

# NPN Silicon Planar Medium Power High Gain Transistors

## PRELIMINARY INFORMATION

ZTX689B ZTX690B  
ZTX692B ZTX694B

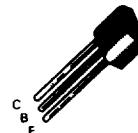
### FEATURES

- High gain — 500 min.
- Up to 3amps continuous current
- Gain specified up to 6amps
- 1.5 watt power dissipation at  
 $T_{amb} = 25^{\circ}\text{C}$ \*
- Voltages up to 120V
- Very low saturation voltages

### DESCRIPTION

A range of high gain, high performance, medium power transistors encapsulated in the popular E-line (TO-92 style) plastic package.

The 1.5 watt performance and outstanding electrical characteristics permit use in a wide variety of applications, including lamp, solenoid and relay drivers, motor drives and DC-DC converters.



Plastic E-Line  
(TO-92 Compatible)

The E-line package is formed by transfer moulding a silicone plastic specially selected to provide a rugged one-piece encapsulation resistant to severe environments and allow the high junction temperature operation normally associated with metal can devices.

### ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	ZTX689B	ZTX690B	ZTX692B	ZTX694B	Unit
Collector-Base Voltage	$V_{CBO}$	20	45	70	120	V
Collector-Emitter Voltage	$V_{CEO}$	20	45	70	120	V
Emitter-Base Voltage	$V_{EBO}$	5	5	5	5	V
Peak Pulse Current	$I_{CM}$	8	6	2	1	A
Continuous Collector Current	$I_C$	3	2	2	0.5	A
Practical Power Dissipation*	$P_{totP}$	1.5				W
Power Dissipation at $T_{amb} = 25^{\circ}\text{C}$ derate above $25^{\circ}\text{C}$	$P_{tot}$	1.0 5.7				W mW/ $^{\circ}\text{C}$
Operating & Storage Temperature Range		-55 to +200				$^{\circ}\text{C}$

\*The power which can be dissipated assuming device mounted in typical manner on P.C.B. with copper equal to 1in<sup>2</sup> minimum.

# ZTX689B, ZTX690B, ZTX692B, ZTX694B

ELECTRICAL CHARACTERISTICS (Test conditions at  $T_{amb} = 25^\circ\text{C}$  unless otherwise stated).

Parameter	Symbol	ZTX689B			ZTX690B			Unit	Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
Collector-base breakdown voltage	$V_{(BR)CBO}$	20	—	—	45	—	—	V	$I_C = 100\mu\text{A}$
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	20	—	—	45	—	—	V	$I_C = 10\text{mA}$
Emitter-base breakdown voltage	$V_{(BR)EBO}$	5	—	—	5	—	—	V	$I_E = 100\mu\text{A}$
Collector cut-off current	$I_{CBO}$	—	—	0.1	—	—	— 0.1	$\mu\text{A}$	$V_{CB} = 16\text{V}$ $V_{CB} = 35\text{V}$
Emitter cut-off current	$I_{EBO}$	—	—	0.1	—	—	0.1	$\mu\text{A}$	$V_{EB} = 4\text{V}$
Collector-emitter saturation voltage	$V_{CE(\text{sat})}$	—	—	0.1	—	—	0.1	V	$I_C = 100\text{mA}$ , $I_B = 0.5\text{mA}$ $I_C = 1\text{A}$ , $I_B = 5\text{mA}^*$ $I_C = 2\text{A}$ , $I_B = 10\text{mA}^*$
Base-emitter saturation voltage	$V_{BE(\text{sat})}$	—	—	0.9	—	—	0.9	V	$I_C = 1\text{A}$ , $I_B = 10\text{mA}^*$
Base-emitter turn-on voltage	$V_{BE(\text{on})}$	—	—	0.9	—	—	0.9	V	$I_C = 1\text{A}$ , $V_{CE} = 2\text{V}^*$
Static forward current transfer ratio	$h_{FE}$	500 — 400 150	— — — —	— 400 150 —	500 — — —	— — — —	— — — —		$I_C = 100\text{mA}$ , $V_{CE} = 2\text{V}$ $I_C = 1\text{A}$ , $V_{CE} = 2\text{V}^*$ $I_C = 2\text{A}$ , $V_{CE} = 2\text{V}^*$ $I_C = 6\text{A}$ , $V_{CE} = 2\text{V}^*$
Transition frequency	$f_T$	150	—	—	150	—	—	MHz	$I_C = 50\text{mA}$ , $V_{CE} = 5\text{V}$ $f = 100\text{MHz}$
Input capacitance	$C_{ibo}$	—	60	—	—	50	—	pF	$V_{EB} = 0.5\text{V}$ , $f = 1\text{MHz}$
Output capacitance	$C_{obo}$	—	25	—	—	25	—	pF	$V_{CE} = 10\text{V}$ , $f = 1\text{MHz}$
Switching times	$t_{on}$ $t_{off}$	— —	50 1000	— —	— 1000	50 —	— —	ns ns	$I_C = 500\text{mA}$ , $I_{B1} = 50\text{mA}$ $I_{B2} = 50\text{mA}$ , $V_{CC} = 10\text{V}$

\* Measured under pulsed conditions. Pulse width = 300μs. Duty cycle ≤ 2%.

# ZTX689B, ZTX690B, ZTX692B, ZTX694B

ELECTRICAL CHARACTERISTICS (Test conditions at  $T_{\text{amb}} = 25^\circ\text{C}$  unless otherwise stated).

Parameter	Symbol	ZTX692B			ZTX694B			Unit	Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
Collector-base breakdown voltage	$V_{(\text{BR})\text{CBO}}$	70	—	—	120	—	—	V	$I_C = 100\mu\text{A}$
Collector-emitter breakdown voltage	$V_{(\text{BR})\text{CEO}}$	70	—	—	120	—	—	V	$I_C = 10\text{mA}$
Emitter-base breakdown voltage	$V_{(\text{BR})\text{EBO}}$	5	—	—	5	—	—	V	$I_E = 100\mu\text{A}$
Collector cut-off current	$I_{\text{CBO}}$	—	—	0.1	—	—	—	$\mu\text{A}$	$V_{\text{CB}} = 55\text{V}$ $V_{\text{CB}} = 100\text{V}$
Emitter cut-off current	$I_{\text{EBO}}$	—	—	0.1	—	—	0.1	$\mu\text{A}$	$V_{\text{EB}} = 4\text{V}$
Collector-emitter saturation voltage	$V_{\text{CE}(\text{sat})}$	—	—	0.15	—	—	0.25	V	$I_C = 100\text{mA}$ , $I_B = 0.5\text{mA}$
		—	—	0.5	—	—	0.5	V	$I_C = 400\text{mA}$ , $I_B = 5\text{mA}^*$
		—	—	—	—	—	—	V	$I_C = 1\text{A}$ , $I_B = 10\text{mA}^*$
Base-emitter saturation voltage	$V_{\text{BE}(\text{sat})}$	—	—	0.9	—	—	0.9	V	$I_C = 1\text{A}$ , $I_B = 10\text{mA}^*$
Base-emitter turn-on voltage	$V_{\text{BE}(\text{on})}$	—	—	0.9	—	—	0.9	V	$I_C = 1\text{A}$ , $V_{\text{CE}} = 2\text{V}^*$
Static forward current transfer ratio	$h_{\text{FE}}$	500	—	—	500	—	—		$I_C = 100\text{mA}$ , $V_{\text{CE}} = 2\text{V}$
		—	—	—	400	—	—		$I_C = 200\text{mA}$ , $V_{\text{CE}} = 2\text{V}^*$
		—	—	—	150	—	—		$I_C = 400\text{mA}$ , $V_{\text{CE}} = 2\text{V}^*$
		400	—	—	—	—	—		$I_C = 500\text{mA}$ , $V_{\text{CE}} = 2\text{V}^*$
		150	—	—	—	—	—		$I_C = 1\text{A}$ , $V_{\text{CE}} = 2\text{V}^*$
Transition frequency	$f_T$	150	—	—	150	—	—	MHz	$I_C = 50\text{mA}$ , $V_{\text{CE}} = 5\text{V}$ $f = 100\text{MHz}$
Input capacitance	$C_{\text{ibo}}$	—	37	—	—	33	—	pF	$V_{\text{EB}} = 0.5\text{V}$ , $f = 1\text{MHz}$
Output capacitance	$C_{\text{obo}}$	—	14	—	—	11	—	pF	$V_{\text{CE}} = 10\text{V}$ , $f = 1\text{MHz}$
Switching times	$t_{\text{on}}$	50	—	—	—	200	—	ns	$I_C = 500\text{mA}$ , $I_{B1} = 50\text{mA}$
	$t_{\text{off}}$	1200	—	—	—	1600	—	ns	$I_{B2} = 50\text{mA}$ , $V_{\text{CC}} = 10\text{V}$

\*Measured under pulsed conditions. Pulse width = 300μs. Duty cycle ≤ 2%.