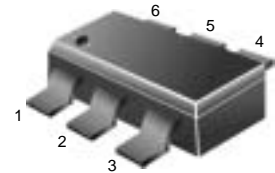


# Dual Bias Resistor Transistors

## NPN 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 DWC3xx 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.

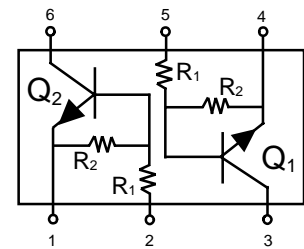
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- We declare that the material of product compliance with RoHS requirements.



SC-88/SOT-363

### MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>)

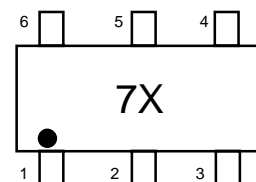
Rating	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	50	Vdc
Collector-Emitter Voltage	V <sub>CEO</sub>	50	Vdc
Collector Current	I <sub>C</sub>	100	mAdc



### THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation T <sub>A</sub> = 25°C	P <sub>D</sub>	187 (Note 1.) 256 (Note 2.)	mW
Derate above 25°C		1.5 (Note 1.) 2.0 (Note 2.)	mW/°C
Thermal Resistance – Junction-to-Ambient	R <sub>θJA</sub>	670 (Note 1.) 490 (Note 2.)	°C/W
Characteristic (Both Junctions Heated)	Symbol	Max	Unit
Total Device Dissipation T <sub>A</sub> = 25°C	P <sub>D</sub>	250 (Note 1.) 385 (Note 2.)	mW
Derate above 25°C		2.0 (Note 1.) 3.0 (Note 2.)	mW/°C
Thermal Resistance – Junction-to-Ambient	R <sub>θJA</sub>	493 (Note 1.) 325 (Note 2.)	°C/W
Thermal Resistance – Junction-to-Lead	R <sub>θJL</sub>	188 (Note 1.) 208 (Note 2.)	°C/W
Junction and Storage Temperature	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

### MARKING DIAGRAM



7X = Device Marking  
(See Page 2)

### DEVICE MARKING INFORMATION

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

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



# DWC301~311, DWC317, 322, 323

## DEVICE MARKING , RESISTOR VALUES AND ORDERING INFORMATION

Device	Package	Marking	R1(K)	R2(K)	Shipping
DWC301T1G	SOT-363	7J	4.7	4.7	3000/Tape&Reel
DWC301T3G	SOT-363	7J	4.7	4.7	10000/Tape&Reel
DWC302T1G	SOT-363	7A	10	10	3000/Tape&Reel
DWC302T3G	SOT-363	7A	10	10	10000/Tape&Reel
DWC303T1G	SOT-363	7B	22	22	3000/Tape&Reel
DWC303T3G	SOT-363	7B	22	22	10000/Tape&Reel
DWC304T1G	SOT-363	7C	47	47	3000/Tape&Reel
DWC304T3G	SOT-363	7C	47	47	10000/Tape&Reel
DWC305T1G	SOT-363	7M	2.2	47	3000/Tape&Reel
DWC305T3G	SOT-363	7M	2.2	47	10000/Tape&Reel
DWC306T1G	SOT-363	7K	4.7	47	3000/Tape&Reel
DWC306T3G	SOT-363	7K	4.7	47	10000/Tape&Reel
DWC307T1G	SOT-363	7D	10	47	3000/Tape&Reel
DWC307T3G	SOT-363	7D	10	47	10000/Tape&Reel
DWC308T1G	SOT-363	7L	22	47	3000/Tape&Reel
DWC308T3G	SOT-363	7L	22	47	10000/Tape&Reel
DWC309T1G	SOT-363	7P	47	22	3000/Tape&Reel
DWC309T3G	SOT-363	7P	47	22	10000/Tape&Reel
DWC310T1G	SOT-363	7F	4.7		3000/Tape&Reel
DWC310T3G	SOT-363	7F	4.7		10000/Tape&Reel
DWC311T1G	SOT-363	7E	10		3000/Tape&Reel
DWC311T3G	SOT-363	7E	10		10000/Tape&Reel
DWC317T1G	SOT-363	7H	2.2	2.2	3000/Tape&Reel
DWC317T3G	SOT-363	7H	2.2	2.2	10000/Tape&Reel
DWC322T1G	SOT-363	7N	100	100	3000/Tape&Reel
DWC322T3G	SOT-363	7N	100	100	10000/Tape&Reel
DWC323T1G	SOT-363	7G	1	1	3000/Tape&Reel
DWC323T3G	SOT-363	7G	1	1	10000/Tape&Reel



# DWC301~311, DWC317, 322, 323

## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>)

Characteristic	Symbol	Min	Typ	Max	Unit	
<b>OFF CHARACTERISTICS</b>						
Collector-Base Cutoff Current (V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0)	I <sub>CBO</sub>	–	–	100	nAdc	
Collector-Emitter Cutoff Current (V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0)	I <sub>CEO</sub>	–	–	500	nAdc	
Emitter-Base Cutoff Current (V <sub>EB</sub> = 6.0 V, I <sub>C</sub> = 0)	DWC302	I <sub>EBO</sub>	–	–	0.5	mAdc
	DWC303		–	–	0.2	
	DWC304		–	–	0.1	
	DWC307		–	–	0.2	
	DWC310		–	–	1.9	
	DWC311		–	–	0.9	
	DWC317		–	–	2.3	
	DWC323		–	–	4.3	
	DWC301		–	–	1.5	
	DWC306		–	–	0.18	
	DWC308		–	–	0.13	
	DWC305		–	–	0.2	
	DWC309		–	–	0.13	
	DWC322		–	–	0.05	
Collector-Base Breakdown Voltage (I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	50	–	–	Vdc	
Collector-Emitter Breakdown Voltage(Note 4.)(I <sub>C</sub> = 2.0 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	50	–	–	Vdc	

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



# DWC301~311, DWC317, 322, 323

## ELECTRICAL CHARACTERISTICS

( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for  $Q_1$  and  $Q_2$ .) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>ON CHARACTERISTICS</b> (Note 5.)					
DC Current Gain ( $V_{CE} = 10\text{ V}$ , $I_C = 5.0\text{ mA}$ )	DWC302	$h_{FE}$	35	60	–
	DWC303		60	100	–
	DWC304		80	140	–
	DWC307		80	140	–
	DWC310		160	350	–
	DWC311		160	350	–
	DWC317		8.0	15	–
	DWC323		3.0	5.0	–
	DWC301		15	30	–
	DWC306		80	200	–
	DWC308		80	150	–
	DWC305		80	140	–
	DW309		80	150	–
	DWC322		80	140	–
Collector-Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.3\text{ mA}$ ) ( $I_C = 10\text{ mA}$ , $I_B = 5\text{ mA}$ ) ( $I_C = 10\text{ mA}$ , $I_B = 1\text{ mA}$ )	$V_{CE(sat)}$	–	–	0.25	Vdc
DWC317/DWC323					
DWC310/DWC311					
DWC301/DWC306/DWC308					
Output Voltage (on) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 2.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	$V_{OL}$	–	–	0.2	Vdc
DWC302					
DWC303				0.2	
DWC307				0.2	
DWC311				0.2	
DWC301				0.2	
DWC310				0.2	
DWC317				0.2	
DWC323				0.2	
DWC305				0.2	
DWC306				0.2	
DWC308				0.2	
( $V_{CC} = 5.0\text{ V}$ , $V_B = 3.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	DWC304			0.2	
( $V_{CC} = 5.0\text{ V}$ , $V_B = 5.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	DWC309			0.2	
( $V_{CC} = 5.0\text{ V}$ , $V_B = 4.0\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	DWC322			0.2	
Output Voltage (off) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.05\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.25\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	$V_{OH}$	4.9	–	–	Vdc
DWC323					
DWC306					
DWC310					
DWC311					

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



# DWC301~311, DWC317, 322, 323

## ELECTRICAL CHARACTERISTICS

( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for  $Q_1$  and  $Q_2$ .) (Continued)

Characteristic		Symbol	Min	Typ	Max	Unit
<b>ON CHARACTERISTICS</b> (Note 6.)						
Input Resistor	DWC302	$R_1$	7.0	10	13	$k\Omega$
	DWC303		15.4	22	28.6	
	DWC304		32.9	47	61.1	
	DWC307		7.0	10	13	
	DWC311		7.0	10	13	
	DWC310		3.3	4.7	6.1	
	DWC323		0.7	1.0	1.3	
	DWC317		1.5	2.2	2.9	
	DWC301		3.3	4.7	6.1	
	DWC306		3.3	4.7	6.1	
	DWC308		15.4	22	28.6	
	DWC305		1.54	2.2	2.86	
	DWC322		70	100	130	
	DWC309		32.9	47	61.1	
Resistor Ratio	DWC302/DWC303	$R_1/R_2$				
	DWC304/DWC322		0.8	1.0	1.2	
	DWC307/DWC311		0.17	0.21	0.25	
	DWC310/DWC323		–	–	–	
	DWC317/DWC301		0.8	1.0	1.2	
	DWC306		0.055	0.1	0.185	
	DWC308		0.38	0.47	0.56	
	DWC305		0.038	0.047	0.056	
DWC309	1.7	2.1	2.6			

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

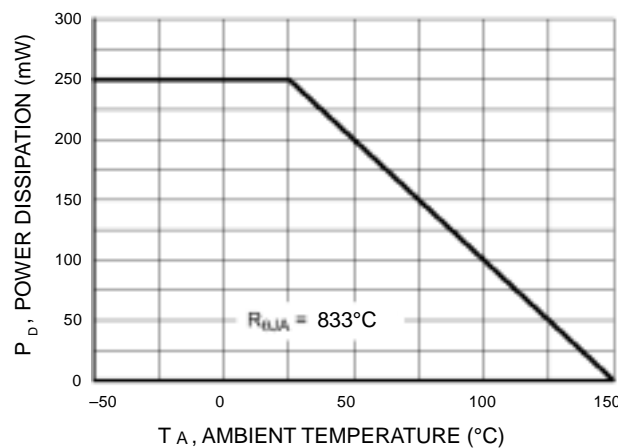
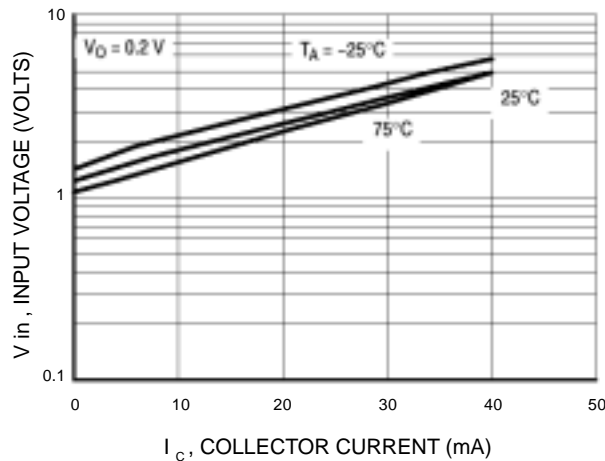
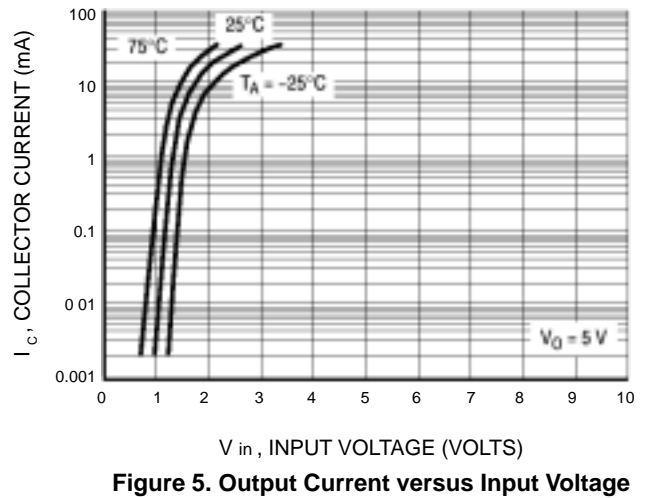
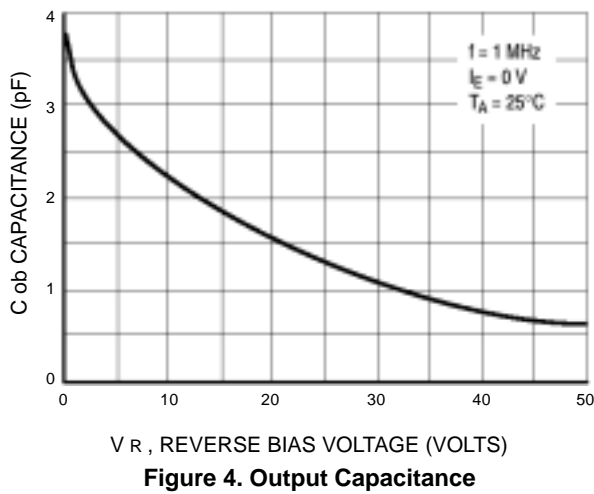
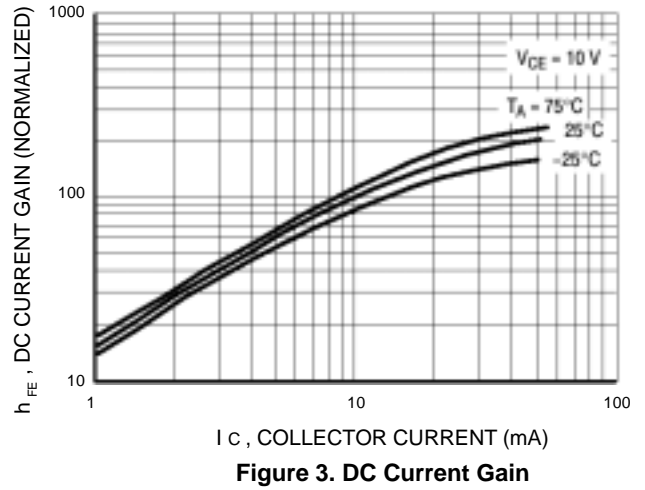
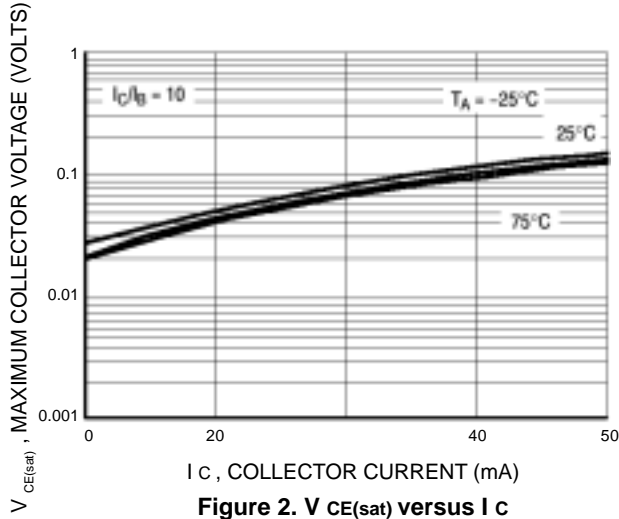
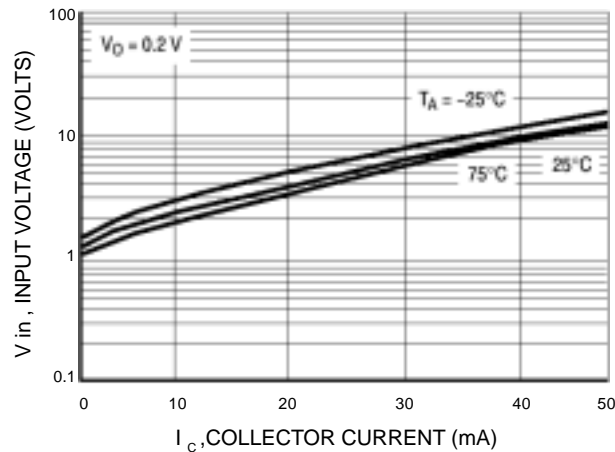
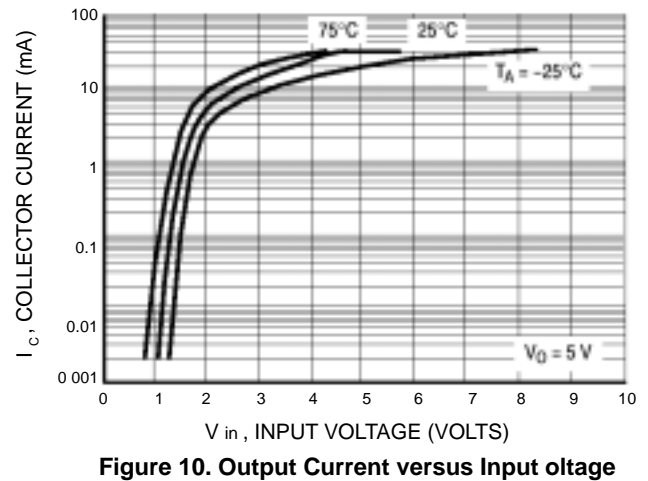
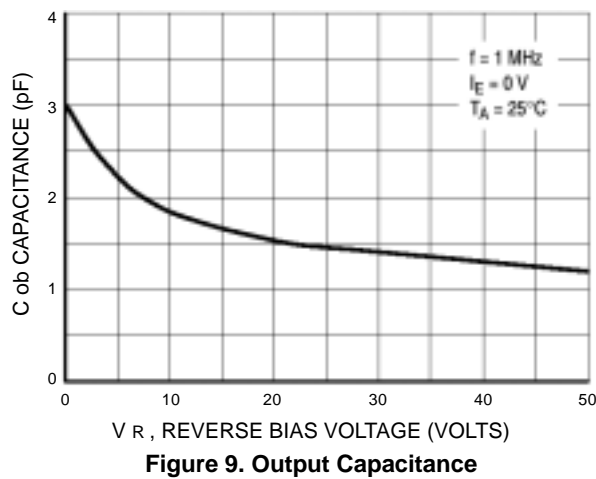
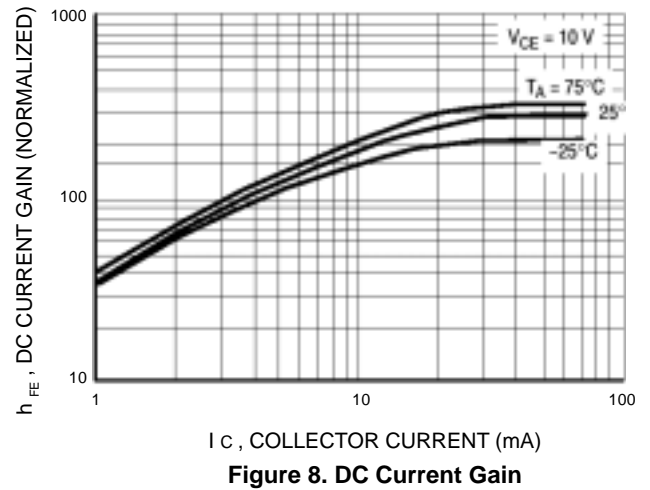
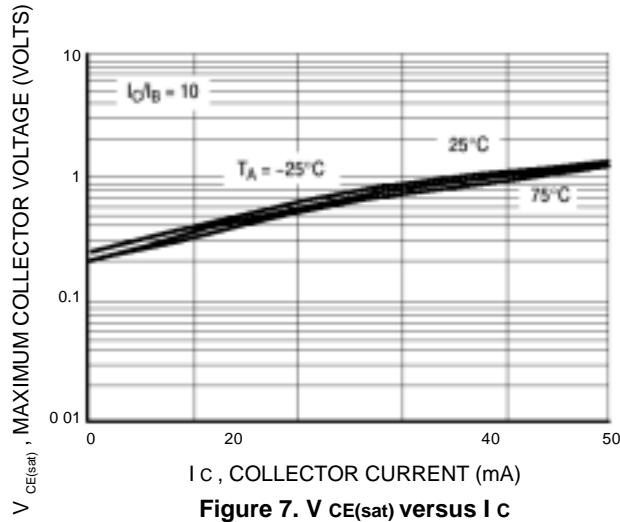


Figure 1. Derating Curve

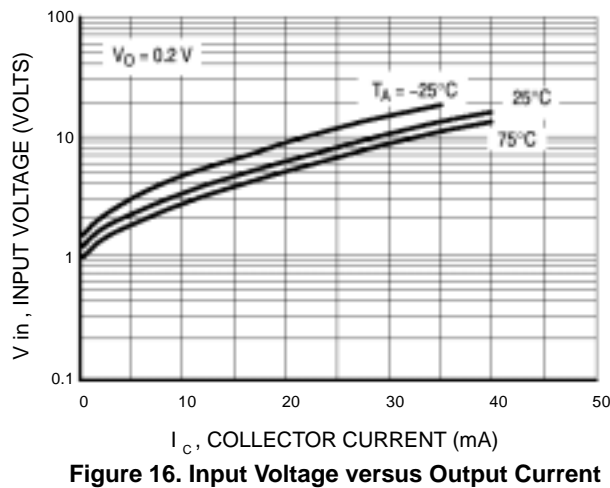
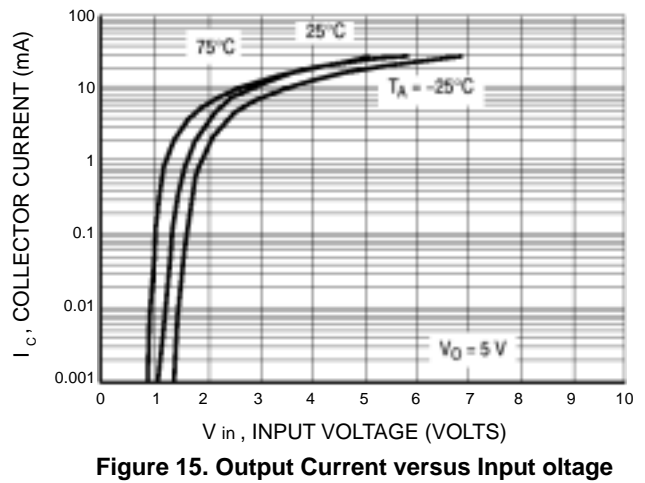
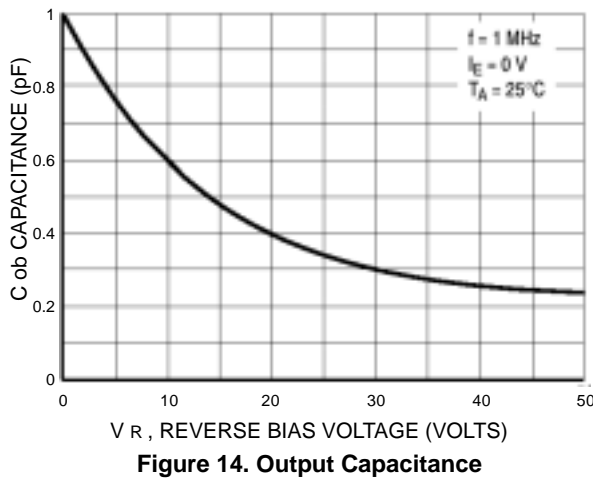
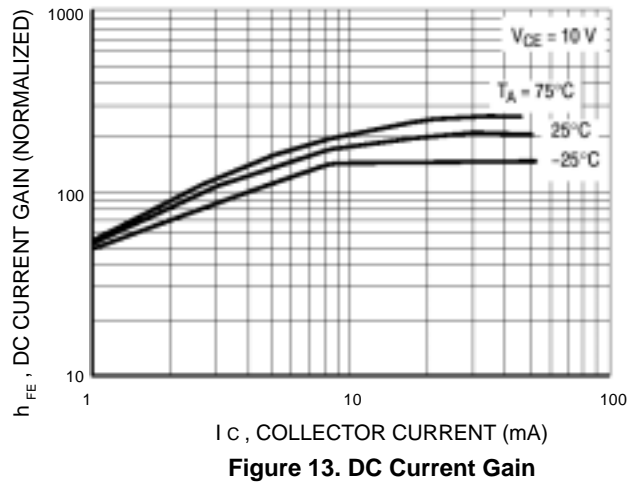
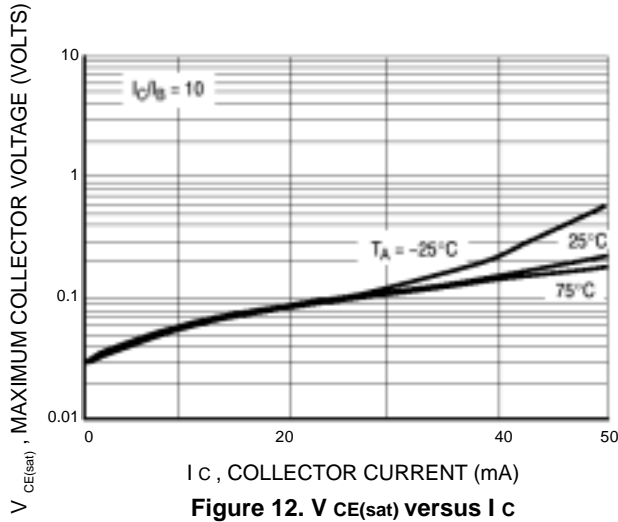
## TYPICAL ELECTRICAL CHARACTERISTICS – DWC302



## TYPICAL ELECTRICAL CHARACTERISTICS – DWC303

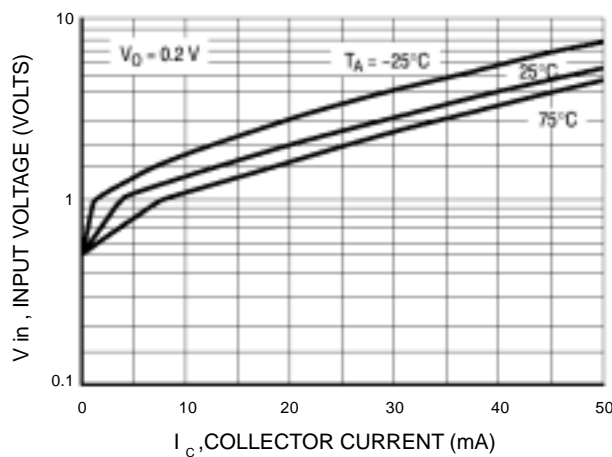
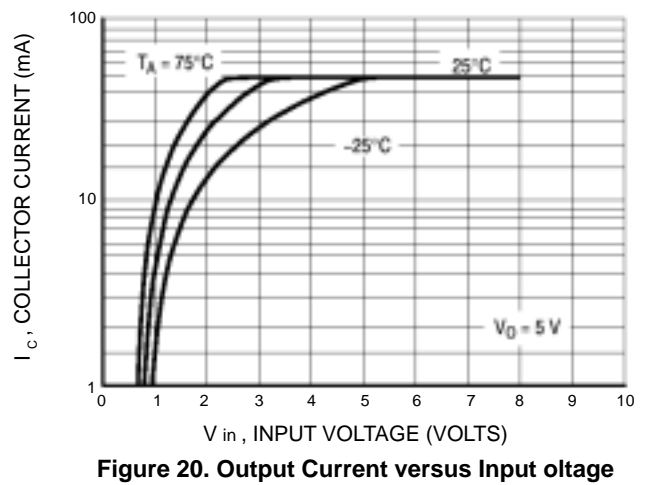
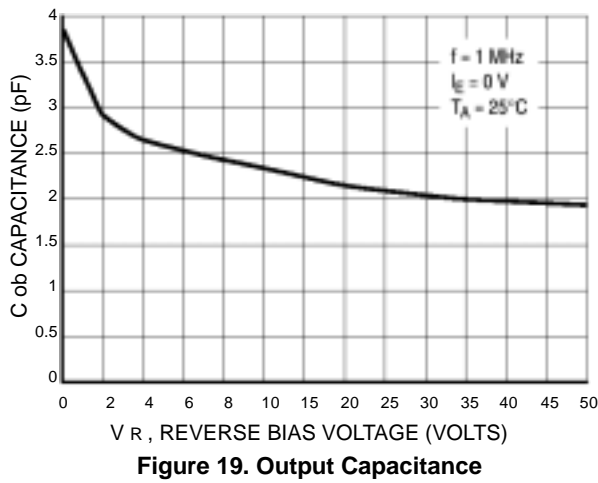
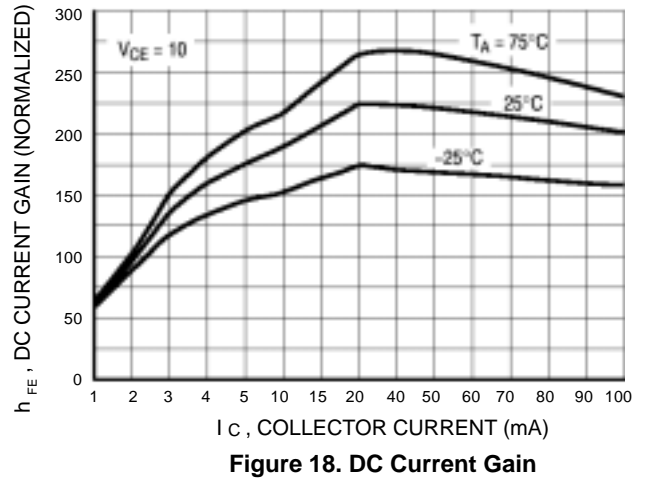
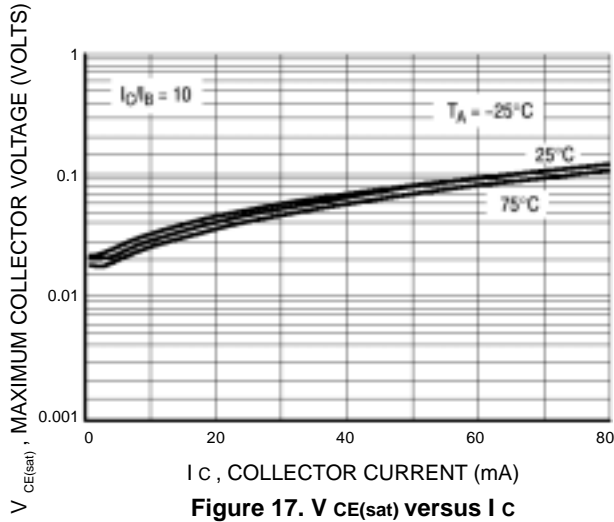


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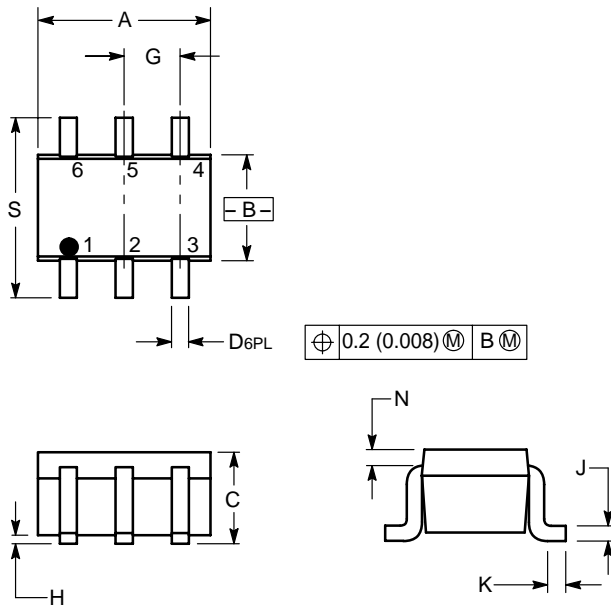




## TYPICAL ELECTRICAL CHARACTERISTICS – DWC307



## SC-88/SOT-363



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

- PIN 1. EMITTER 2  
 2. BASE 2  
 3. COLLECTOR 1  
 4. EMITTER 1  
 5. BASE 1  
 6. COLLECTOR 2

