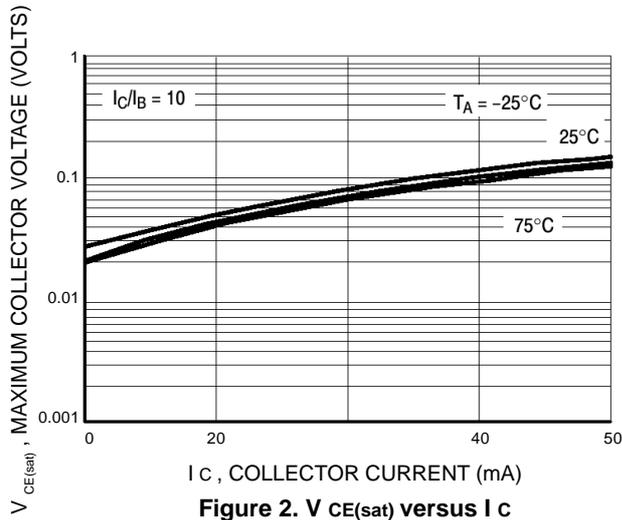


Figure 1. Derating Curve

MUN5311DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5311DW1T1 NPN TRANSISTOR



MUN5311DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5311DW1T1 PNP TRANSISTOR

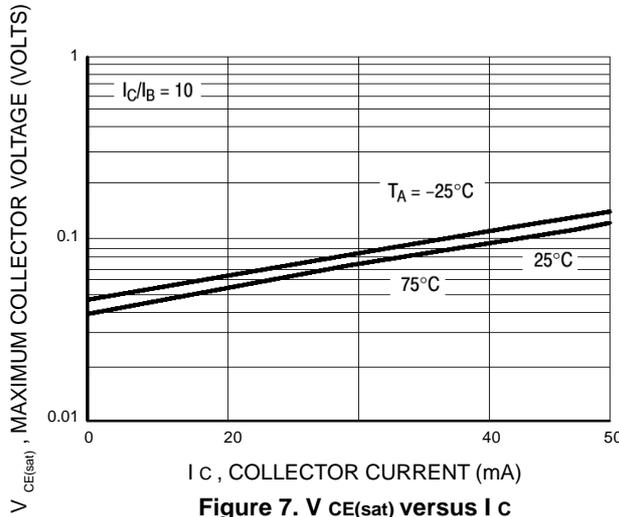


Figure 7. $V_{CE(sat)}$ versus I_c

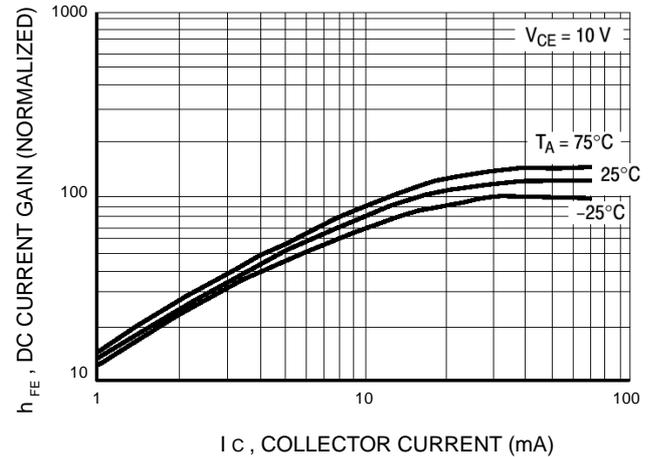


Figure 8. DC Current Gain

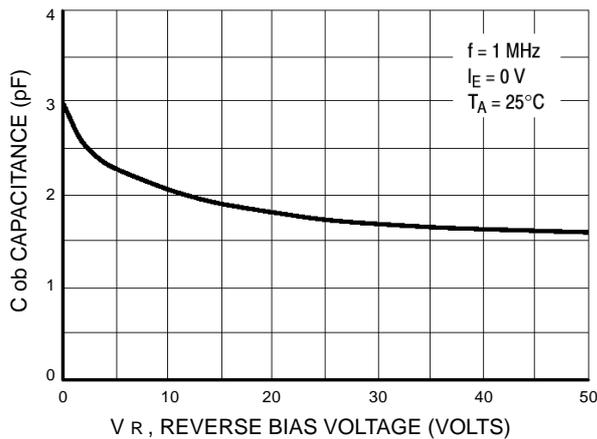


Figure 9. Output Capacitance

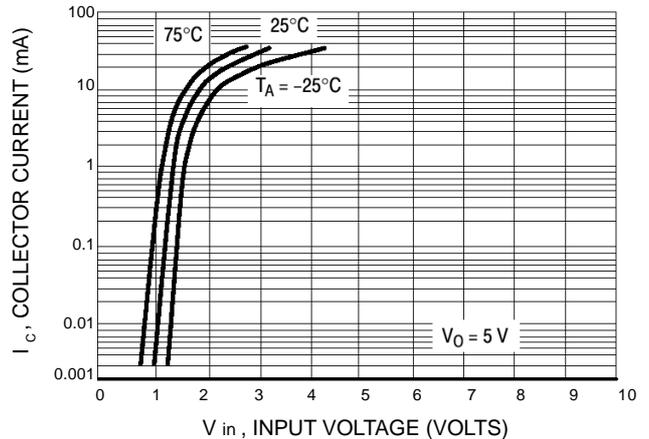


Figure 10. Output Current versus Input Voltage

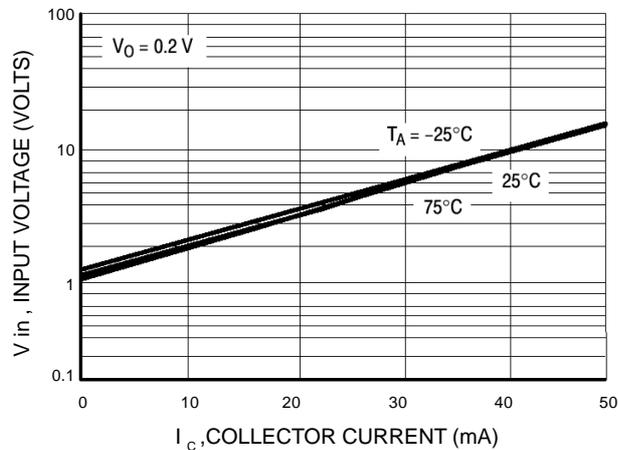
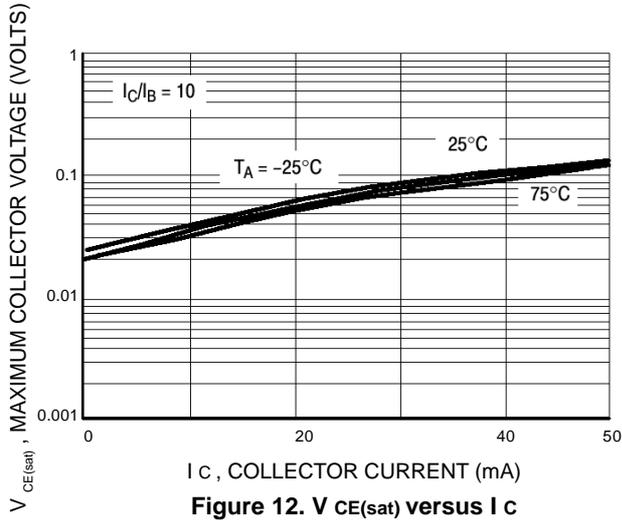


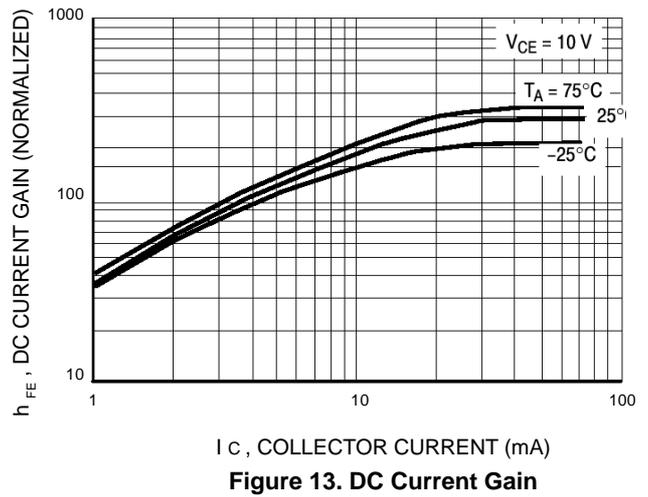
Figure 11. Input Voltage versus Output Current

MUN5311DW1T1 Series

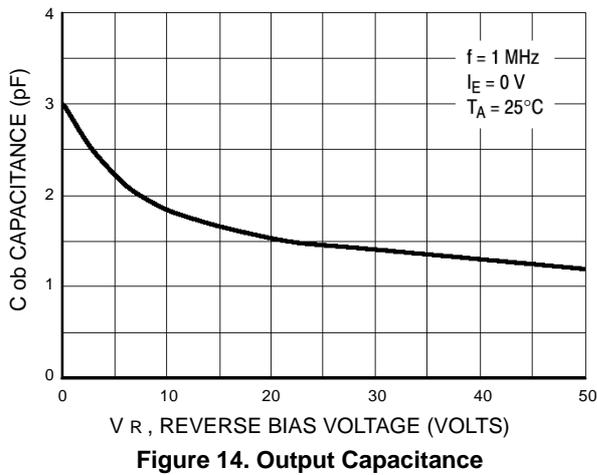
TYPICAL ELECTRICAL CHARACTERISTICS – MUN5312DW1T1 NPN TRANSISTOR



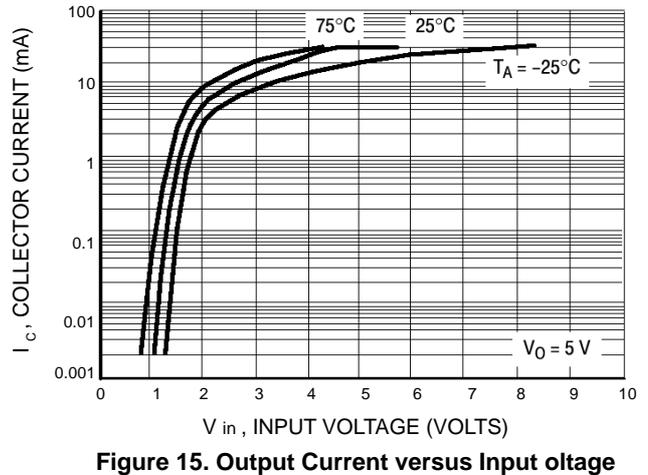
I_C , COLLECTOR CURRENT (mA)
Figure 12. $V_{CE(sat)}$ versus I_C



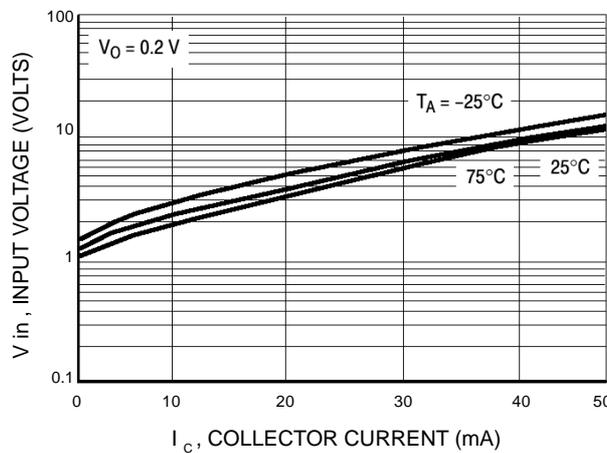
I_C , COLLECTOR CURRENT (mA)
Figure 13. DC Current Gain



V_R , REVERSE BIAS VOLTAGE (VOLTS)
Figure 14. Output Capacitance



V_{in} , INPUT VOLTAGE (VOLTS)
Figure 15. Output Current versus Input Voltage



I_C , COLLECTOR CURRENT (mA)
Figure 16. Input Voltage versus Output Current

MUN5311DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5312DW1T1 PNP TRANSISTOR

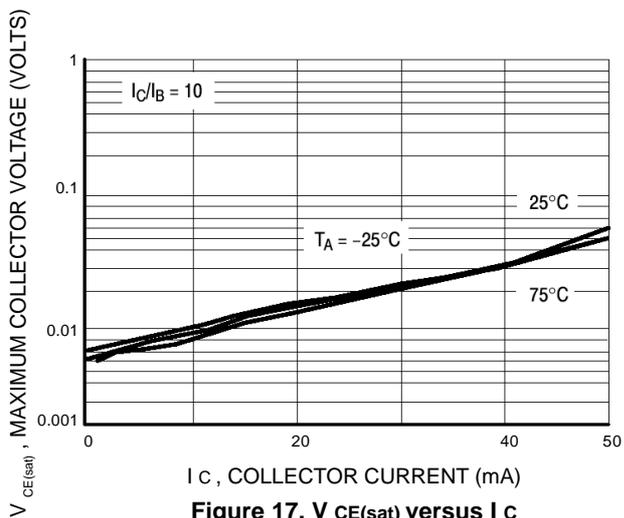


Figure 17. $V_{CE(sat)}$ versus I_C

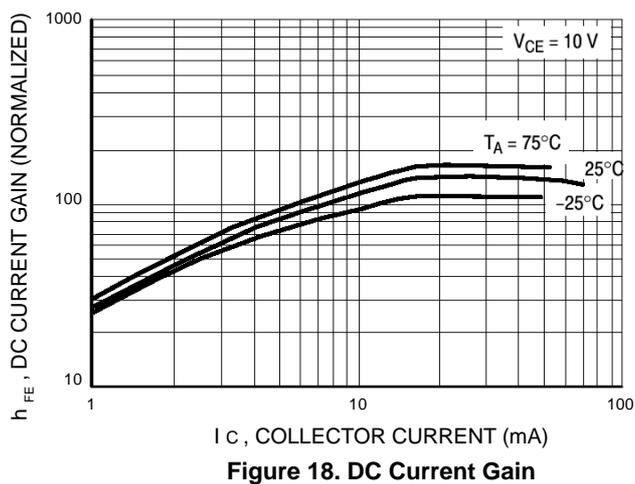


Figure 18. DC Current Gain

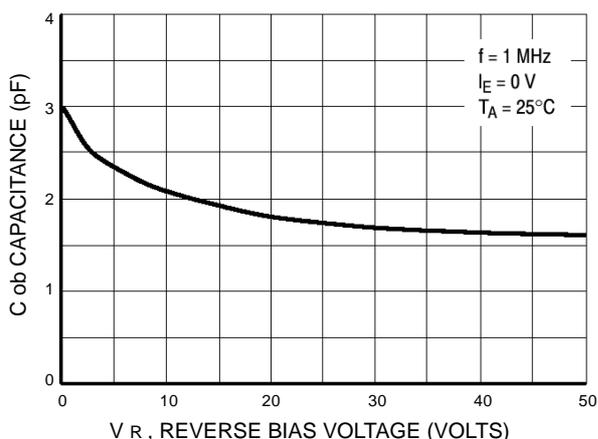


Figure 19. Output Capacitance

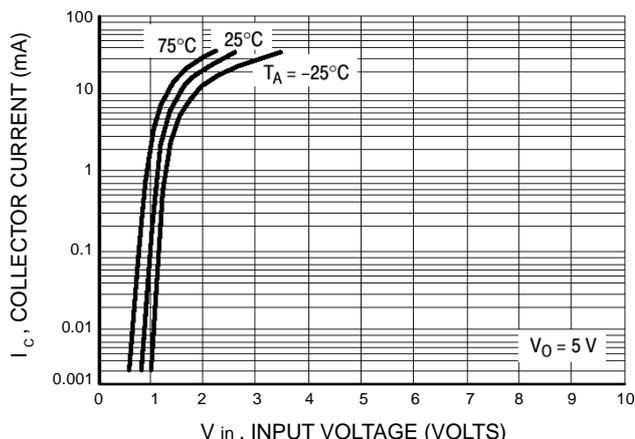


Figure 20. Output Current versus Input Voltage

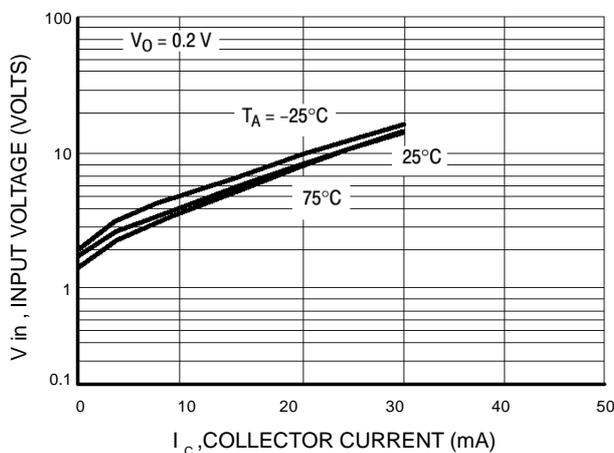
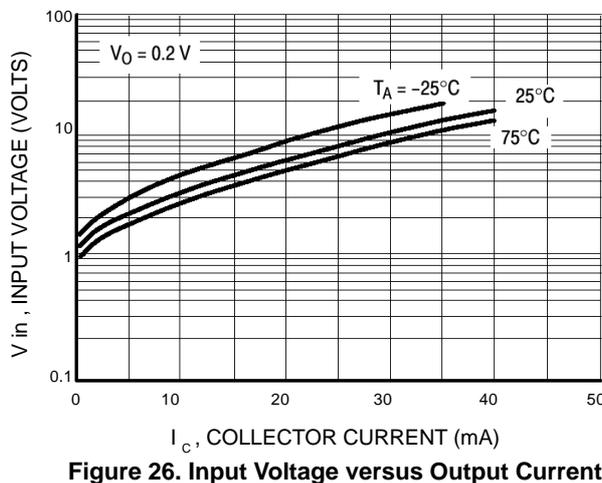
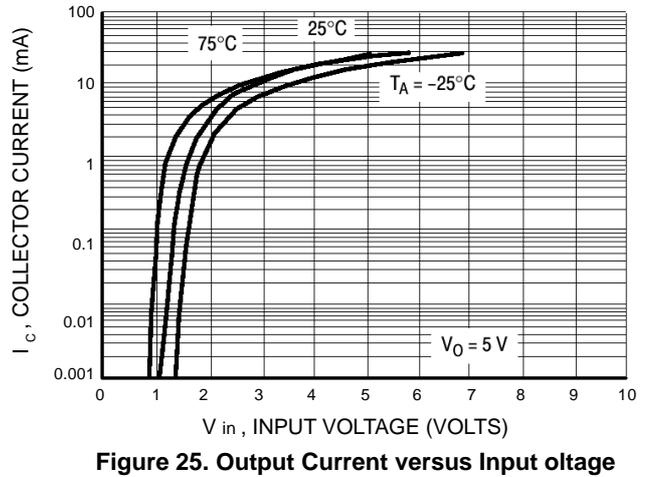
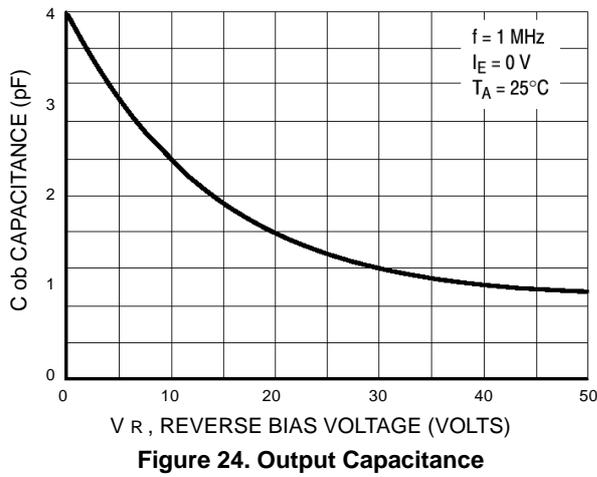
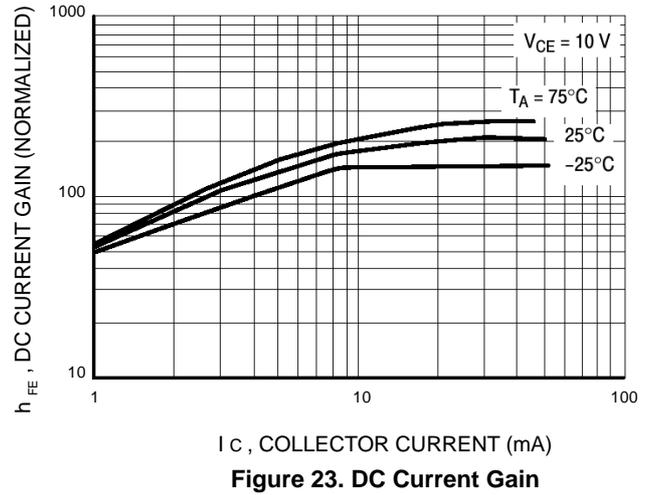
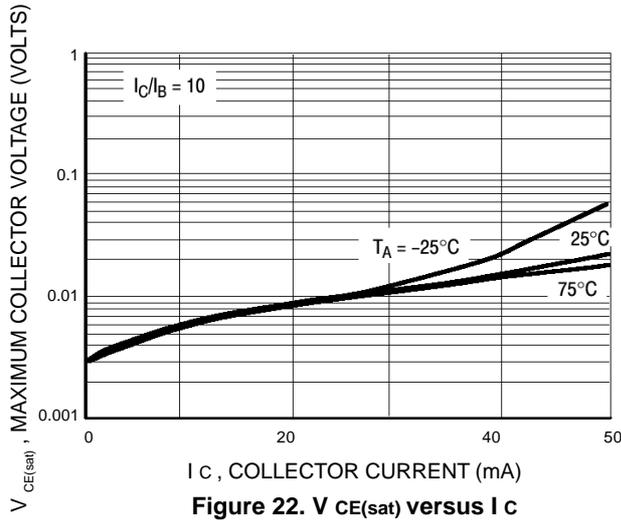


Figure 21. Input Voltage versus Output Current

MUN5311DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5313DW1T1 NPN TRANSISTOR



MUN5311DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5313DW1T1 PNP TRANSISTOR

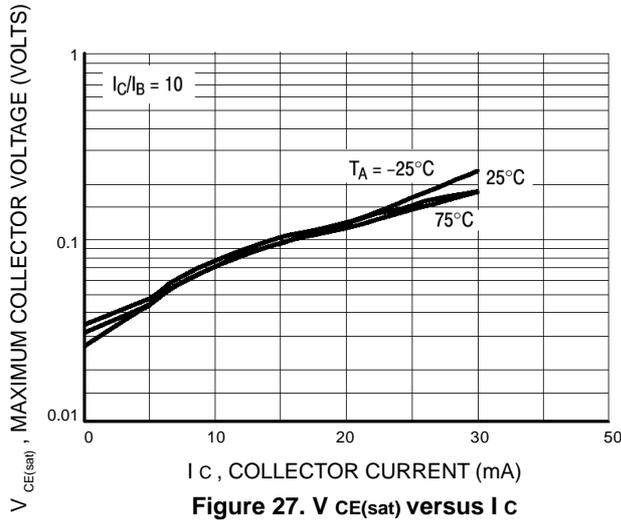


Figure 27. $V_{CE(sat)}$ versus I_c

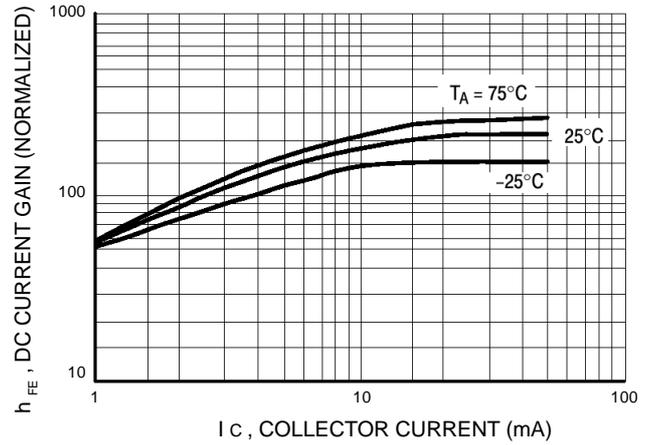


Figure 28. DC Current Gain

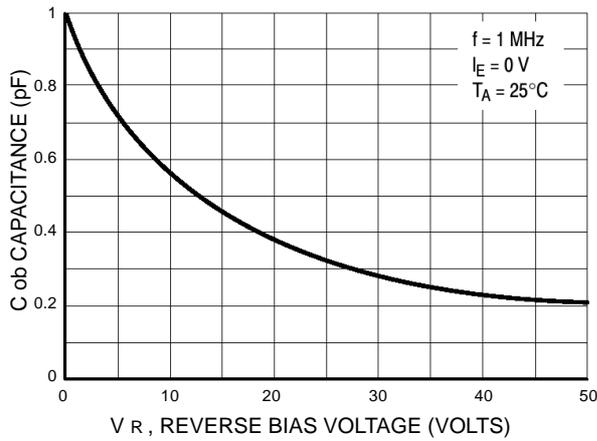


Figure 29. Output Capacitance

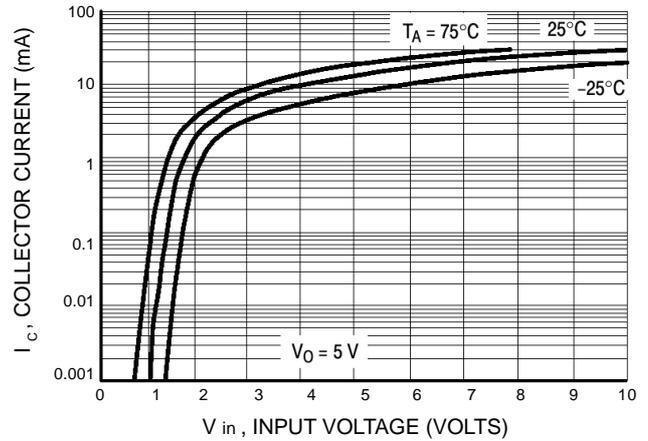


Figure 30. Output Current versus Input Voltage

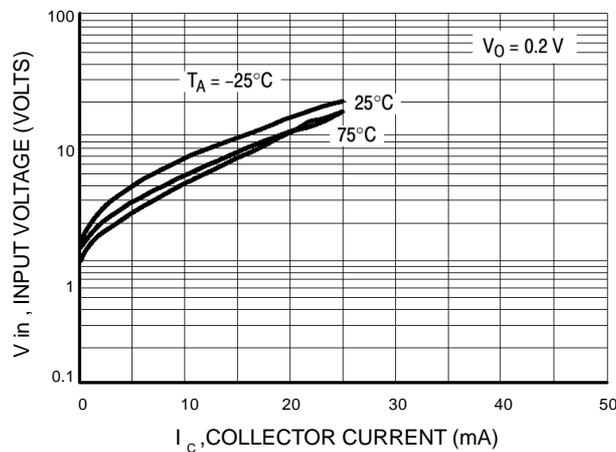
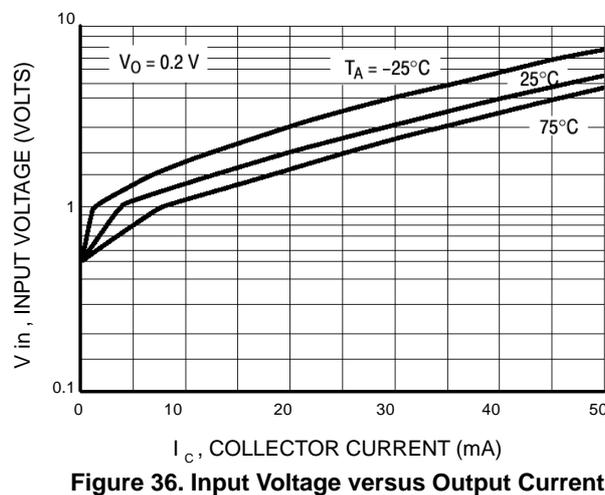
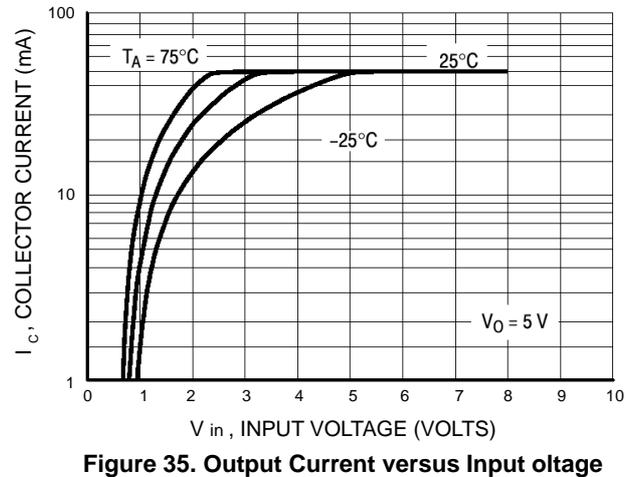
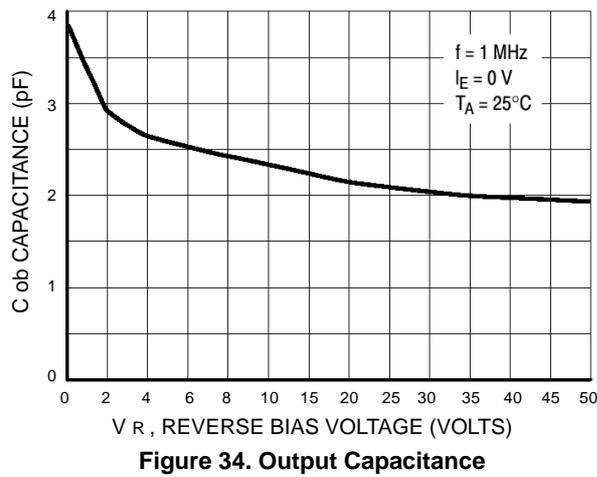
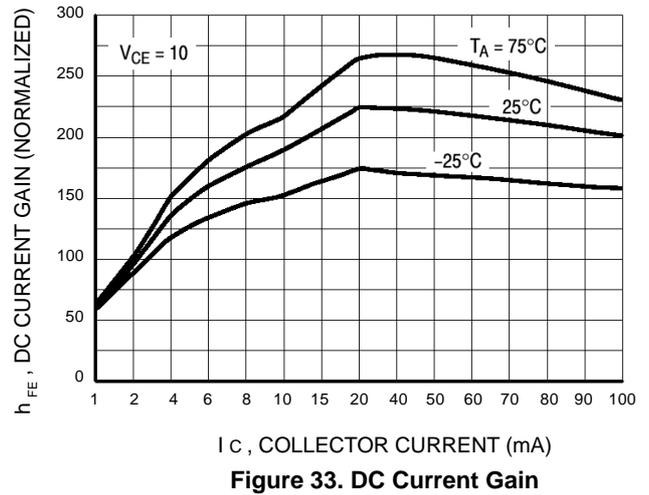
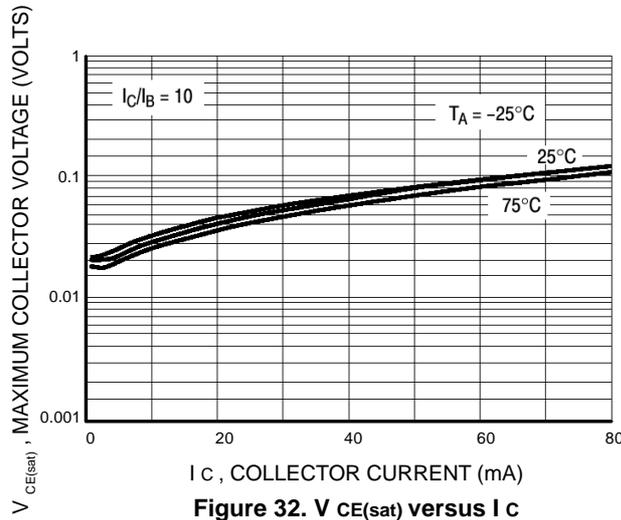


Figure 31. Input Voltage versus Output Current

MUN5311DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5314DW1T1 NPN TRANSISTOR



MUN5311DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5314DW1T1 PNP TRANSISTOR

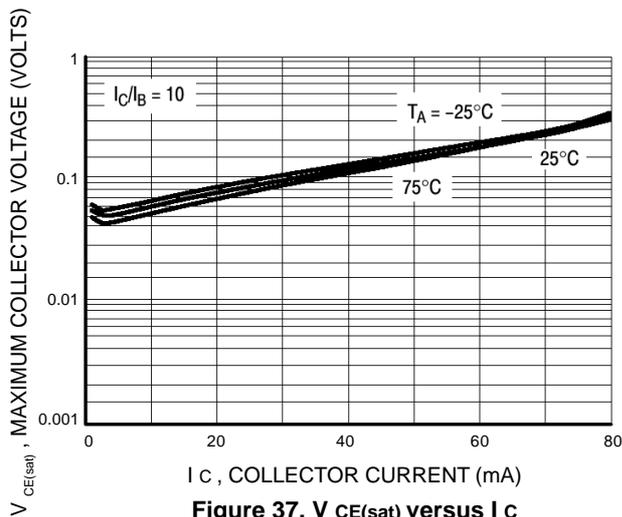


Figure 37. $V_{CE(sat)}$ versus I_C

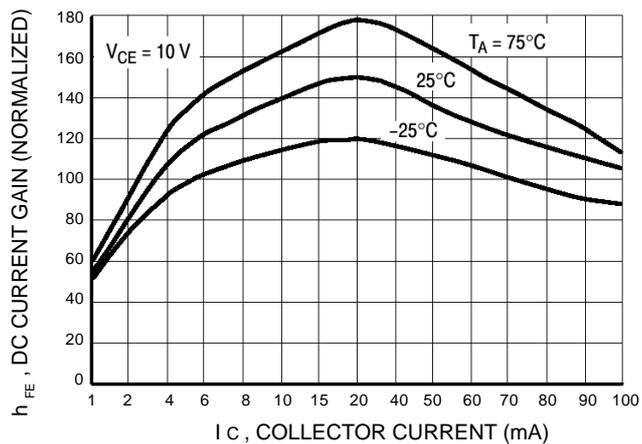


Figure 38. DC Current Gain

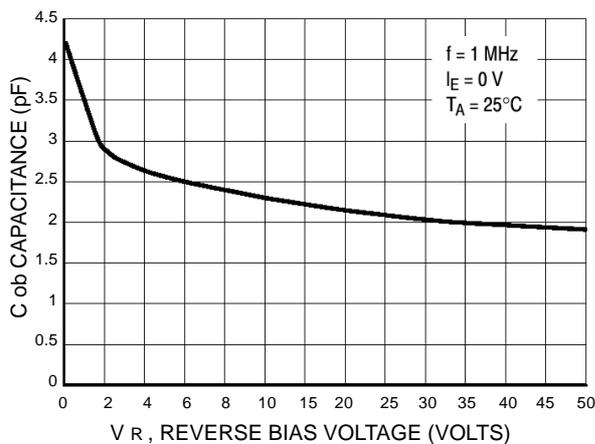


Figure 39. Output Capacitance

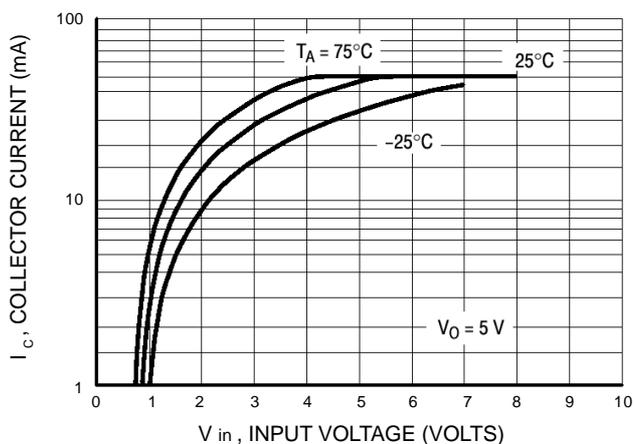


Figure 40. Output Current versus Input Voltage

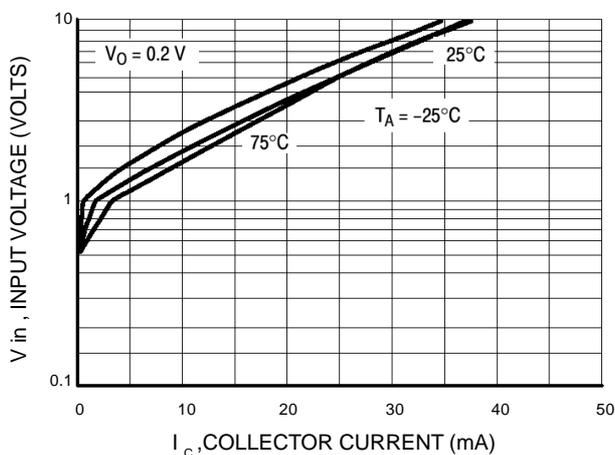


Figure 41. Input Voltage versus Output Current

MUN5311DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5315DW1T1

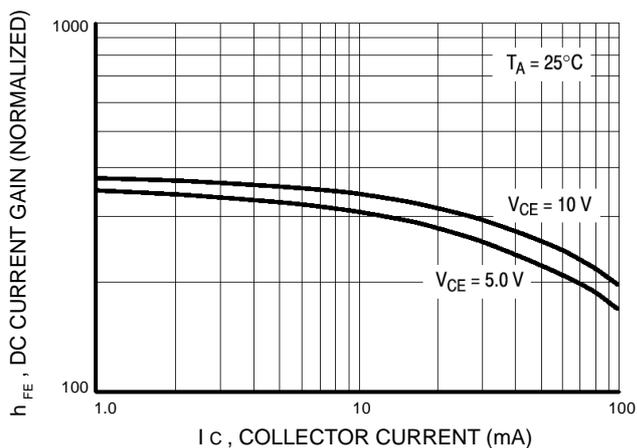


Figure 42. DC Current Gain-PNP

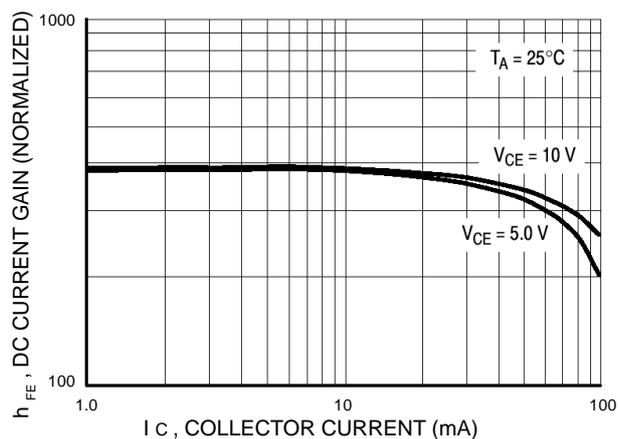


Figure 43. DC Current Gain-NPN

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5316DW1T1

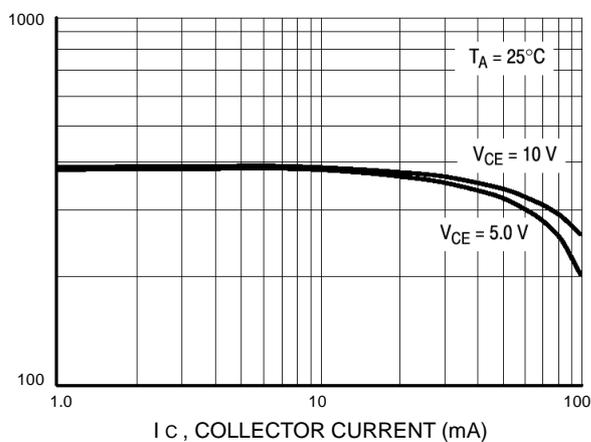


Figure 44. DC Current Gain-PNP

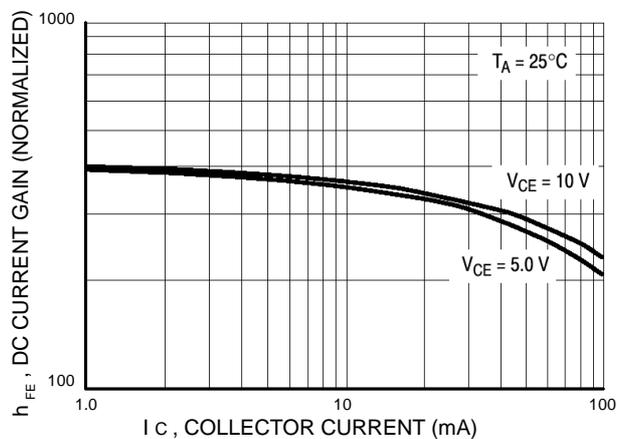


Figure 45. DC Current Gain-NPN