

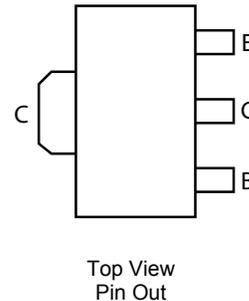
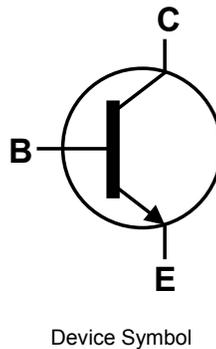
**45V NPN HIGH GAIN POWER TRANSISTOR IN SOT89**

**Features**

- $BV_{CEO} > 45V$
- $I_C = 2A$  high Continuous Collector Current
- $I_{CM}$  up to 6A Peak Pulse Current
- High gain  $h_{FE} > 400 @ 1A$
- 2W Power Dissipation
- Low saturation voltage  $V_{CE(sat)} < 300mV @ 1A$
- Complementary PNP type: FCX790A
- **Lead-Free Finish; 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 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)

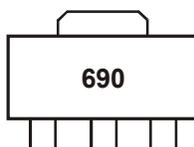


**Ordering Information** (Note 4)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
FCX690BTA	690	7	12	1,000
FCX690B-13R	690	13	12	4,000

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
  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**



690 = Product Type Marking Code

**Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Limit	Unit
Collector-Base Voltage	$V_{CBO}$	45	V
Collector-Emitter Voltage	$V_{CEO}$	45	V
Emitter-Base Voltage	$V_{EBO}$	7	V
Continuous Collector Current	$I_C$	2	A
Peak Pulse Current	$I_{CM}$	6	A
Base Current	$I_B$	500	mA

**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

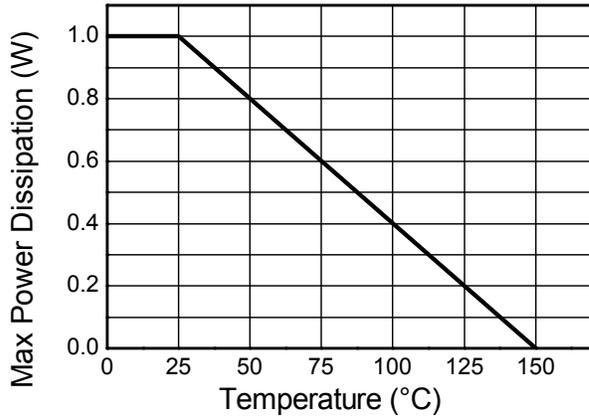
Characteristic	Symbol	Value	Unit
Power Dissipation	$P_D$	(Note 5) 1	W
		(Note 6) 2	
Thermal Resistance, Junction to Ambient Air	$R_{\theta JA}$	(Note 5) 125	$^\circ\text{C/W}$
		(Note 6) 62.5	
Thermal Resistance, Junction to Leads	$R_{\theta JL}$	5.31	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

**ESD Ratings** (Note 8)

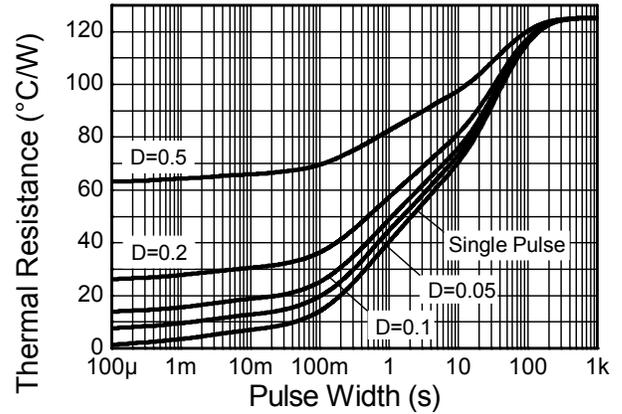
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	$\geq 8,000$	V	3B
Electrostatic Discharge - Machine Model	ESD MM	$\geq 400$	V	C

- 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. Same as note (5), except the device is mounted on 40mm x 40mm x 1.6mm FR4 PCB.
  7. Thermal resistance from junction to solder-point (on the exposed collector pad).
  8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

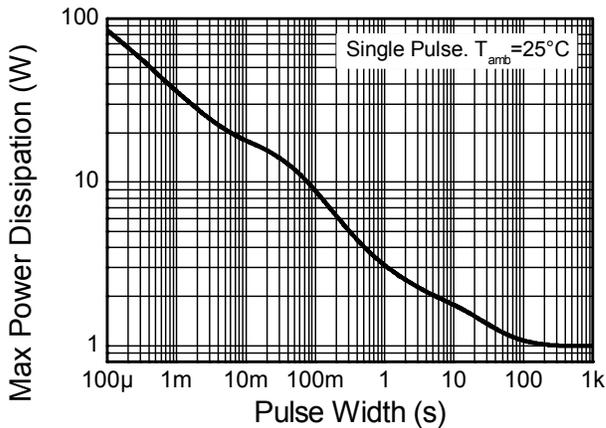
**Thermal Characteristics and Derating Information**



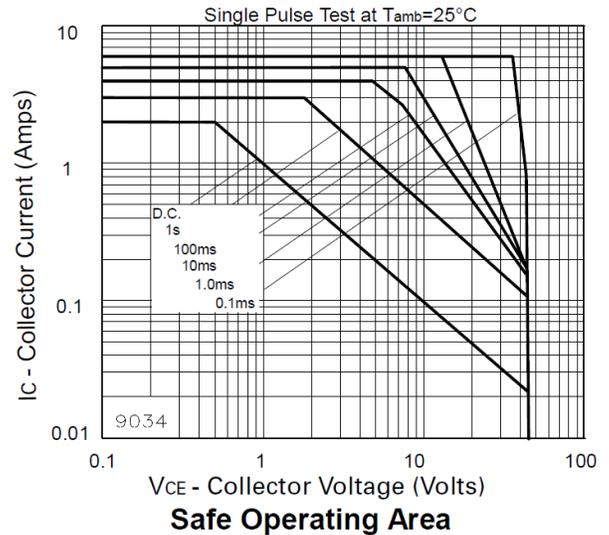
**Derating Curve**



**Transient Thermal Impedance**



**Pulse Power Dissipation**



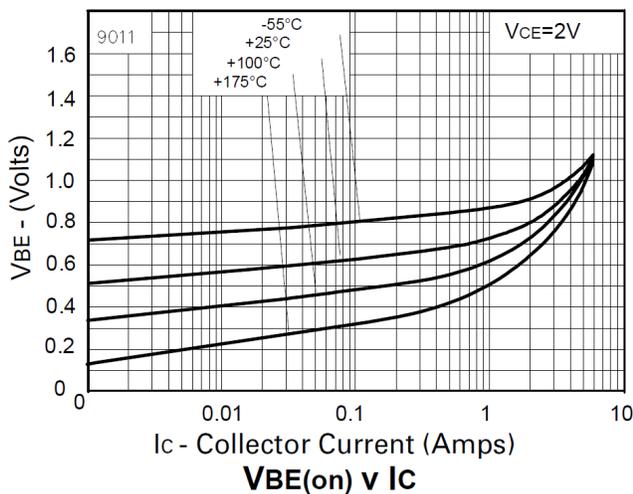
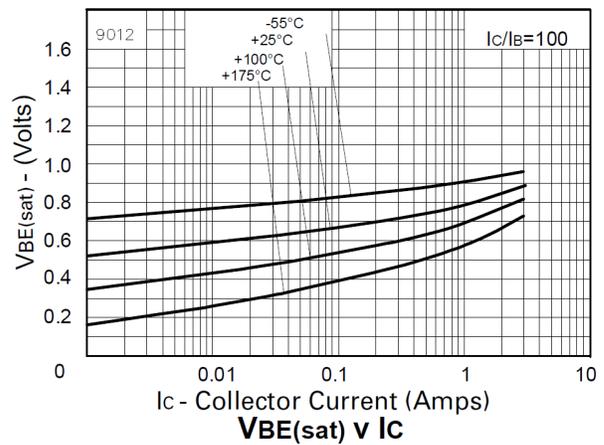
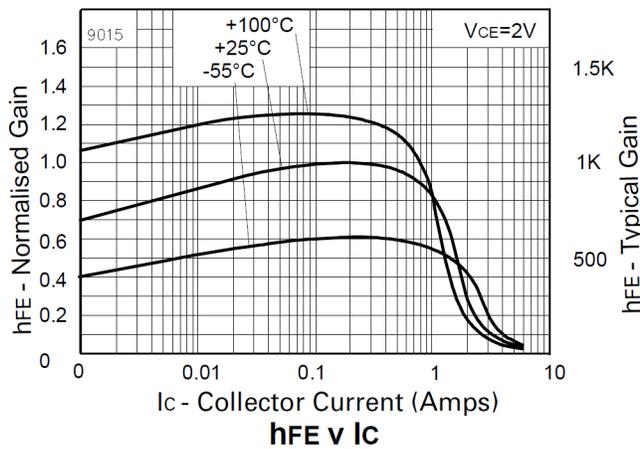
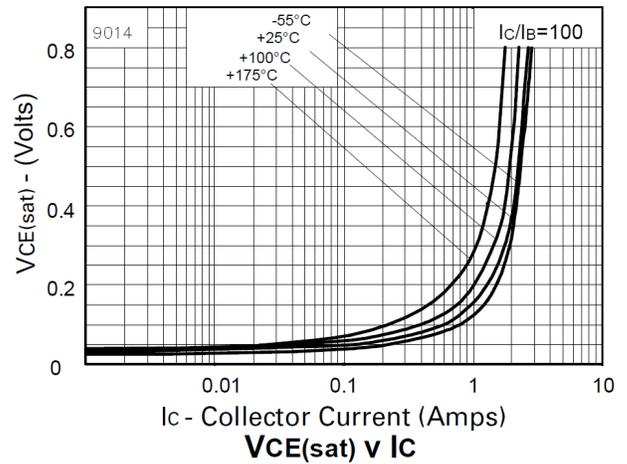
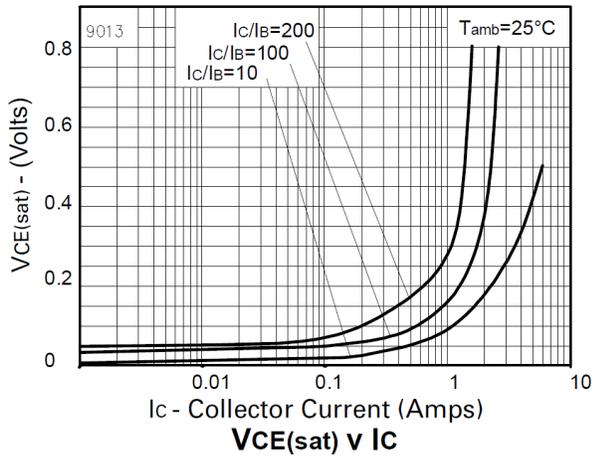
**Safe Operating Area**

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ.	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	45	—	—	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 9)	$BV_{CEO}$	45	—	—	V	$I_C = 10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	7	—	—	V	$I_E = 100\mu\text{A}$
Collector Cutoff Current	$I_{CBO}$	—	—	100	nA	$V_{CB} = 35\text{V}$
Emitter Cutoff Current	$I_{EBO}$	—	—	100	nA	$V_{EB} = 5.6\text{V}$
DC current transfer Static ratio (Note 9)	$h_{FE}$	500	—	—	—	$I_C = 100\text{mA}, V_{CE} = 2\text{V}$
		400	—	—		$I_C = 1\text{A}, V_{CE} = 2\text{V}$
		150	—	—		$I_C = 2\text{A}, V_{CE} = 2\text{V}$
Collector-Emitter Saturation Voltage (Note 9)	$V_{CE(sat)}$	—	—	80	mV	$I_C = 0.1\text{A}, I_B = 0.5\text{mA}$
		—	—	300		$I_C = 1\text{A}, I_B = 5\text{mA}$
Base-Emitter Saturation Voltage (Note 9)	$V_{BE(sat)}$	—	—	0.9	V	$I_C = 1\text{A}, I_B = 10\text{mA}$
Base-Emitter Turn-on Voltage (Note 9)	$V_{BE(on)}$	—	—	0.85	V	$I_C = 1\text{A}, V_{CE} = 2\text{V}$
Transitional Frequency	$f_T$	150	—	—	MHz	$I_C = 50\text{mA}, V_{CE} = 5\text{V}$ $f = 50\text{MHz}$
Input capacitance	$C_{ibo}$	—	200	—	pF	$V_{EB} = 0.5\text{V}, f = 1\text{MHz}$ ,
Output capacitance	$C_{obo}$	—	16	—	pF	$V_{CB} = 10\text{V}, f = 1\text{MHz}$ ,
Switching times	$t_{on}$	—	33	—	ns	$I_C = 500\text{mA}, V_{CC} = 10\text{V}$ $I_{B1} = -I_{B2} = 50\text{mA}$
	$t_{off}$		1300			

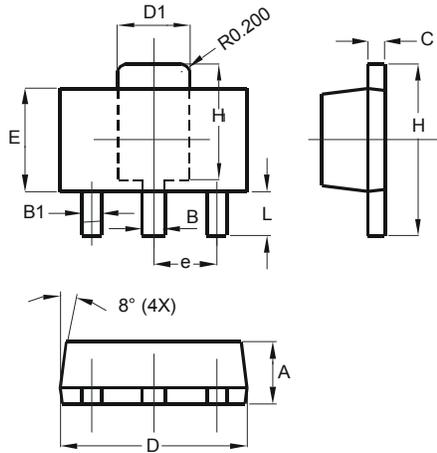
Note: 9. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



## Package Outline Dimensions

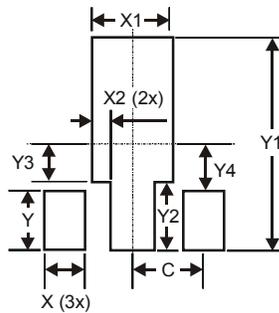
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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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