

# NPN SILICON PLANAR MEDIUM POWER TRANSISTORS

## ZTX650 ZTX651

ISSUE 2 – JULY 94

### FEATURES

- \* 60 Volt  $V_{CE0}$
- \* 2 Amp continuous current
- \* Low saturation voltage
- \*  $P_{tot}=1$  Watt



**E-Line**  
**TO92 Compatible**

### ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX650	ZTX651	UNIT
Collector-Base Voltage	$V_{CBO}$	60	80	V
Collector-Emitter Voltage	$V_{CEO}$	45	60	V
Emitter-Base Voltage	$V_{EBO}$	5		V
Peak Pulse Current	$I_{CM}$	6		A
Continuous Collector Current	$I_C$	2		A
Power Dissipation at $T_{amb}=25^{\circ}C$ derate above $25^{\circ}C$	$P_{tot}$	1	5.7	W mW/ $^{\circ}C$
Operating and Storage Temperature Range	$T_j; T_{stg}$	-55 to +200		$^{\circ}C$

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

PARAMETER	SYMBOL	ZTX650			ZTX651			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60			80			V	$I_C=100\mu A$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	45			60			V	$I_C=10mA^*$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			5			V	$I_E=100\mu A$
Collector Cut-Off Current	$I_{CBO}$			0.1 10			0.1 10	$\mu A$ $\mu A$ $\mu A$ $\mu A$	$V_{CB}=45V$ $V_{CB}=60V$ $V_{CB}=45V, T_{amb}=100^{\circ}C$ $V_{CB}=60V, T_{amb}=100^{\circ}C$
Emitter Cut-Off Current	$I_{EBO}$			0.1			0.1	$\mu A$	$V_{EB}=4V$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.12 0.23	0.3 0.5		0.12 0.23	0.3 0.5	V V	$I_C=1A, I_B=100mA^*$ $I_C=2A, I_B=200mA^*$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.9	1.25		0.9	1.25	V	$I_C=1A, I_B=100mA^*$
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.8	1		0.8	1	V	$I_C=1A, V_{CE}=2V^*$

# ZTX650 ZTX651

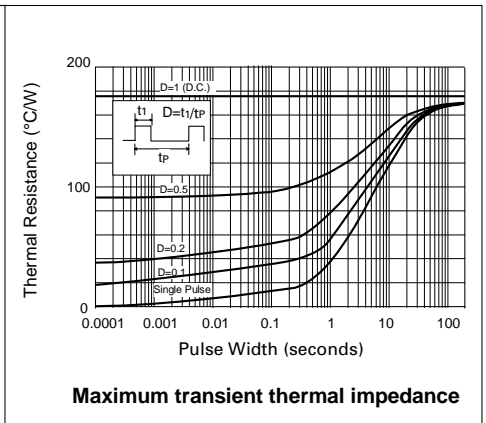
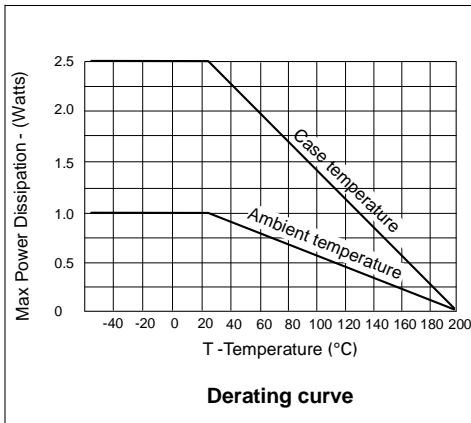
PARAMETER	SYMBOL	ZTX650			ZTX651			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Transition Frequency	$f_T$	140	175		140	175		MHz	$I_C=100\text{mA}$ , $V_{CE}=5\text{V}$ $f=100\text{MHz}$
Switching Times	$t_{on}$		45			45		ns	$I_C=500\text{mA}$ , $V_{CC}=10\text{V}$ $I_{B1}=I_{B2}=50\text{mA}$
	$t_{off}$		800			800		ns	
Output Capacitance	$C_{obo}$			30			30	pF	$V_{CB}=10\text{V}$ $f=1\text{MHz}$

\*Measured under pulsed conditions. Pulse width=300 $\mu$ s. Duty cycle  $\leq$  2%

## THERMAL CHARACTERISTICS

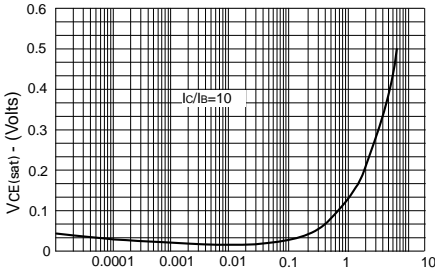
PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient <sub>1</sub>	$R_{th(j-amb)1}$	175	$^{\circ}\text{C/W}$
Junction to Ambient <sub>2</sub>	$R_{th(j-amb)2}$	116	$^{\circ}\text{C/W}$
Junction to Case	$R_{th(j-case)}$	70	$^{\circ}\text{C/W}$

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



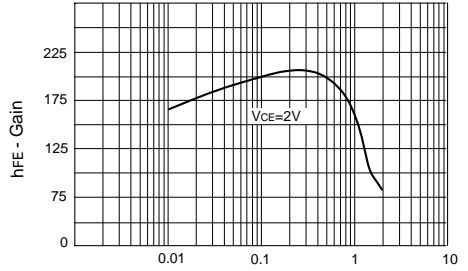
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## TYPICAL CHARACTERISTICS



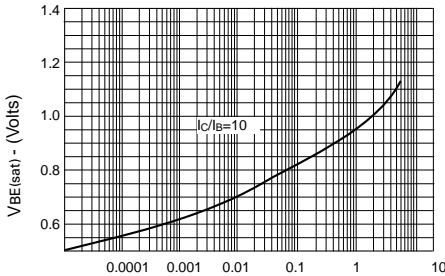
IC - Collector Current (Amps)

**VCE(sat) v IC**



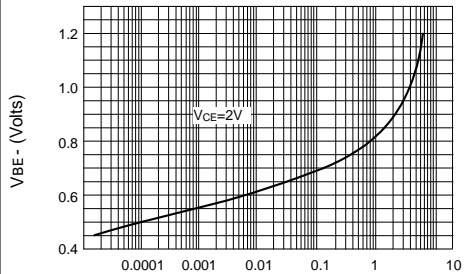
IC - Collector Current (Amps)

**hFE v IC**



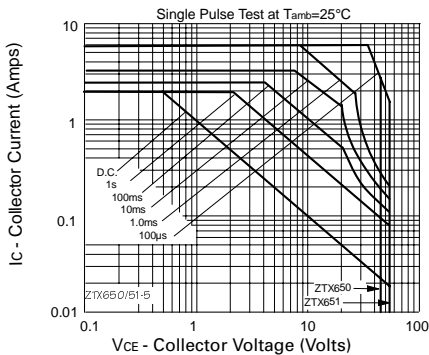
IC - Collector Current (Amps)

**VBE(sat) v IC**

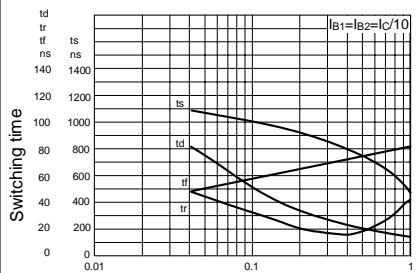


IC - Collector Current (Amps)

**VBE(on) v IC**



**Safe Operating Area**



IC - Collector Current (Amps)

**Switching Speeds**