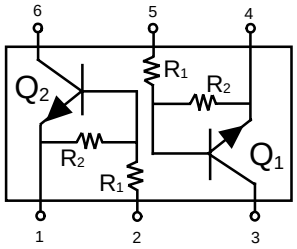
Elektronische Bauelemente

SMUN52XXDW

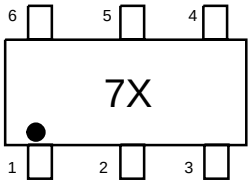
NPN Multi-Chip
Built-in Resistors Transistor

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 SMUN5211DW series, two 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
- Pb-Free Package is available

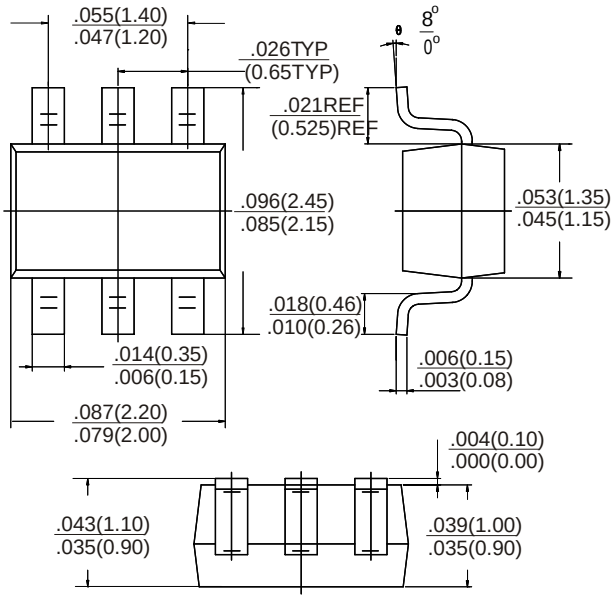


MARKING DIAGRAM



7X = Device Marking

SOT-363



Dimensions in inches and (millimeters)

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted, common for Q_1 and Q_2)

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

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

DEVICE MARKING , RESISTOR VALUES AND ORDERING INFORMATION

Device	Package	Marking	R1(K)	R2(K)	Shipping
SMUN5211DW	SOT-363	7A	10	10	3000/Tape&Reel
SMUN5212DW	SOT-363	7B	22	22	3000/Tape&Reel
SMUN5213DW	SOT-363	7C	47	47	3000/Tape&Reel
SMUN5214DW	SOT-363	7D	10	47	3000/Tape&Reel
SMUN5215DW	SOT-363	7E	10	open	3000/Tape&Reel
SMUN5216DW	SOT-363	7F	4.7	open	3000/Tape&Reel
SMUN5230DW	SOT-363	7G	1	1	3000/Tape&Reel
SMUN5231DW	SOT-363	7H	2.2	2.2	3000/Tape&Reel
SMUN5232DW	SOT-363	7J	4.7	4.7	3000/Tape&Reel
SMUN5233DW	SOT-363	7K	4.7	47	3000/Tape&Reel
SMUN5234DW	SOT-363	7L	22	47	3000/Tape&Reel
SMUN5235DW	SOT-363	7M	2.2	47	3000/Tape&Reel
SMUN5236DW	SOT-363	7N	100	100	3000/Tape&Reel
SMUN5237DW	SOT-363	7P	47	22	3000/Tape&Reel

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q_1 and Q_2)

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	SMUN5211DW	I_{EBO}	–	–	0.5	mAdc
(V_{EB} = 6.0 V, I_C = 0)	SMUN5212DW		–	–	0.2	
	SMUN5213DW		–	–	0.1	
	SMUN5214DW		–	–	0.2	
	SMUN5215DW		–	–	0.9	
	SMUN5216DW		–	–	1.9	
	SMUN5230DW		–	–	4.3	
	SMUN5231DW		–	–	2.3	
	SMUN5232DW		–	–	1.5	
	SMUN5233DW		–	–	0.18	
	SMUN5234DW		–	–	0.13	
	SMUN5235DW		–	–	0.2	
	SMUN5236DW		–	–	0.05	
	SMUN5237DW		–	–	0.13	
Collector-Base Breakdown Voltage (I_C = 10 ∝A, 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

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

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q_1 and Q_2,) (Continued)

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS(Note 5.)						
DC Current Gain	SMUN5211DW	h_{FE}	35	60	–	
(V_{CE} = 10 V, I_C = 5.0 mA)	SMUN5212DW		60	100	–	
	SMUN5213DW		80	140	–	
	SMUN5214DW		80	140	–	
	SMUN5215DW		160	350	–	
	SMUN5216DW		160	350	–	
	SMUN5230DW		3.0	5.0	–	
	SMUN5231DW		8.0	15	–	
	SMUN5232DW		15	30	–	
	SMUN5233DW		80	200	–	
	SMUN5234DW		80	150	–	
	SMUN5235DW		80	140	–	
	SMUN5236DW		80	150	–	
	SMUN5237DW		80	140	–	
Collector-Emitter Saturation Voltage (I_C= 10mA,I_B= 0.3 mA)		$V_{CE(sat)}$	–	–	0.25	Vdc
(I_C= 10mA, I_B= 5mA) SMUN5230DW/SMUN5231DW						
(I_C= 10mA, I_B= 1mA) SMUN5215DW/SMUN5216DW						
SMUN5232DW/SMUN5233DW/SMUN5234DW						
Output Voltage (on)	SMUN5211DW	V_{OL}	–	–	0.2	Vdc
(V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	SMUN5212DW		–	–	0.2	
	SMUN5214DW		–	–	0.2	
	SMUN5215DW		–	–	0.2	
	SMUN5216DW		–	–	0.2	
	SMUN5230DW		–	–	0.2	
	SMUN5231DW		–	–	0.2	
	SMUN5232DW		–	–	0.2	
	SMUN5233DW		–	–	0.2	
	SMUN5234DW		–	–	0.2	
	SMUN5235DW		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 3.5 V, R_L = 1.0 kΩ)	SMUN5213DW		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 5.5 V, R_L = 1.0 kΩ)	SMUN5236DW		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 4.0 V, R_L = 1.0 kΩ)	SMUN5237DW		–	–	0.2	
Output Voltage (off) (V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ)		V_{OH}	4.9	–	–	Vdc
(V_{CC} = 5.0 V, V_B = 0.05 V, R_L = 1.0 kΩ)	SMUN5230DW					
(V_{CC} = 5.0 V, V_B = 0.25 V, R_L = 1.0 kΩ)	SMUN5215DW					
	SMUN5216DW					
	SMUN5233DW					

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

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q_1 and Q_2,) (Continued)

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS(Note 6.)						
Input Resistor	SMUN5211DW	R_1	7.0	10	13	kΩ
	SMUN5212DW		15.4	22	28.6	
	SMUN5213DW		32.9	47	61.1	
	SMUN5214DW		7.0	10	13	
	SMUN5215DW		7.0	10	13	
	SMUN5216DW		3.3	4.7	6.1	
	SMUN5230DW		0.7	1.0	1.3	
	SMUN5231DW		1.5	2.2	2.9	
	SMUN5232DW		3.3	4.7	6.1	
	SMUN5233DW		3.3	4.7	6.1	
	SMUN5234DW		15.4	22	28.6	
	SMUN5235DW		1.54	2.2	2.86	
	SMUN5236DW		70	100	130	
	SMUN5237DW		32.9	47	61.1	
Resistor Ratio	SMUN5211DW/SMUN5212DW	R_1/R_2				
	SMUN5213DW/SMUN5236DW		0.8	1.0	1.2	
	SMUN5214DW/SMUN5215DW		0.17	0.21	0.25	
	SMUN5216DW/SMUN5230DW		–	–	–	
	SMUN5231DW/SMUN5232DW		0.8	1.0	1.2	
	SMUN5233DW		0.055	0.1	0.185	
	SMUN5234DW		0.38	0.47	0.56	
	SMUN5235DW		0.038	0.047	0.056	
	SMUN5237DW		1.7	2.1	2.6	

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

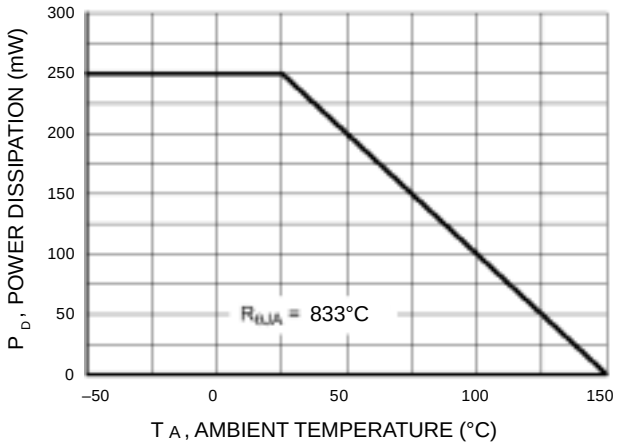


Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS – SMUN5211DW

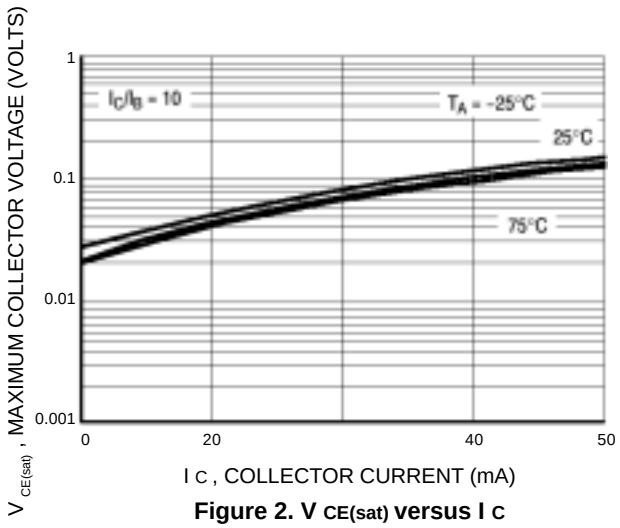


Figure 2. $V_{CE(sat)}$ versus I_C

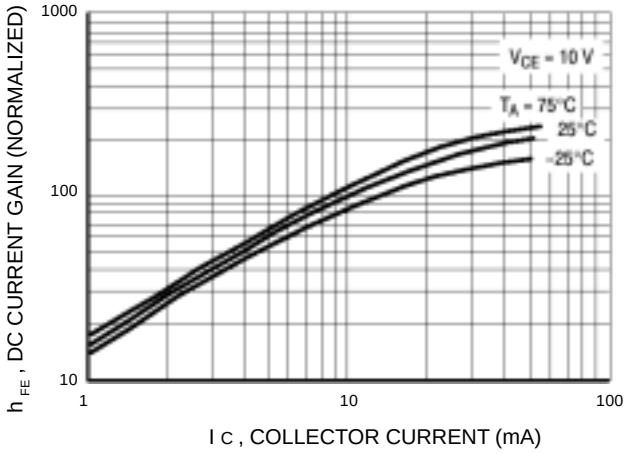


Figure 3. DC Current Gain

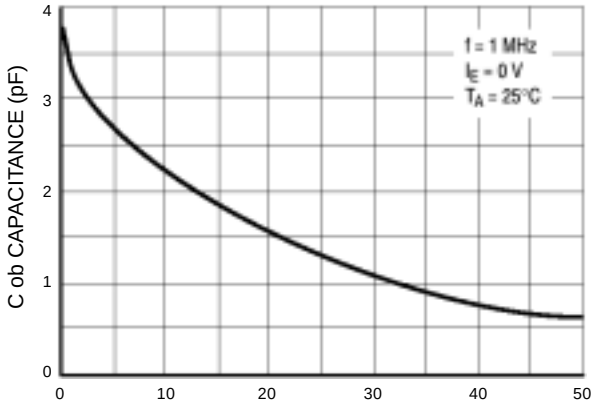


Figure 4. Output Capacitance

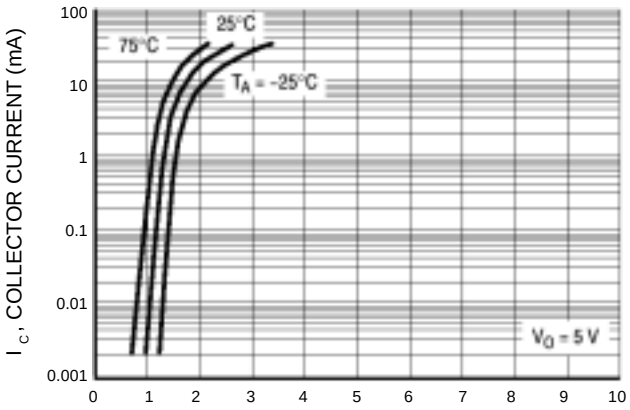


Figure 5. Output Current versus Input Voltage

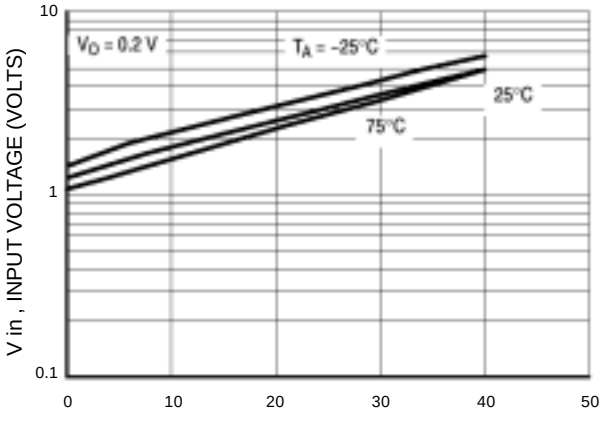


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – SMUN5212DW

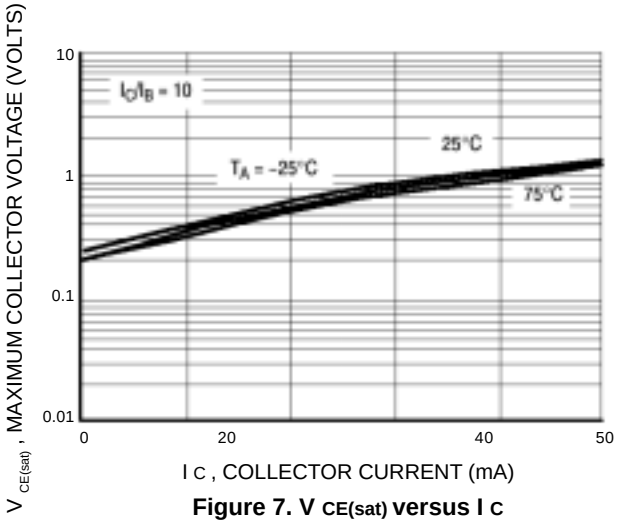


Figure 7. V CE(sat) versus I C

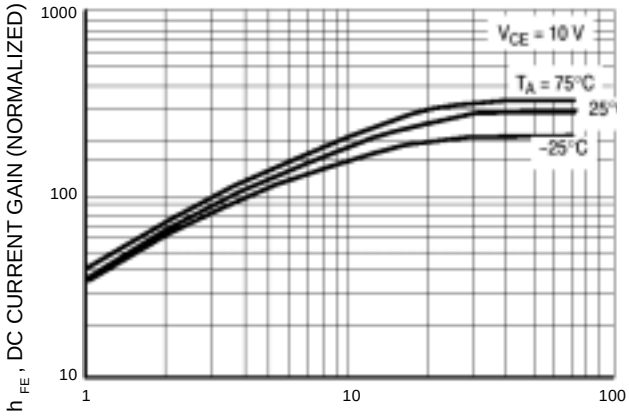


Figure 8. DC Current Gain

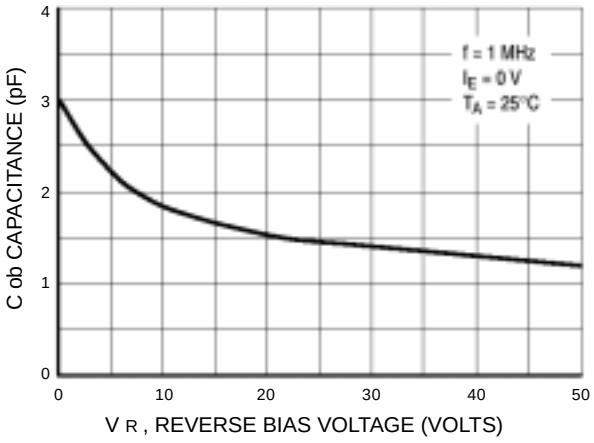


Figure 9. Output Capacitance

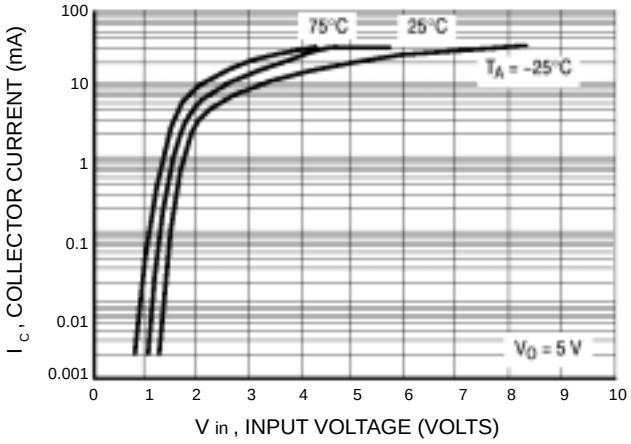


Figure 10. Output Current versus Input oltage

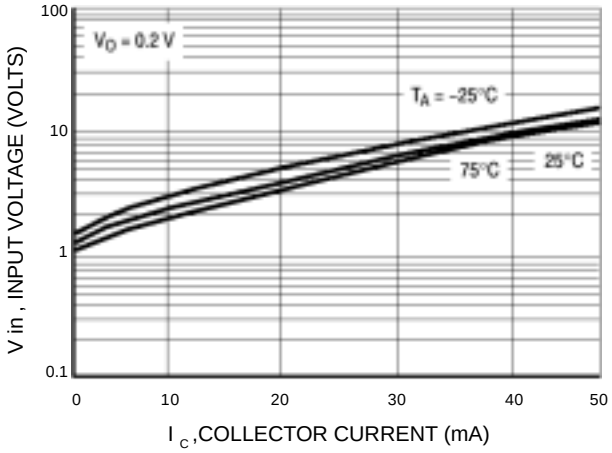


Figure 11. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – SMUN5213DW

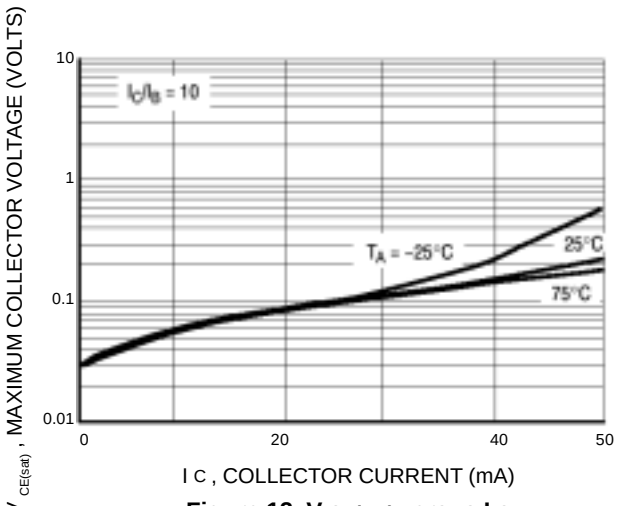


Figure 12. $V_{CE(sat)}$ versus I_C

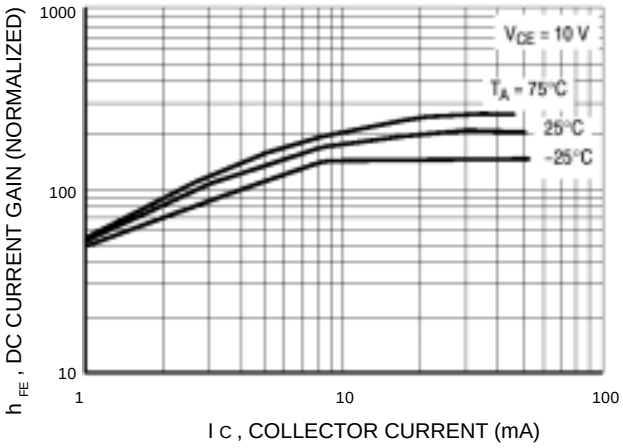


Figure 13. DC Current Gain

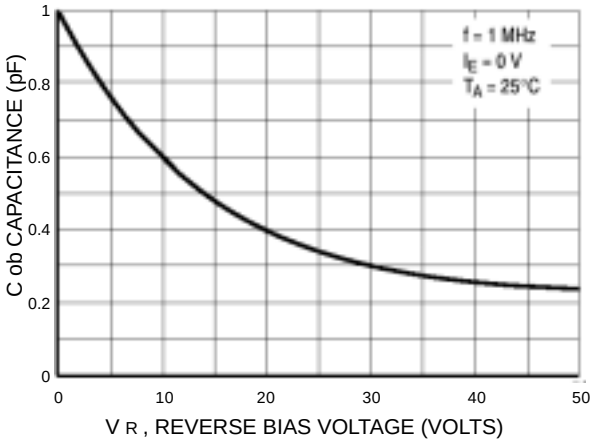


Figure 14. Output Capacitance

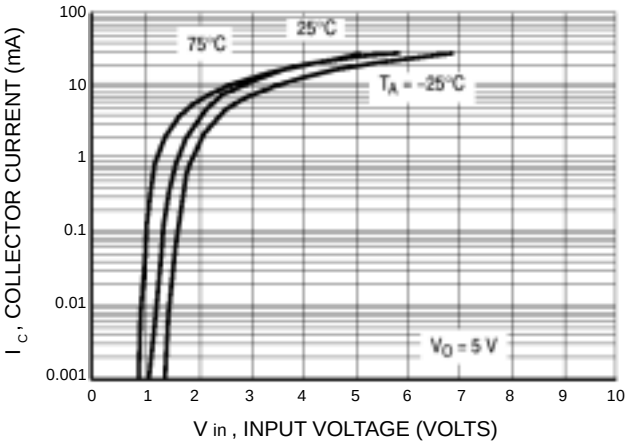


Figure 15. Output Current versus Input oltage

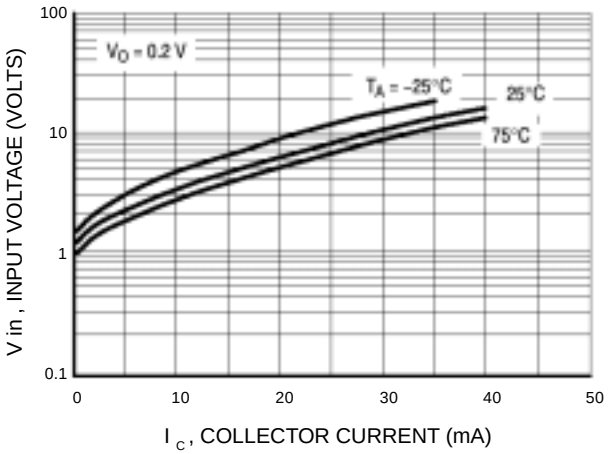


Figure 16. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – SMUN5214DW

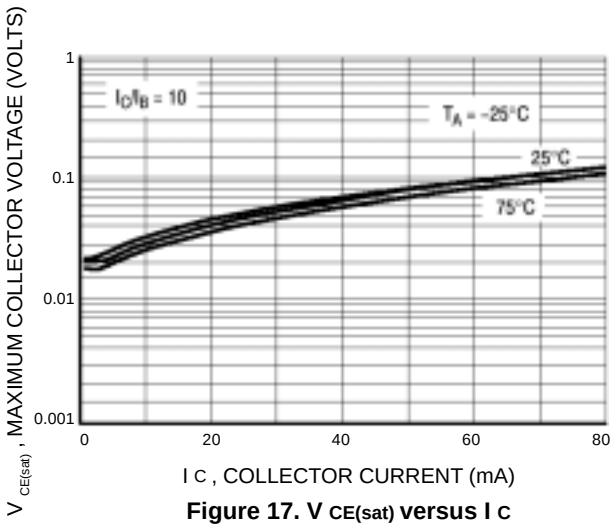


Figure 17. V CE(sat) versus I C

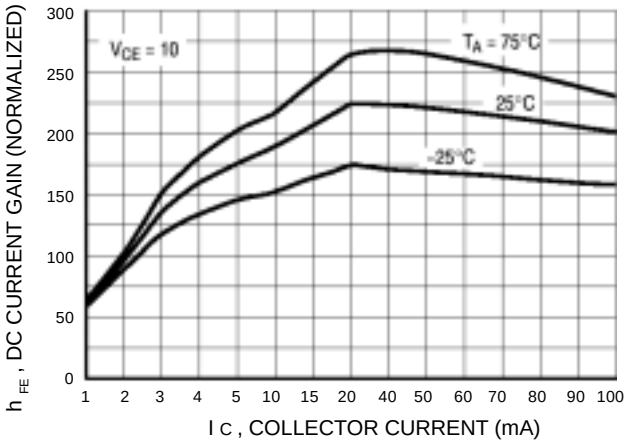


Figure 18. DC Current Gain

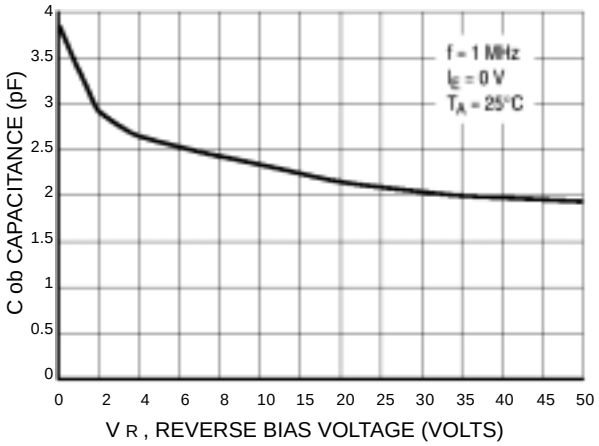


Figure 19. Output Capacitance

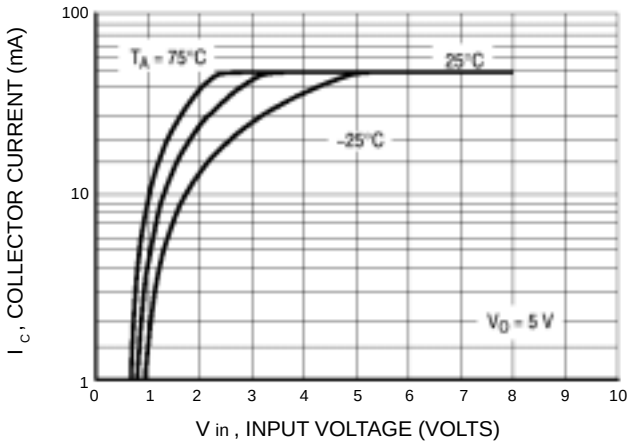


Figure 20. Output Current versus Input oltage

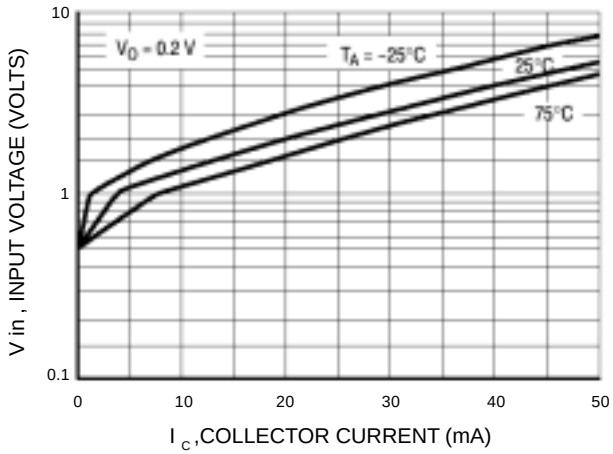


Figure 21. Input Voltage versus Output Current