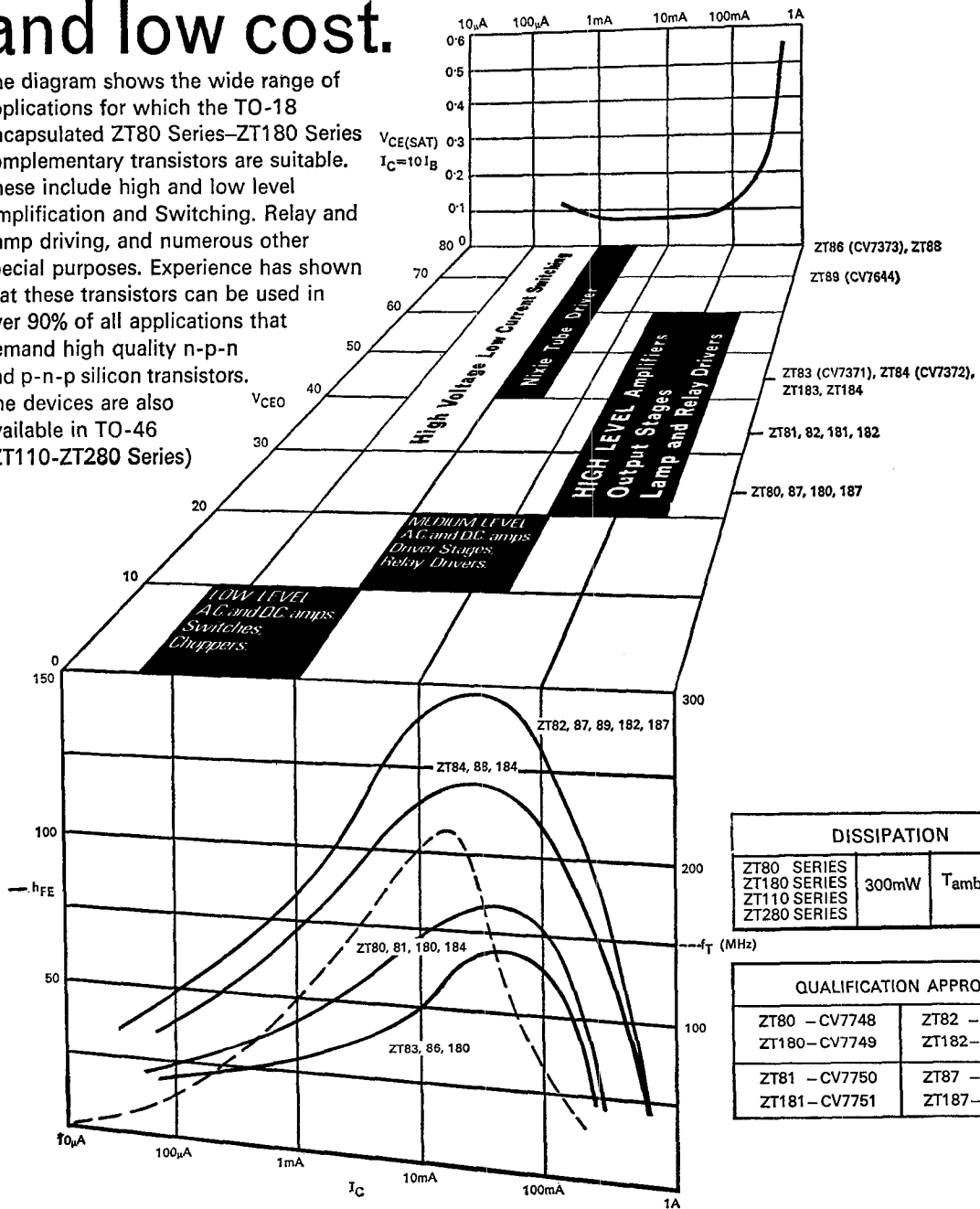


ZT80-ZT180 Series—Truly general purpose complementary n-p-n and p-n-p transistors featuring high performance, high reliability and low cost.

The diagram shows the wide range of applications for which the TO-18 encapsulated ZT80 Series—ZT180 Series complementary transistors are suitable. These include high and low level Amplification and Switching. Relay and Lamp driving, and numerous other special purposes. Experience has shown that these transistors can be used in over 90% of all applications that demand high quality n-p-n and p-n-p silicon transistors. The devices are also available in TO-46 (ZT110-ZT280 Series)



DISSIPATION		
ZT80 SERIES	300mW	$T_{amb} = 25^{\circ}C$
ZT180 SERIES		
ZT110 SERIES		
ZT280 SERIES		

QUALIFICATION APPROVAL			
ZT80 - CV7748	ZT82 - CV7752		
ZT180 - CV7749	ZT182 - CV7753		
ZT81 - CV7750	ZT87 - CV7754		
ZT181 - CV7751	ZT187 - CV7755		

SILICON TRANSISTORS

Planar Medium Power and Switching (n-p-n)

Type No.	Maximum Ratings						Characteristics							Package	Outline Drawing	Comments
	V _{CB0}	V _{CE0}	V _{EB0}	I _C (pk)	P _{tot} Watts		V _{CE(sat)} (max)		h _{FE}			I _{CB0} (max) at 25°C μA	f _T min. MHz			
					25°C amb.	100°C case	volts	at I _C mA	min.	max.	at I _C mA					
BFS59	60	30	5	—	0.5	—	0.35	150	40	300	150	0.1	150	E-Line†	T21	High gain, low cut-off current, high power Compl'mty to BFS96-98
BFS60	60	40	5	—	0.5	—	0.25	150	100	300	150	0.1	150	E-Line†	T21	
BFS61	80	60	5	—	0.5	—	0.35	150	40	160	150	0.1	150	E-Line†	T21	
BFX84	100	60	6	1.0	0.8	2.86	0.35	150	20	—	10	0.05	50	TO-5	T7A	General purpose
BFX85	100	60	6	1.0	0.8	2.86	0.35	150	50	—	10	0.05	50	TO-5	T7A	
BFY50	80	60 ‡	6	1.0	0.8	2.86	0.2	150	30	—	150	0.05	60	TO-5	T7A	
BFY51	60	60 ‡	6	1.0	0.8	2.86	0.2	150	40	—	150	0.05	50	TO-5	T7A	
BFY52	40	40 ‡	6	1.0	0.8	2.86	0.2	150	60	—	150	0.05	50	TO-5	T7A	
ZT80	25	25	4	0.5	0.3	0.12**	0.2	10	38	162	10	0.5	150	TO-18	T2B	Power Complementary to ZT180 series
ZT81	45	35	4	0.5	0.3	0.12**	0.2	10	38	162	10	0.5	150	TO-18	T2B	
ZT82	45	35	4	0.5	0.3	0.12**	0.2	10	75	250	10	0.5	150	TO-18	T2B	
ZT83	60	45	5	0.5	0.3	0.17**	0.2	50	38	85	10	0.05	150	TO-18	T2B	
ZT84	60	45	5	0.5	0.3	0.17**	0.2	50	75	170	10	0.05	150	TO-18	T2B	
ZT86	100	80	5	0.5	0.3	0.17**	0.2	50	38	85	10	0.05	150	TO-18	T2B	
ZT87	25	25	4	0.5	0.3	0.17**	0.2	10	75	250	10	0.5	150	TO-18	T2B	
ZT88	100	80	5	0.5	0.3	0.17**	0.2	50	75	170	10	0.05	150	TO-18	T2B	
ZT89	70	70	5	0.5	0.3	0.17**	0.2	50	75	250	10	0.5	150	TO-18	T2B	
ZT90	60	60	6	1.0	1.0	2.9	0.7	200	60	200	200	0.1	60	TO-5	T7A	High gain, low cut-off current, medium power, high voltage
ZT91	120	100	6	1.0	1.0	2.9	1.2	200	40	120	200	1.0	60	TO-5	T7A	
ZT92	120	100	6	1.0	1.0	2.9	1.2	200	65	200	200	1.0	60	TO-5	T7A	
ZT93	120	80	6	1.0	1.0	2.9	0.5	150	40	120	150	0.1	60	TO-5	T7A	
ZT94	60	45	6	1.0	1.0	2.9	0.7	200	30	—	200	1.0	60	TO-5	T7A	
ZT95	60	60	6	1.0	1.0	2.9	1.2	200	30	200	350	0.1	60	TO-5	T7A	
*2N696	60	40 ‡	5	0.5	0.6	1.0	1.5	150	20	60	150	1.0	80 †	TO-5	T7A	Switching and medium power applications
*2N697	60	40 ‡	5	0.5	0.6	1.0	1.5	150	40	120	150	1.0	100 †	TO-5	T7A	
*2N1613	75	50 ‡	7	1.0	0.8	1.7	1.5	150	40	120	150	0.01	60	TO-5	T7A	General purpose and switching applications.
*2N1711	75	50 ‡	7	—	0.8	1.7	1.5	150	100	300	150	0.01	70	TO-5	T7A	
*2N2102	120	80 ‡	7	1.0	1.0	2.9	0.5	150	40	120	150	0.1	60	TO-5	T7A	Switching applications very low cut-off current
2N2218	60	30	5	0.8	0.8	1.5	0.4	150	40	120	150	0.01	250	TO-5	T7A	High speed, medium power switching
2N2218A	75	40	6	0.8	0.8	1.5	0.3	150	40	120	150	0.01	250	TO-5	T7A	
2N2219	60	30	5	0.8	0.8	1.5	0.4	150	100	300	150	0.01	250	TO-5	T7A	General purpose applications
2N2219A	75	40	6	0.8	0.8	1.5	0.3	150	100	300	150	0.01	300	TO-5	T7A	
2N2221	60	30	5	0.8	0.5	1.0	0.4	150	40	120	150	0.01	250	TO-18	T2A	
2N2221A	75	40	6	0.8	0.5	1.0	0.3	150	40	120	150	0.01	250	TO-18	T2A	
2N2222	60	30	5	0.8	0.5	1.0	0.4	150	100	300	150	0.01	250	TO-18	T2A	
2N2222A	75	40	6	0.8	0.5	1.0	0.3	150	100	300	150	0.01	300	TO-18	T2A	
*2N2270	60	60 ‡	7	1.0	1.0	2.9	0.9	150	50	200	150	0.1	60	TO-5	T7A	Low noise-medium power
2N3053	60	50 ‡	5	0.7	1.0	2.9	1.4	150	50	250	150	0.25	100	TO-5	T7A	
2N3439	450	350 †	7	1.0	1.0	3.4	0.5	50	40	160	20	20 ‡	20	TO-5	T7A	High Voltage Low Current Switching
2N3440	300	250 †	7	1.0	1.0	3.4	0.5	50	40	160	20	20 ‡	20	TO-5	T7A	

*Also Available as ZT696, etc. †Typical. ‡V_{CE R} ≤ 10 ohms. **100°C ambient temp. ††V_{CE0(sus)} ‡‡I_{EB0}

†† See Lead Configuration note at bottom of page.

Planar V.H.F. and U.H.F. Small Signal (n-p-n)

Type No.	Maximum Ratings				Characteristics							Package	Outline Drawing	Comments
	V _{CB0}	V _{CE0}	V _{EB0}	P _{tot} at 25°C amb mW	h _{FE}		Noise Figure N max. dB	c _{ob} max. pF	Power Gain (neutralised) dB	Output Power at 500 MHz mW	f _T min. MHz			
					min.	max.								
BFY90	30	15	2.5	200	25	150	5.0	—	—	175	1300	TO-72	T3A †	Low noise UHF type
ZTX325	30	15	2.5	200	25	150	5.0	—	—	175	1000	E-Line†	T21	
ZTX326	25	12	2.5	200	25	150	6.0	—	—	—	1000	E-Line†	T21	
ZTX327	55	30	3.5	500	—	—	—	3.0	—	200 ‡‡	800 ††	E-Line†	T21	
ZTX320, BFW97	30	15	3	250	20 ††	—	6.0**	1.7	15 ‡	—	600	E-Line†	T21	Low noise VHF types
ZTX321	30	15	3	250	20 ††	—	6.0**	1.7	15 ‡	—	600	E-Line†	T21	
2N918	30	15	3	200	20	—	3.0†	1.7	15 ‡	30	600	TO-72	T3A †	General Purpose
§ 2N2708	35	20	3	200	30	200	8.5 ‡	1.5	15 ‡	—	700	TO-72	T3A †	
§ 2N2857	30	15	2.5	200	30	150	4.5 ††	1.8	12.5 ††	30	1000	TO-72	T3A †	
2N3570	30	15	3.0	200	20	150	7.0*	0.75	—	60*	1500	TO-18	T3A †	Low noise VHF types
2N3571	25	15	3.0	200	20	200	4.0 ††	0.85	—	—	1200	TO-18	T3A †	
2N3572	25	13	3.0	200	20	300	6.0 ††	0.85	—	—	1000	TO-18	T3A †	
2N3600	30	15	3.0	200	20	150	4.5	1.7	17 ‡	20	850	TO-72	T3A †	

† Typical at 60 MHz ** at 60 MHz † at 200 MHz †† at 450 MHz ‡‡ at 800 MHz. * at 1GHz ‡ Can be supplied as ZT2708, etc.

†† Lead connections 1 - E, 2 - B, 3 - C, 4 - Case. ††† Typical †††† I_C=3mA, V_{CE}=IV

††† Lead Configuration:— The leads of E-Line devices can be preformed, on request, to the TO-5 configuration and when this is done suffix K is added to the type number Similarly, suffix L indicates that the leads have been preformed to the TO-18 configuration. For flat mounting, suffix M is added to the type number

SILICON TRANSISTORS

Power (n-p-n)

Type No.	Maximum Ratings					Characteristics							Jedec Outline	Outline Drawing	Comments
	V _{CBO} volts	V _{CEO(sus)} volts	I _C amps	Dissipation Watts		h _{FE}			R _(sat) (max.)		f _T Typical MHz				
				Case Temp. 25°C	100°C	min.	max.	V _{CE} volts	at I _C amps	ohms		at I _C amps			
*ZT1479	60	40	1.5	5	2.9	20	60	4	0.2	7	0.2	1.5	TO-5	T7A	Medium power types for switching applications
*ZT1480	100	55	1.5	5	2.9	20	60	4	0.2	7	0.2	1.5	TO-5	T7A	
*ZT1481	60	40	1.5	5	2.9	35	100	4	0.2	7	0.2	1.5	TO-5	T7A	
*ZT1482	100	55	1.5	5	2.9	35	100	4	0.2	7	0.2	1.5	TO-5	T7A	
*ZT1483	60	40	3.0	25	14	20	60	4	0.75	2.67	0.75	1.25	TO-8	T10	
*ZT1484	100	55	3.0	25	14	20	60	4	0.75	2.67	0.75	1.25	TO-8	T10	
*ZT1485	60	40	3.0	25	14	35	100	4	0.75	1.0	0.75	1.25	TO-8	T10	
*ZT1486	100	55	3.0	25	14	35	100	4	0.75	1.0	0.75	1.25	TO-8	T10	
*ZT1487	60	40	6.0	75	43	15	45	4	1.5	2	1.5	1.0	TO-3	T9C	
*ZT1488	100	55	6.0	75	43	15	45	4	1.5	2	1.5	1.0	TO-3	T9C	
*ZT1489	60	40	6.0	75	43	25	75	4	1.5	0.67	1.5	1.0	TO-3	T9C	
*ZT1490	100	55	6.0	75	43	25	75	4	1.5	0.67	1.5	1.0	TO-3	T9C	
*ZT1700	60	40	1.0	5	2.8	20	80	4	0.1	10	0.1	1.2	TO-5	T7A	
*ZT1701	60	40	2.5	25	14	20	80	4	0.3	5	0.3	1.0	TO-8	T10	
*ZT1702	60	40	5.0	75	43	15	60	4	0.8	4	0.8	1.0	TO-3	T9C	
2N3055	100	60	15	115	65	20	70	4	4	0.28	4	0.7‡	TO-3	T9C	Series/shunt Regulator, Power switching
2N3441	160	140	3	25	10.6	20	80	4	0.5	1.0†	0.5	0.65	TO-66	T9A	Series/shunt Regulators,
2N3442	160	140	10	117	67	20	70	4	3.0	1.0†	3.0	0.8‡	TO-3	T9C	Power switching
2N3583	250	175	2.0	35	20	10	—	10	1.0	—	—	10‡	TO-66	T9A	High voltage, high
2N3584	375	250	2.0	35	20	25	100	10	1.0	0.75†	1.0	10‡	TO-66	T9A	speed switching and
2N3585	500	300	2.0	35	20	25	100	10	1.0	0.75†	1.0	10‡	TO-66	T9A	linear amplification

†V_{CE(sat)} ‡f_T at I_C=200mA *Also available as 2N1479 etc.

Planar General Purpose—Small Signal (n-p-n)

Type No.	Maximum Ratings					Characteristics							Jedec Outline	Outline Drawing	Comments
	V _{CBO} volts	V _{CEO} volts	V _{EBO} volts	I _C (pk) mA	P _{tot} mW		V _{CE(sat)}		h _{FE} I _C =10mA V _{CE} =6V		I _{CBO} max. μA	f _T min. MHz			
					amb. temp.	25°C	100°C	Max. volts	at I _C mA	min.					
BCY42	40	25	5	200	300	—	0.25	10	45	90	0.025	100	TO-18	T2A	Low leakage current, low saturation voltage
BCY43	40	25	5	200	300	—	0.25	10	75	150	0.025	100	TO-18	T2A	
ZT20	20	20	6	50	350	140	0.5	10	18	42	0.5	70	TO-5	T7A	For amplifier and switching applications
ZT21	20	20	6	50	350	140	0.5	10	38	82	0.5	70	TO-5	T7A	
ZT22	45	45	6	50	350	140	1.0	10	18	42	0.5	70	TO-5	T7A	
ZT23	45	45	6	50	350	140	1.0	10	38	82	0.5	70	TO-5	T7A	
ZT24	45	45	6	50	350	140	1.0	10	78	160	0.5	70	TO-5	T7A	
ZT40	20	20	6	50	300	120	0.5	10	18	42	0.5	70	TO-18	T2B	
ZT41	20	20	6	50	300	120	0.5	10	38	82	0.5	70	TO-18	T2B	
ZT42	45	45	6	50	300	120	1.0	10	18	42	0.5	70	TO-18	T2B	
ZT43	45	45	6	50	300	120	1.0	10	38	82	0.5	70	TO-18	T2B	
ZT44	45	45	6	50	300	120	1.0	10	78	160	0.5	70	TO-18	T2B	
ZT80	25	25	4	500	300	120	0.2	10	38	162	0.5	150	TO-18	T2B	Low leakage current, low saturation voltage
ZT81	45	35	4	500	300	120	0.2	10	38	162	0.5	150	TO-18	T2B	
ZT82	45	35	4	500	300	120	0.2	10	75	250	0.5	150	TO-18	T2B	
ZT83	60	45	5	500	300	170	0.2	50	38	85	0.05	150	TO-18	T2B	
ZT84	60	45	5	500	300	170	0.2	50	75	170	0.05	150	TO-18	T2B	
ZT86	100	80	5	500	300	170	0.2	50	38	85	0.05	150	TO-18	T2B	
ZT87	25	25	4	500	300	120	0.2	10	75	250	0.5	150	TO-18	T2B	
ZT88	100	80	5	500	300	170	0.2	50	75	170	0.05	150	TO-18	T2B	
ZT89	70	70	5	500	300	170	0.2	50	75	250	0.5	150	TO-18	T2B	
ZT110 to ZT119	SO-12C (TO-46) versions of ZT80 to ZT89											TO-46	T1B	Low level, low noise amplifiers	
2N929	45	45	5	30	300	150	1.0	10	40*	120*	0.01	30	TO-18		T2A
2N930	45	45	5	30	300	150	1.0	10	100*	300*	0.01	30	TO-18		T2A
2N2484	60	60	6	50	360	—	0.35	1.0	100*	500*	0.01	60	TO-18		T2A

*I_C=10μA V_{CE}=5V

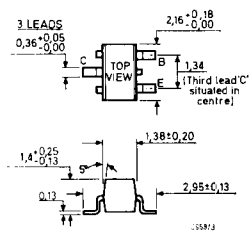
MICRO-E CHARACTERISTICS AT 25°C

MEDIUM CURRENT GENERAL PURPOSE TRANSISTORS		n-p-n						p-n-p						Units
		BFS38A		BFS38		BFS39		BFS40A		BFS40		BFS41		
Parameter	Test Conditions	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
V_{CB0}	Rated Max.	—	25	—	45	—	60	—	25	—	45	—	45	V
$V_{CE0(sus)}$	$I_C=5mA, I_B=0$	25	—	35	—	45	—	25	—	35	—	45	—	V
V_{EBO}	Rated Max.	—	5	—	5	—	5	—	5	—	5	—	5	V
I_{CB0}	$V_{CB}=V_{CB0}$ Rated Max, $I_E=0$	—	0.5	—	0.5	—	0.5	—	0.5	—	0.5	—	0.5	μA
I_{EBO}	$V_{EBO}=5V, I_C=0$	—	0.5	—	0.5	—	0.5	—	—	—	—	—	—	μA
	$V_{EBO}=4V, I_C=0$	—	—	—	—	—	—	—	0.5	—	0.05	—	0.05	μA
h_{FE}	$I_C=100\mu A, V_{CE}=6V$	—	—	20	—	—	—	—	—	20	—	—	—	
h_{FE}	$I_C=10mA, V_{CE}=6V$	50	300	100	300	40	120	50	300	100	300	40	120	
h_{FE}	$I_C=50mA, V_{CE}=6V$	—	—	50	—	—	—	—	—	50	—	—	—	
$V_{CE(sat)}$	$I_C=50mA, I_B=5mA$	—	—	—	0.25	—	0.25	—	—	—	0.25	—	0.25	V
	$I_C=10mA, I_B=1mA$	—	0.35	—	—	—	—	—	0.35	—	—	—	—	V
$V_{BE(sat)}$	$I_C=50mA, I_B=5mA$	—	—	—	1.0	—	1.0	—	—	—	1.0	—	1.0	V
	$I_C=10mA, I_B=1mA$	—	1.0	—	—	—	—	—	1.0	—	—	—	—	V
f_T	$I_C=10mA, V_{CE}=6V, f=100MHz$	150	—	150	—	150	—	150	—	150	—	150	—	MHz
C_{ob}	$V_{CB}=6V, I_E=0$	—	5	—	5	—	5	—	5	—	5	—	5	pF

DEVICE TYPES and nearest metal can equivalents

	n-p-n		p-n-p	
LOW LEVEL AMPLIFICATION	BFS36 BFS36A	2N930 2N929	BFS37 BFS37A	2N2605 2N2604
MEDIUM CURRENT	BFS38A BFS38 BFS39	ZT80 ZT82 ZT83	BFS40A BFS40 BFS41	ZT180 ZT182 ZT183
MEDIUM POWER	BFS42 BFS43	2N2221 2N2222A	BFS44 BFS45	2N2906 2N2907A
HIGH-SPEED SWITCHES	BSV35A BSV35 BSV36	2N708 2N2369 2N2475	BSV37	2N2894
V.H.F. AMPLIFIERS	BFS46 BFS46A	2N918		
HIGH-SPEED DIODES	BAW63 BAW63A BAW63B	1N914		

PACKAGE PHYSICAL DATA



B — Base C — Collector E — Emitter
Dimensions in millimetres

Actual size

HIGH SPEED SWITCHING DIODES

Pin Connections

