



**THE DATASHEET OF**  
**2DB1386R-13**

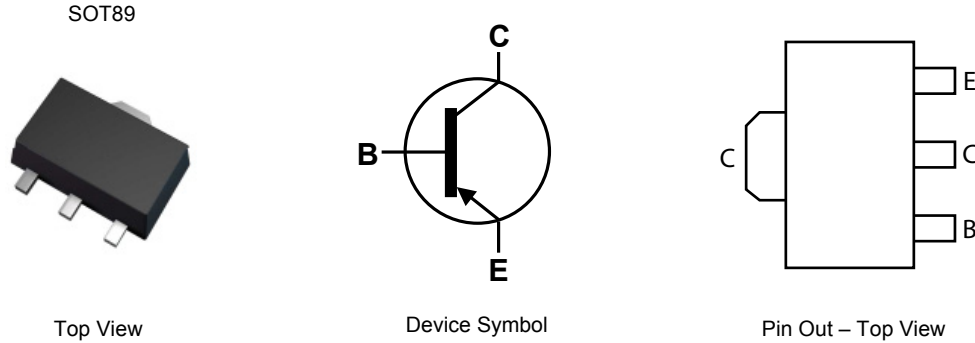


## Features

- $BV_{CEO} > -20V$
- $I_C = -5A$  high Continuous Current
- Low saturation voltage  $V_{CE(sat)} < -1V @ -4A$
- Complementary NPN Type: 2DD2098
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

- Case: SOT89
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 ③
- Weight: 0.052 grams (approximate)



## Ordering Information (Note 4)

Part Number	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
2DB1386Q-13	KP3Q	13	12	2,500
2DB1386Q-13R	KP3Q	13	12	4,000
2DB1386R-13	KP3R	13	12	2,500

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen and Antimony free, "Green" and Lead-Free.
  3. Halogen and Antimony free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>

## Marking Information



KP3x = Product Type Marking Code,  
 where: KP3Q = 2DB1386Q  
 KP3R = 2DB1386R  
 YWW = Date Code Marking  
 Y = Last digit of year (ex: 7 = 2007)  
 WW = Week code (01 – 53)

### Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

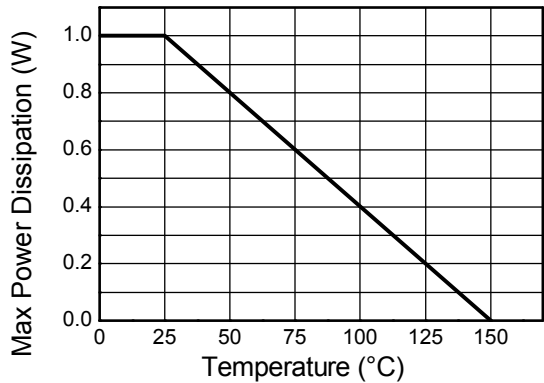
Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	-30	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-20	V
Emitter-Base Voltage	V <sub>EBO</sub>	-6	V
Continuous Collector Current	I <sub>C</sub>	-5	A
Peak Pulse Current	I <sub>CM</sub>	-10	A
Base Current	I <sub>B</sub>	-500	mA

### Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

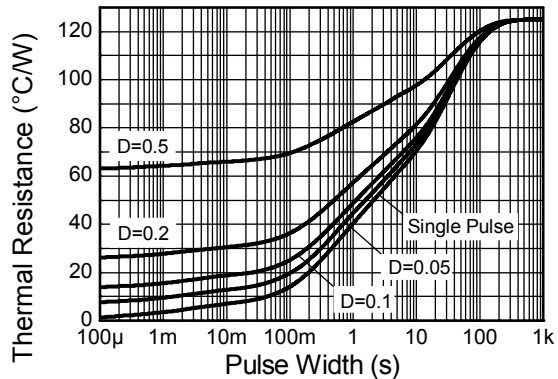
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P <sub>D</sub>	1	W
Thermal Resistance, Junction to Ambient Air (Note 5)	R <sub>θJA</sub>	125	°C/W
Thermal Resistance, Junction to Leads (Note 6)	R <sub>θJL</sub>	19	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

Notes: 5. For a device surface mounted on 15mm x 15mm x 0.6mm FR4 PCB with high coverage of single sided 1 oz copper, in still air conditions; the device is measured when operating in steady state condition.  
 6. Thermal resistance from junction to solder-point (on the exposed collector pad).

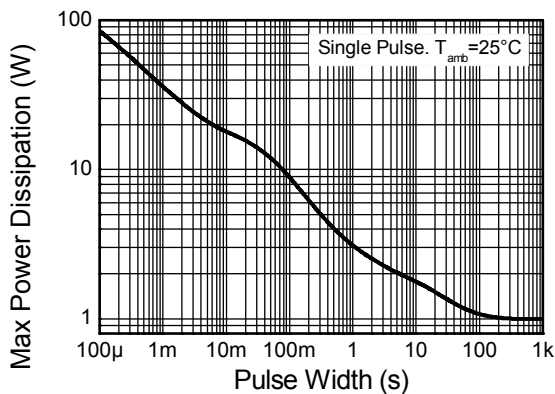
### Thermal Characteristics and Derating Information



**Derating Curve**



**Transient Thermal Impedance**



**Pulse Power Dissipation**

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Conditions	
<b>OFF CHARACTERISTICS (Note 7)</b>							
Collector-Base Breakdown Voltage	BV <sub>CB0</sub>	-30	—	—	V	I <sub>C</sub> = -50μA, I <sub>E</sub> = 0	
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	-20	—	—	V	I <sub>C</sub> = -1mA, I <sub>B</sub> = 0	
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-6	—	—	V	I <sub>E</sub> = -50μA, I <sub>C</sub> = 0	
Collector Cut-Off Current	I <sub>CB0</sub>	—	—	-0.5	μA	V <sub>CB</sub> = -20V, I <sub>E</sub> = 0	
Emitter Cut-Off Current	I <sub>EBO</sub>	—	—	-0.5	μA	V <sub>EB</sub> = -5V, I <sub>C</sub> = 0	
<b>ON CHARACTERISTICS (Note 7)</b>							
Collector-Emitter Saturation Voltage	V <sub>CE(SAT)</sub>	—	-0.25	-1.0	V	I <sub>C</sub> = -4A, I <sub>B</sub> = -0.1A	
DC Current Gain	2DB1386Q	h <sub>FE</sub>	120	—	270	—	I <sub>C</sub> = -0.5A, V <sub>CE</sub> = -2V
	2DB1386R		180	—	390		
<b>SMALL SIGNAL CHARACTERISTICS</b>							
Output Capacitance	C <sub>obo</sub>	—	55	—	pF	V <sub>CB</sub> = -20V, I <sub>E</sub> = 0, f = 1MHz	
Current Gain-Bandwidth Product	f <sub>T</sub>	—	100	—	MHz	V <sub>CE</sub> = -6V, I <sub>E</sub> = 50mA, f = 30MHz	

Notes: 7. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

**Typical Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

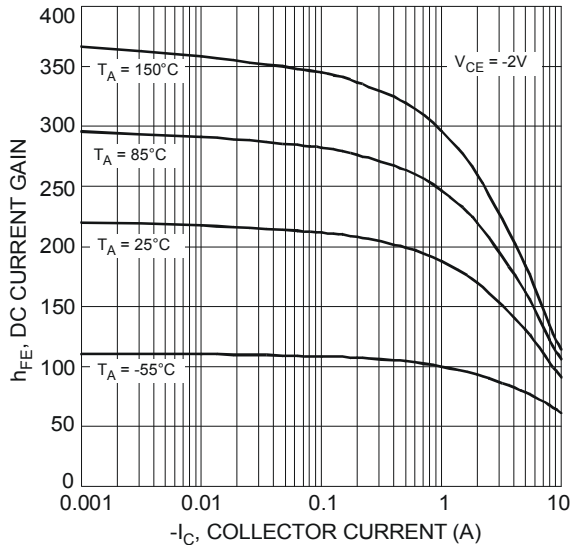


Figure 1 Typical DC Current Gain vs. Collector Current (2DB1386Q)

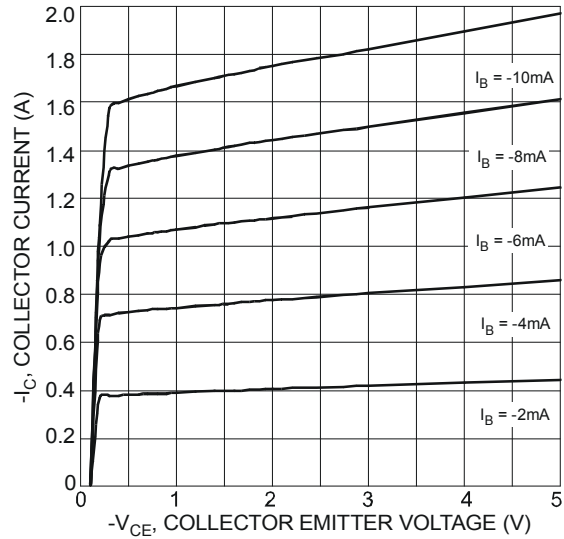


Figure 2 Typical Collector Current vs. Collector-Emitter Voltage

**Typical Electrical Characteristics (cont.)**

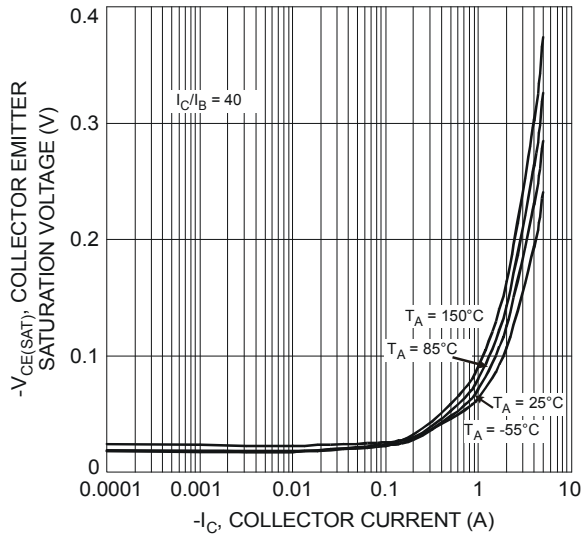


Figure 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

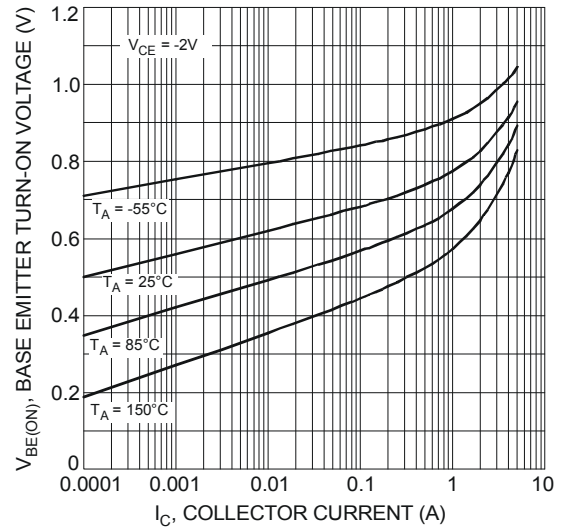


Figure 4 Typical Base-Emitter Turn-On Voltage vs. Collector Current

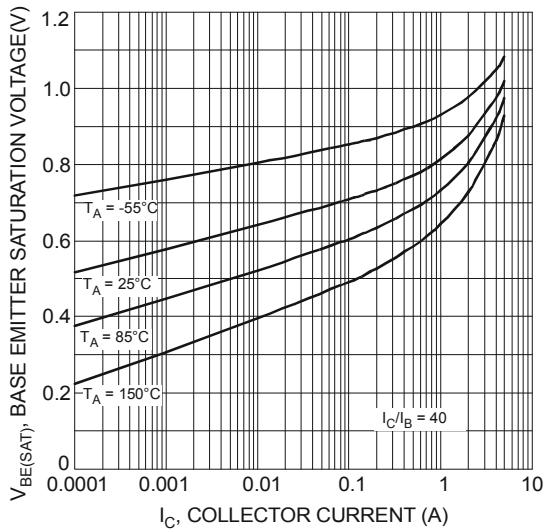


Figure 5 Typical Base-Emitter Saturation Voltage vs. Collector Current

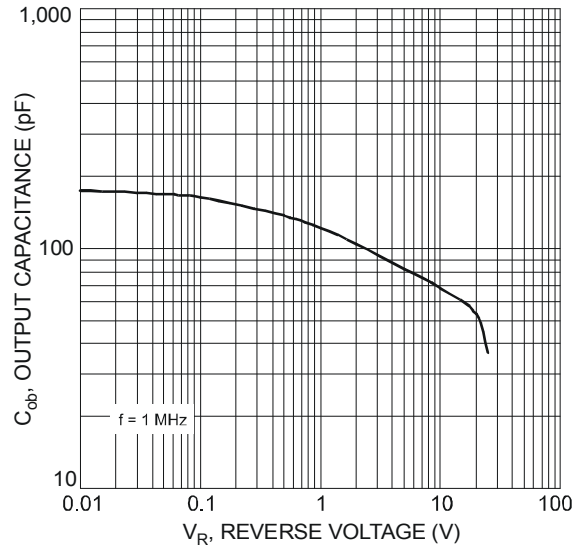


Figure 6 Typical Output Capacitance Characteristics

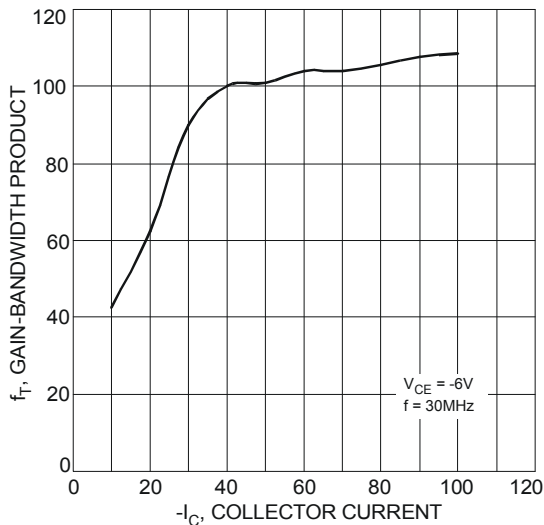
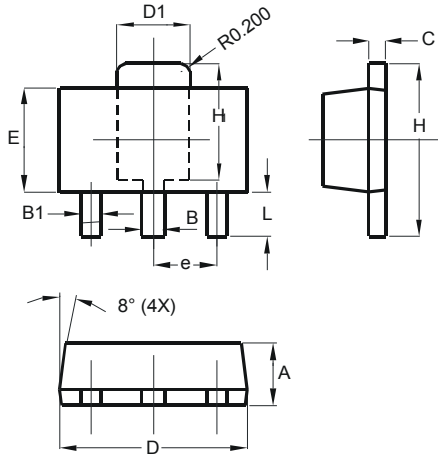


Figure 7 Typical Gain-Bandwidth Product vs. Collector Current

**Package Outline Dimensions**

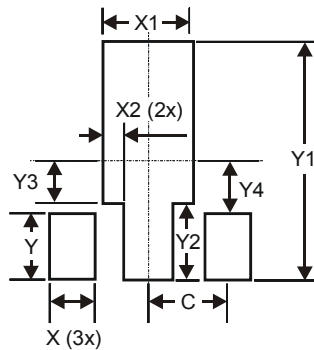
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



SOT89		
Dim	Min	Max
A	1.40	1.60
B	0.44	0.62
B1	0.35	0.54
C	0.35	0.44
D	4.40	4.60
D1	1.62	1.83
E	2.29	2.60
e	1.50 Typ	
H	3.94	4.25
H1	2.63	2.93
L	0.89	1.20
All Dimensions in mm		

**Suggested Pad Layout**

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
X	0.900
X1	1.733
X2	0.416
Y	1.300
Y1	4.600
Y2	1.475
Y3	0.950
Y4	1.125
C	1.500

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