

**120V NPN MEDIUM POWER DARLINGTON TRANSISTOR IN SOT23F**

**Features**

- $BV_{CEO} > 120V$
- $I_C = 1A$  Continuous Collector Current
- $V_{CE(SAT)} < 1.5V @ 1A$
- $R_{CE(SAT)} = 38m\Omega$
- 1.5W Power Dissipation
- Complementary PNP Type: ZXTN05120FF
- **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: SOT23F
- 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 208③
- Weight: 0.012 grams (Approximate)

**Description**

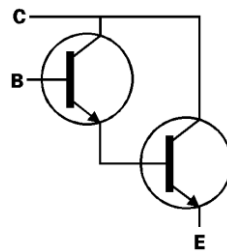
This high performance NPN Darlington transistor is housed in the small outline SOT23 flat package for applications where space is at a premium.

**Applications**

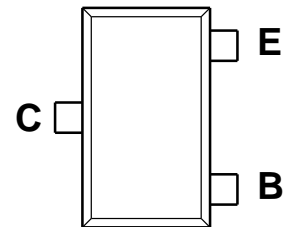
- Lamp, Relay and Solenoid Drive
- Lighting



Top View



Device Symbol



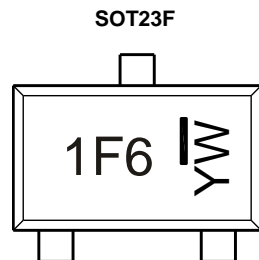
Top View  
Pin Configuration

**Ordering Information** (Note 4)

Part Number	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
ZXTN04120HFFTA	AEC-Q101	1F6	7	8	3,000

- 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**



- 1F6 = Product Type Marking Code
- YW = Date Code Marking
- Y = Year : 0~9
- W = Week : A~Z : 1~26
- a~z : 27~52
- z represents 52 & 53 week

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	140	V
Collector-Emitter Voltage	V <sub>CEO</sub>	120	V
Emitter-Base Voltage	V <sub>EBO</sub>	10	V
Continuous Collector Current	I <sub>C</sub>	1	A
Peak Pulse Current	I <sub>CM</sub>	4	A
Base Current	I <sub>B</sub>	0.5	A

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

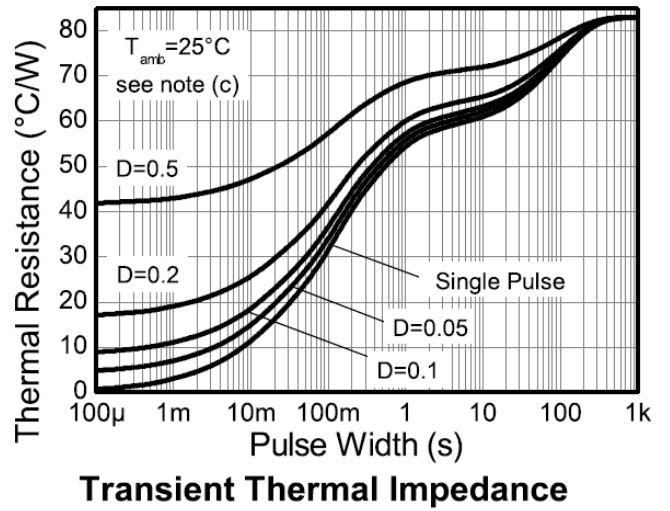
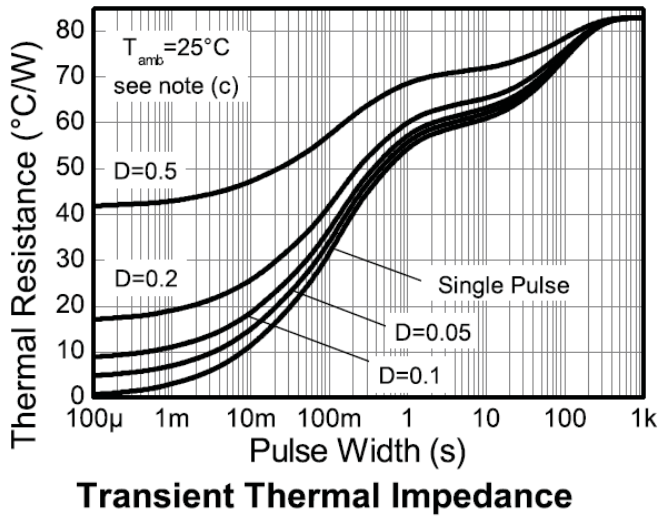
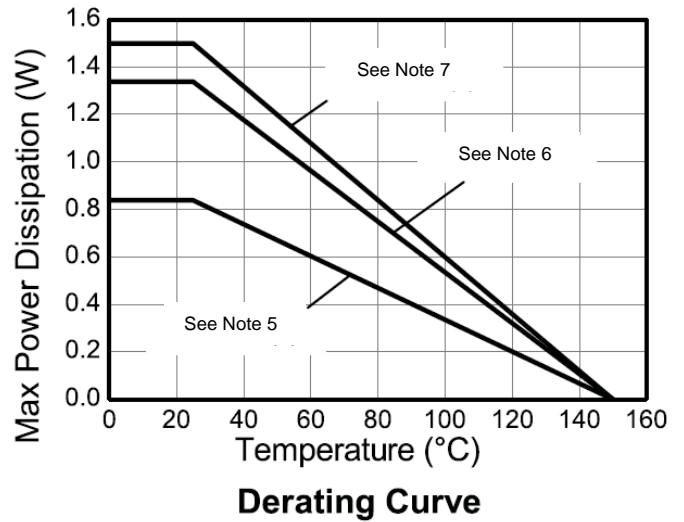
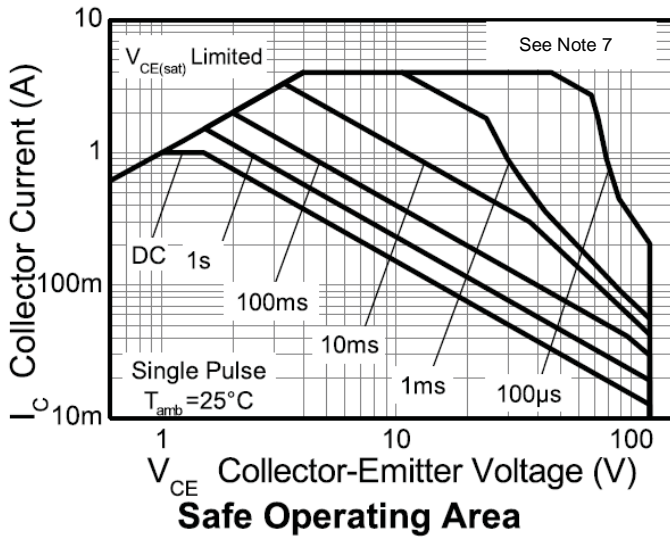
Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor	P <sub>D</sub>	0.84	W mW/°C
		6.72	
		1.34	
		10.72	
		1.50	
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	12.0	°C/W
		2.0	
		16.0	
		60	
Thermal Resistance, Junction to Lead	R <sub>θJL</sub>	43.8	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**ESD Ratings** (Note 10)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	2,000	V	2
Electrostatic Discharge – Machine Model	ESD MM	200	V	B

- Notes:
5. For a device mounted with the exposed collector pad on 15mm x 15mm 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  6. Same as Note 5, except the device is mounted on 25mm x 25mm 2oz copper.
  7. Same as Note 5, except the device is mounted on 50mm x 50mm 2oz copper.
  8. Same as Note 7, whilst measured at t < 5 seconds.
  9. Thermal resistance from junction to solder-point (at the end of the collector lead).
  10. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

**Thermal Characteristics and Derating Information**

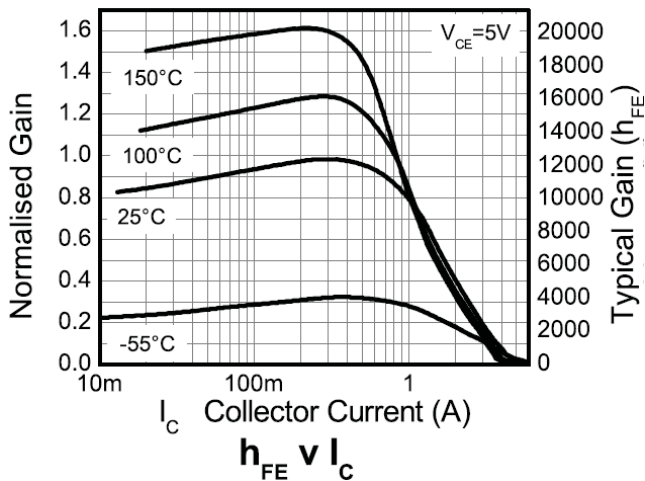
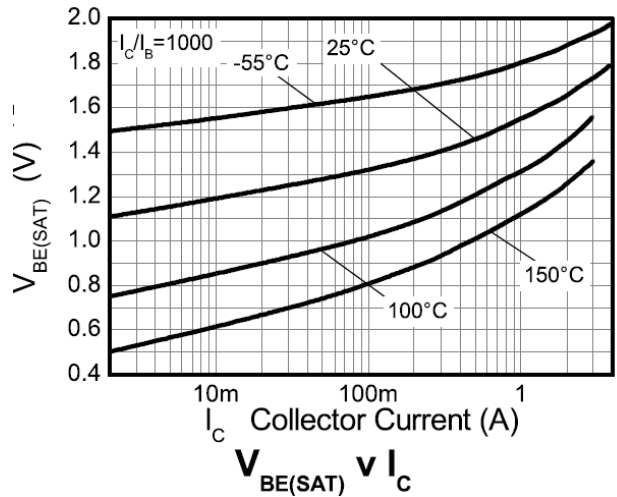
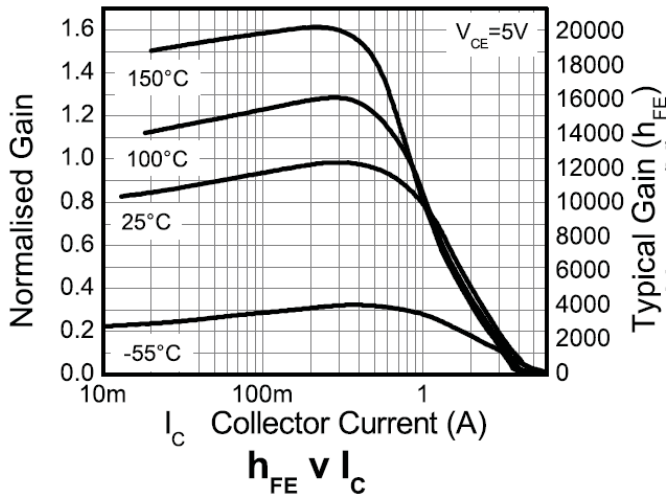
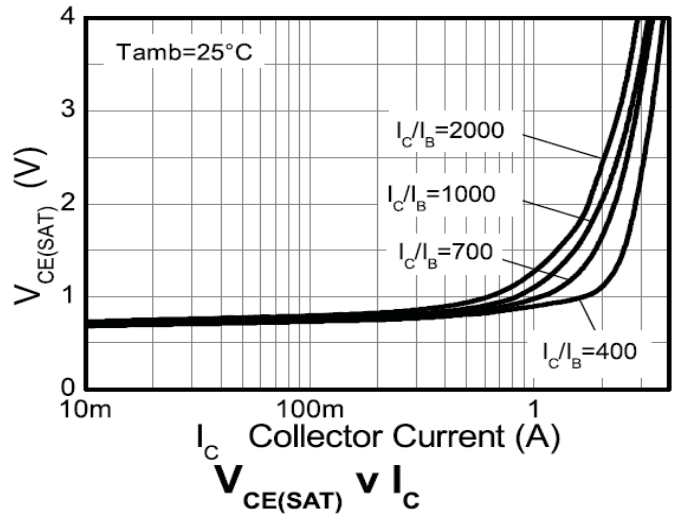
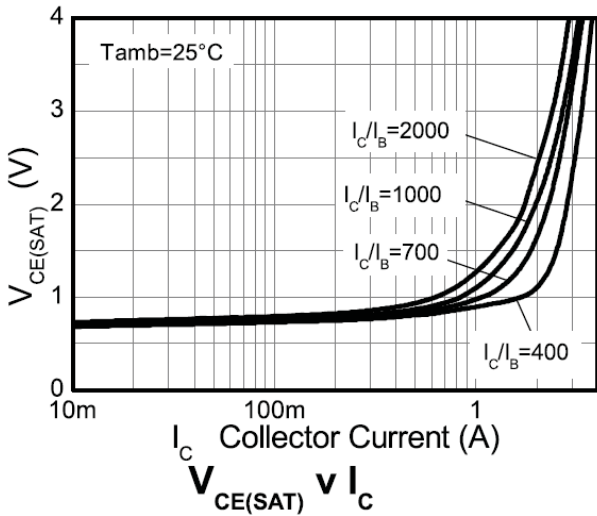


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	140	300	—	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage (Base Open) (Note 11)	BV <sub>CEO</sub>	120	140	—	V	I <sub>C</sub> = 10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	10	16	—	V	I <sub>E</sub> = 100μA
Collector-Base Cutoff Current	I <sub>CBO</sub>	—	<1	100	nA	V <sub>CB</sub> = 120V
Collector-Emitter Cutoff Current	I <sub>CES</sub>	—	<0.1	10	μA	V <sub>CB</sub> = 120V, T <sub>A</sub> = +100°C
Emitter-Base Cutoff Current	I <sub>EBO</sub>	—	<1	100	nA	V <sub>EB</sub> = 8V
<b>ON CHARACTERISTICS (Note 11)</b>						
Static Forward Current Transfer Ratio	h <sub>FE</sub>	3k 3k 3k 1k	11k 12k 10k 5k	— — 30k —	—	I <sub>C</sub> = 50mA, V <sub>CE</sub> = 5V I <sub>C</sub> = 500mA, V <sub>CE</sub> = 5V I <sub>C</sub> = 1A, V <sub>CE</sub> = 5V I <sub>C</sub> = 2A, V <sub>CE</sub> = 5V
Collector-Emitter Saturation Voltage	V <sub>CE(SAT)</sub>	—	0.8 1.1 1.1	0.9 1.5 1.5	V	I <sub>C</sub> = 250mA, I <sub>B</sub> = 25mA I <sub>C</sub> = 1A, I <sub>B</sub> = 1mA I <sub>C</sub> = 2A, I <sub>B</sub> = 5mA
Base-Emitter Saturation Voltage	V <sub>BE(SAT)</sub>	—	1.55	1.7	V	I <sub>C</sub> = 1A, I <sub>B</sub> = 1mA
Base-Emitter On Voltage	V <sub>BE(ON)</sub>	—	1.45	1.7	V	I <sub>C</sub> = 1A, V <sub>CE</sub> = 5V
<b>SMALL SIGNAL CHARACTERISTICS</b>						
Transition Frequency	f <sub>T</sub>	—	120	—	MHz	I <sub>C</sub> = 100mA, V <sub>CE</sub> = 10V, f = 20MHz
Input Capacitance	C <sub>I(BO)</sub>	—	68	90	pF	V <sub>EB</sub> = 500mV, f = 1MHz
Output Capacitance	C <sub>O(BO)</sub>	—	12.8	25	pF	V <sub>CB</sub> = 10V, f = 1MHz
Delay Time	t <sub>D</sub>	—	507	—	ns	V <sub>CC</sub> = 10V, I <sub>C</sub> = 500mA, I <sub>B1</sub> = -I <sub>B2</sub> = 0.5mA
Rise Time	t <sub>R</sub>	—	136	—	ns	
Storage Time	t <sub>S</sub>	—	910	—	ns	
Fall Time	t <sub>F</sub>	—	369	—	ns	

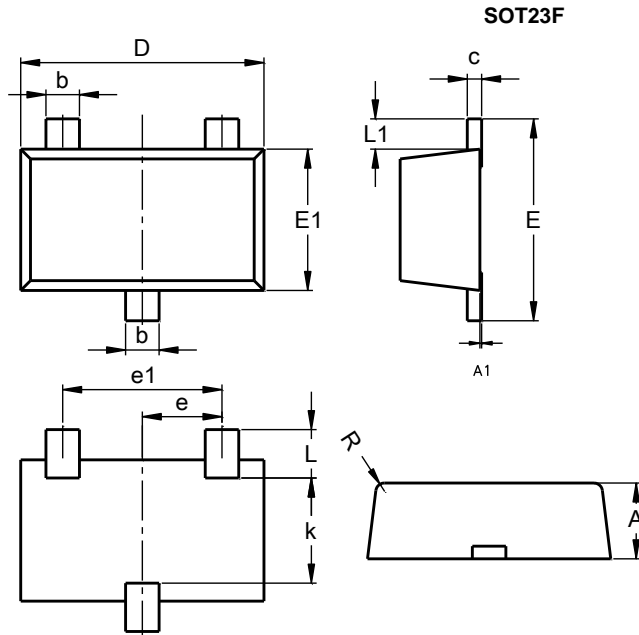
Note: 11. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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



**Package Outline Dimensions**

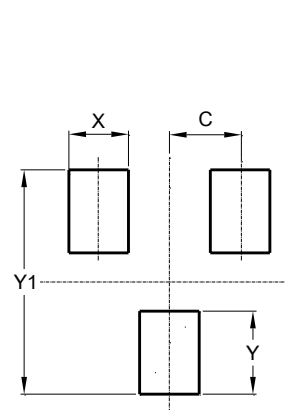
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



SOT23F			
Dim	Min	Max	Typ
A	0.80	1.00	0.90
b	0.35	0.50	0.44
c	0.10	0.20	0.16
D	2.80	3.00	2.90
e	0.95 REF		
e1	0.190 REF		
E	2.30	2.50	2.40
E1	1.50	1.70	1.65
k	1.20	–	–
L	0.30	0.65	0.50
L1	0.30	0.50	0.40
R	0.05	0.15	–
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.



Dimensions	Value (in mm)
C	0.95
X	0.80
Y	1.110
Y1	3.000

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device Terminals and PCB tracking.

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