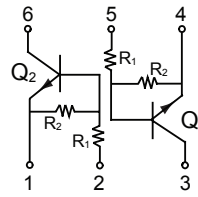


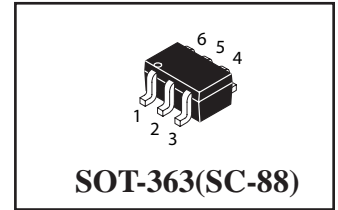
### Surface Mount Dual Bias Resistor Transistor

NPN Silicon

 Lead(Pb)-Free



NPN+NPN



### Maximum Ratings

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	50	Vdc
Collector-Base Voltage	V <sub>CB0</sub>	50	Vdc
Collector Current	I <sub>C</sub>	100	mAdc

### Thermal Characteristics

Characteristics (1)	Symbol	Max	Unit	
Total Device Dissipation TA=25°C	P <sub>D</sub>	187 (2)	mW	
		256 (3)		
		1.5 (2)		mW/°C
		2.0 (3)		
Thermal Resistance, Junction to Ambient	R <sub>θA</sub>	670(2) 490(3)	°C/W	
Junction and Storage, Temperature	T <sub>J</sub> ,T <sub>stg</sub>	-55 to +150	°C	

1.One Junction Heated

2.FR-4 @ Minimum Pad

3.FR-4 @ 1.0x1.0 Inch Pad

### Device Marking and Resistor Values

Device	Marking	R1(K)	R2(K)	Device	Marking	R1(K)	R2(K)
MUN5211DW	7A	10	10	MUN5231DW	7H	2.2	2.2
MUN5212DW	7B	22	22	MUN5232DW	7J	4.7	4.7
MUN5213DW	7C	47	47	MUN5233DW	7K	4.7	47
MUN5214DW	7D	10	47	MUN5234DW	7L	22	47
MUN5215DW	7E	10	∞	MUN5235DW	7M	2.2	47
MUN5216DW	7F	4.7	∞	MUN5236DW	7N	100	100
MUN5230DW	7G	1.0	1.0	MUN5237DW	7P	47	22

**Electrical Characteristics** (TA=25°C Unless Otherwise noted)

Characteristics	Symbol	Min	Max	Unit
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**Off Characteristics**

Collector-Base Cutoff Current (VCB=50Vdc, IE=0)	ICBO	-	100	nAdc
Collector-Emitter Cutoff Current(VCE=50Vdc, IB=0)	ICEO	-	500	nAdc
Emitter-Base Cutoff Current (VEB=6.0Vdc, IC=0)	IEBO	-	0.5	mAdc
MUN5211DW		-	0.2	
MUN5212DW		-	0.1	
MUN5213DW		-	0.2	
MUN5214DW		-	0.9	
MUN5215DW		-	1.9	
MUN5216DW		-	4.3	
MUN5230DW		-	2.3	
MUN5231DW		-	1.5	
MUN5232DW		-	0.18	
MUN5233DW		-	0.13	
MUN5234DW		-	0.2	
MUN5235DW		-	0.05	
MUN5236DW		-	0.13	
MUN5237DW	-			
Collector-Base Breakdown Voltage (IC=10uAdc, IE=0)	V(BR)CBO	50	-	Vdc
Collector-Emitter Breakdown Voltage(4) (IC=2.0mA, IB=0)	V(BR)CEO	50	-	Vdc

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

## Electrical Characteristics (T<sub>A</sub>=25 °C unless otherwise noted) (Continued)

Characteristics	Symbol	Min	Typ	Max	Unit
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### On Characteristics (4)

DC Current Gain (I <sub>C</sub> = 5.0 mAdc, V <sub>CE</sub> =10Vdc)	MUN5211DW	H <sub>FE</sub>	35	60	-	
	MUN5212DW		60	100	-	
	MUN5213DW		80	140	-	
	MUN5214DW		80	140	-	
	MUN5215DW		160	350	-	
	MUN5216DW		160	350	-	
	MUN5230DW		3.0	5.0	-	
	MUN5231DW		8.0	15	-	
	MUN5232DW		15	30	-	
	MUN5233DW		80	200	-	
	MUN5234DW		80	150	-	
	MUN5235DW		80	140	-	
	MUN5236DW		80	150	-	
	MUN5237DW		80	140	-	
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 0.3mAdc) (I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 5.0mAdc) MUN5230DW/MUN5231DW (I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 1.0mAdc) MUN5215DW/MUN5216DW MUN5232DW/MUN5233DW/MUN5234DW		V <sub>CE(sat)</sub>	-	-	0.25	Vdc
Output Voltage (on) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 2.5V, R <sub>L</sub> =1.0 kΩ)	MUN5211DW MUN5212DW MUN5214DW MUN5215DW MUN5216DW MUN5230DW MUN5231DW MUN5232DW MUN5233DW MUN5234DW MUN5235DW (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 3.5V, R <sub>L</sub> =1.0 kΩ) MUN5213DW (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 5.5V, R <sub>L</sub> =1.0 kΩ) MUN5236DW (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 4.0V, R <sub>L</sub> =1.0 kΩ) MUN5237DW	V <sub>OL</sub>	-	-	0.2	Vdc
Output Voltage (off) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.5V, R <sub>L</sub> =1.0 kΩ) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.05V, R <sub>L</sub> =1.0 kΩ) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.25V, R <sub>L</sub> =1.0 kΩ)	MUN5230DW MUN5215DW MUN5216DW MUN5233DW	V <sub>OL</sub>	4.9	-	-	Vdc

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

**Electrical Characteristics** ( $T_A=25^{\circ}\text{C}$  unless otherwise noted) (Continued)

Characteristics	Symbol	Min	Typ	Max	Unit
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**On Characteristics** <sup>(5)</sup>

Input Resistor	MUN5211DW	R1	7.0	10	13	k $\Omega$
	MUN5212DW		15.4	22	28.6	
	MUN5213DW		32.9	47	61.1	
	MUN5214DW		7.0	10	13	
	MUN5215DW		7.0	10	13	
	MUN5216DW		3.3	4.7	6.1	
	MUN5230DW		0.7	1.0	1.3	
	MUN5231DW		1.5	2.2	2.9	
	MUN5232DW		3.3	4.7	6.1	
	MUN5233DW		3.3	4.7	6.1	
	MUN5234DW		15.4	22	28.6	
	MUN5235DW		1.54	2.2	2.86	
	MUN5236DW		70	100	130	
	MUN5237DW		32.9	47	61.1	
Resistor Ratio	MUN5211DW/MUN5212DW	R1/R2	0.8	1.0	1.2	
	MUN5213DW/MUN5236DW		0.17	0.21	0.25	
	MUN5214DW		-	-	-	
	MUN5215DW/MUN5216DW		0.8	1.0	1.2	
	MUN5230DW/MUN5231DW/MUN5232DW		0.055	0.1	0.185	
	MUN5233DW		0.38	0.47	0.56	
	MUN5234DW		0.038	0.047	0.056	
	MUN5235DW		1.7	2.1	2.6	

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

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5211DW

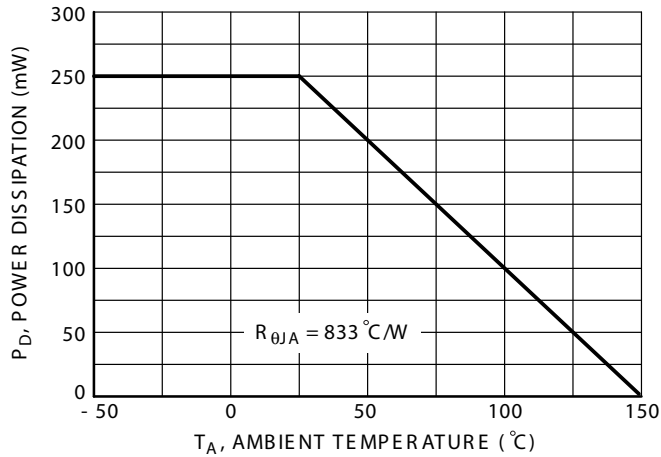


FIG 1. Derating Curve

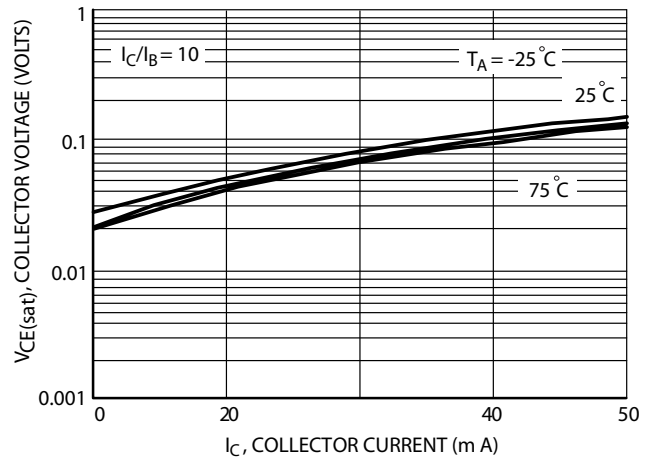


FIG 2.  $V_{CE(sat)}$  versus  $I_C$

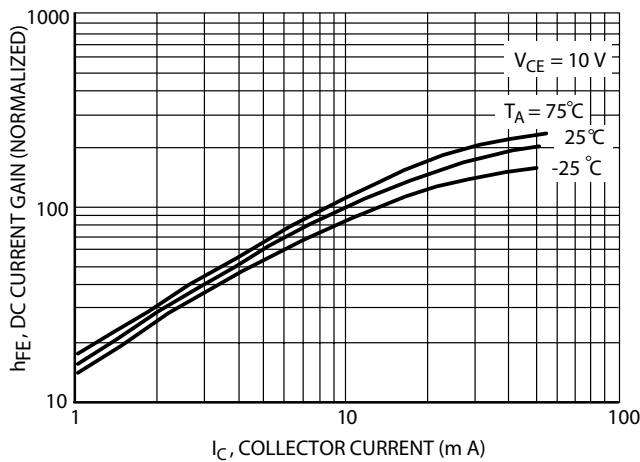


FIG 3. DC Current Gain

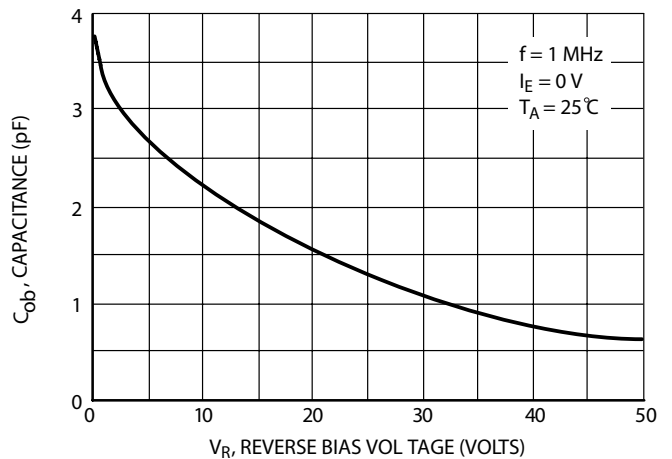


FIG 4. Output Capacitance

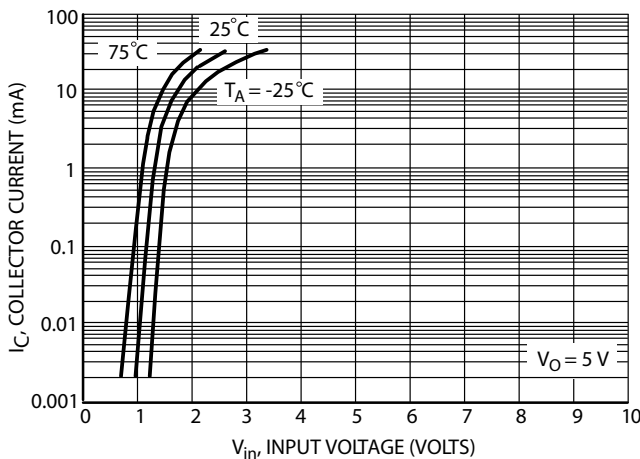


FIG 5. Output Current versus Input Voltage

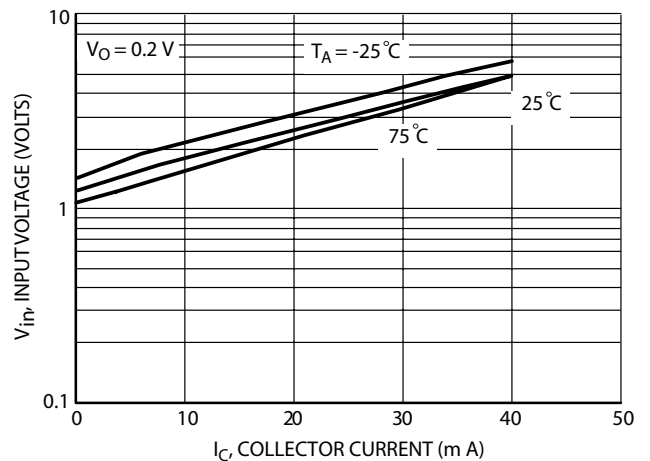
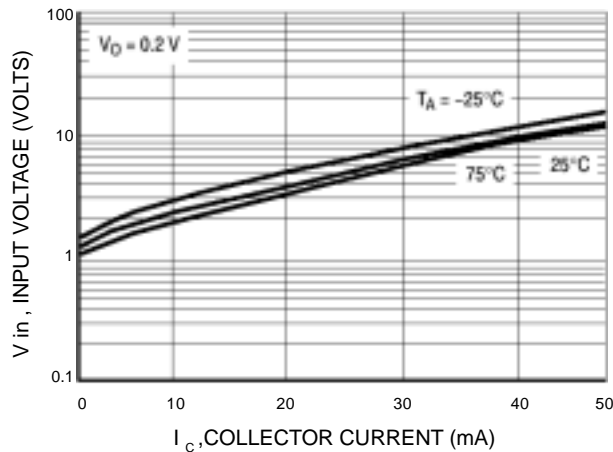
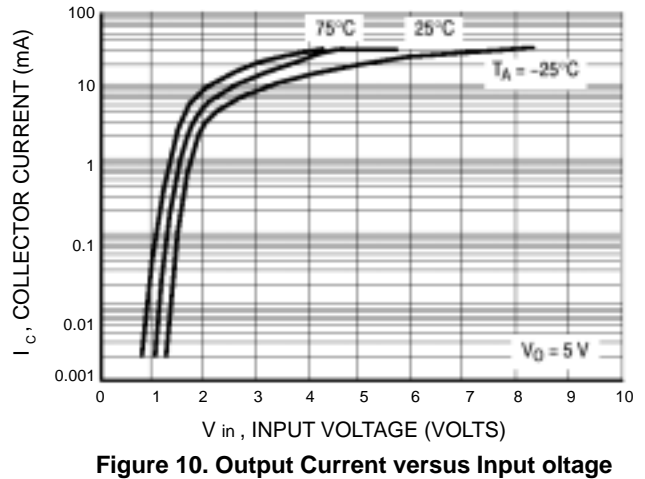
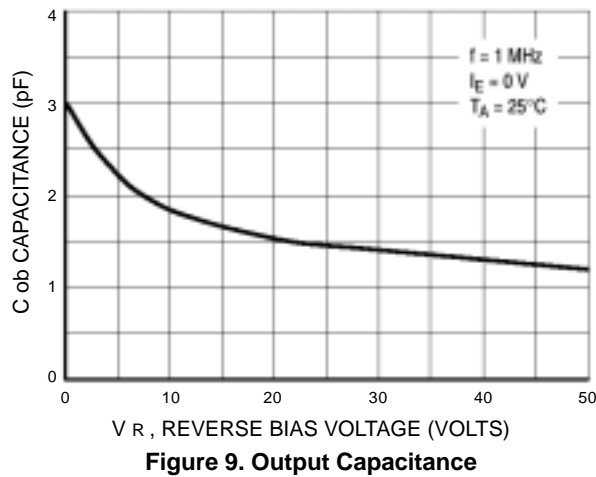
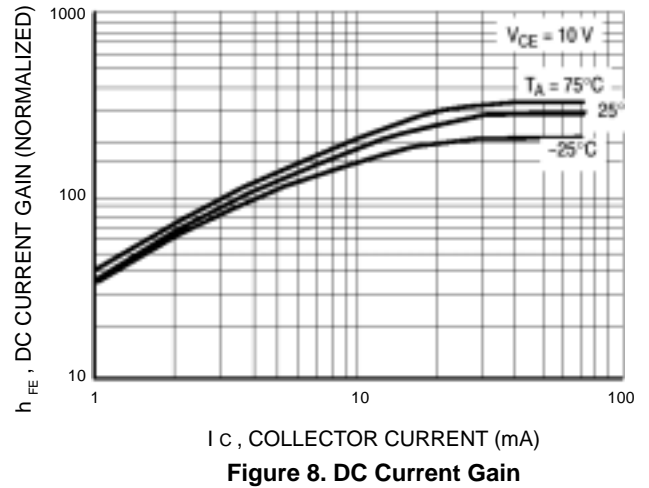
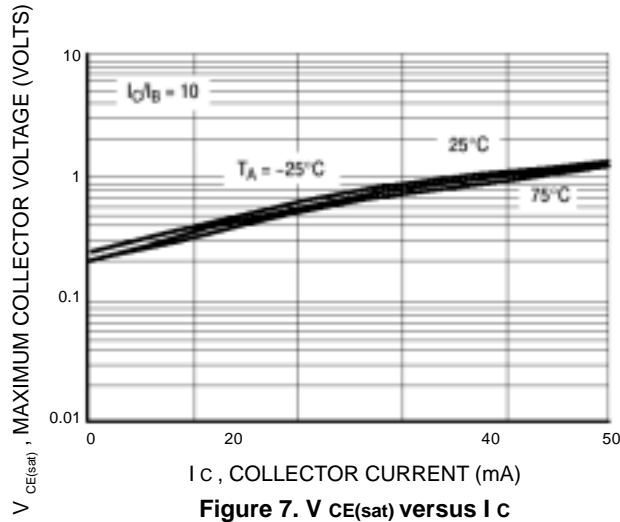


FIG 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5212DW



TYPICAL ELECTRICAL CHARACTERISTICS – MUN5213DW

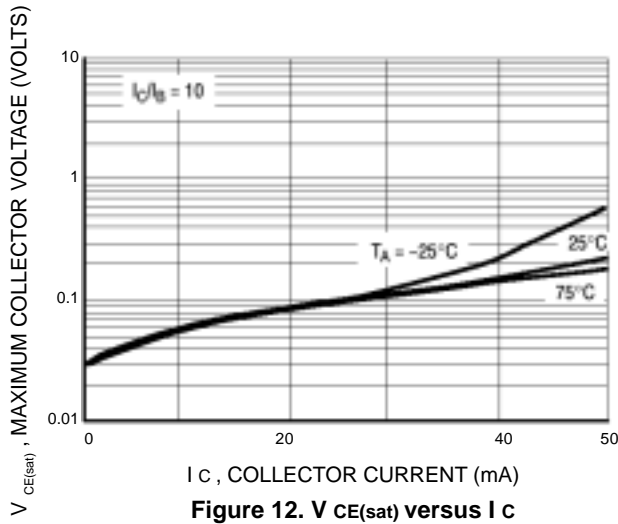


Figure 12.  $V_{CE(sat)}$  versus  $I_c$

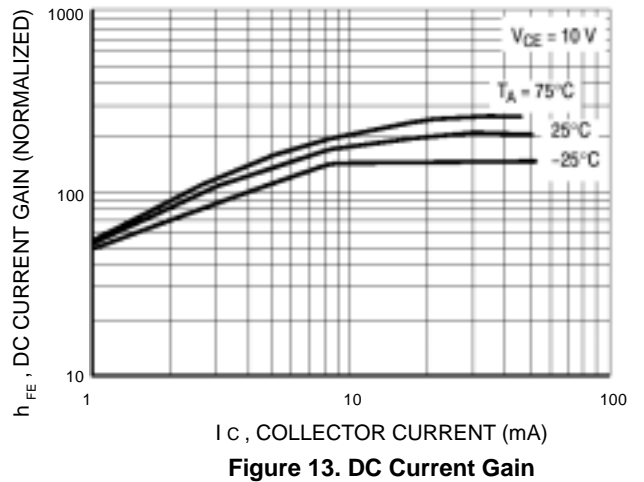


Figure 13. DC Current Gain

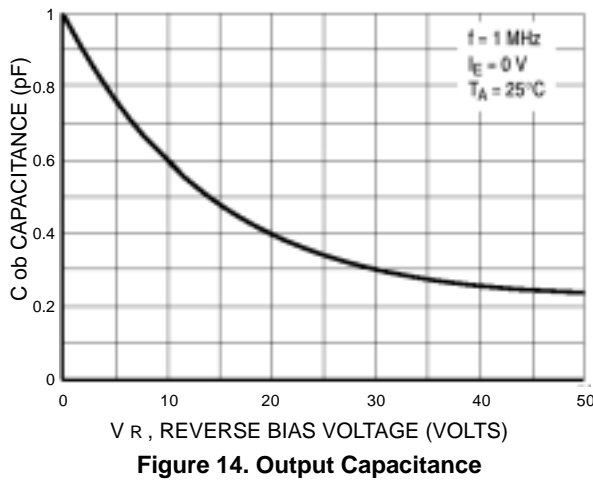


Figure 14. Output Capacitance

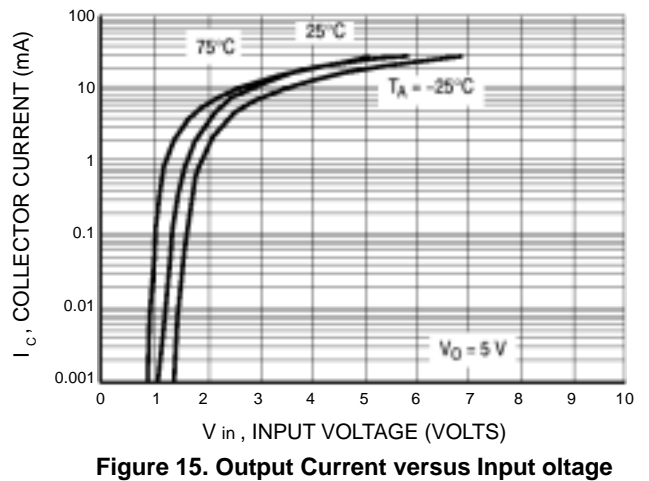


Figure 15. Output Current versus Input voltage

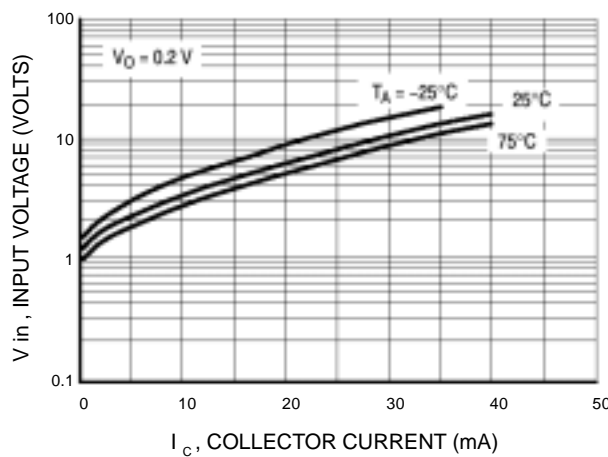


Figure 16. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5214DW

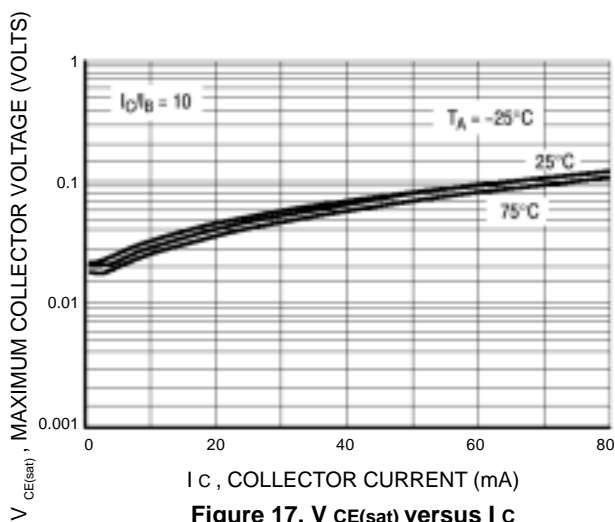


Figure 17.  $V_{CE(sat)}$  versus  $I_C$

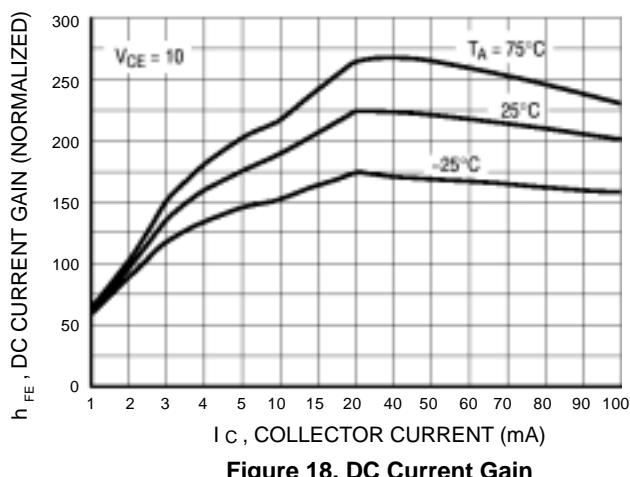


Figure 18. DC Current Gain

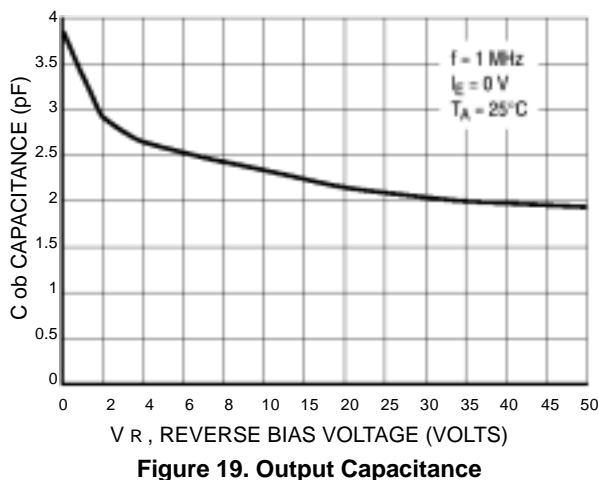


Figure 19. Output Capacitance

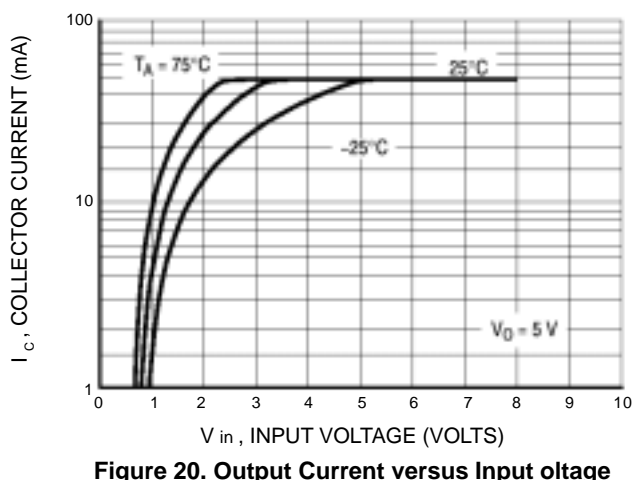


Figure 20. Output Current versus Input Voltage

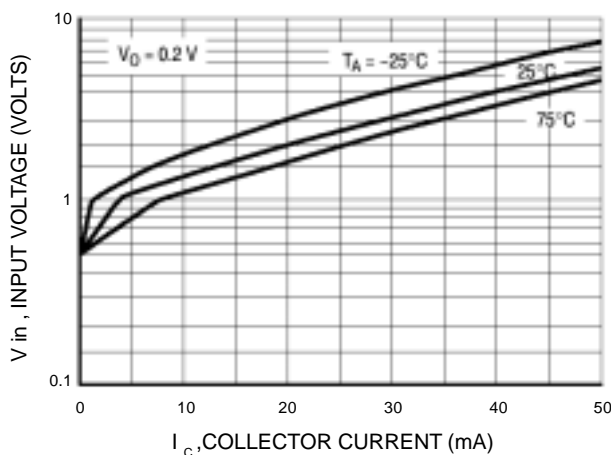
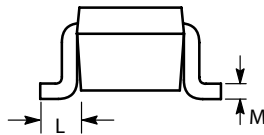
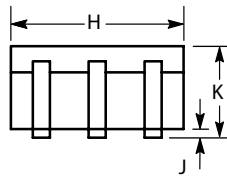
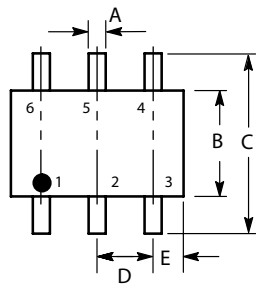


Figure 21. Input Voltage versus Output Current



**SOT-363 Package Outline Dimensions**

Unit:mm



SOT-363		
Dim	Min	Max
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 REF	
E	0.30	0.40
H	1.80	2.20
J	-	0.10
K	0.80	1.10
L	0.25	0.40
M	0.10	0.25