

SYMBOLS & CODES EXPLAINED

IN TYPE No. CROSS-INDEX & TECHNICAL SECTIONS

- Δ } Indicators of separate manufacturers producing same type number (non-JEDEC) whose characteristics are not the same.
- \square } This manufacturer-identifying symbol (assigned by D.A.T.A.) is an integral part of the type number (in Type No. Cross Index, Technical Data Sections) to avoid the possibility of confusing the devices of one manufacturer with the devices of others.
- $\%$ } Technical Data Sections)
- RT ... Replacement Type; consult manufacturer.

SYMBOLS & CODES COMMON TO MORE THAN ONE TECHNICAL SECTION

LINE No.

- ∇ - New Type
- \blacklozenge - Revised Specifications
- # - Non-JEDEC Type manufactured outside U.S.A.

TYPE No.

- \dagger - Switching type, also listed in Section 12
- \emptyset - Chopper, also listed in Section 13, Category 10
- * - These types also included elsewhere with other characteristics. See Type No. Cross Index for alternate line no.
- \S - Radiation Resistant Devices, also listed in Section 13, Category 13.

STRUCTURE (All Sections)

- A - Alloy Except 6 & 7)
- AN - Annular
- D - Diffused or drift
- DM - Diffused mesa
- E - Epitaxial
- EA - Epitaxial annular
- EM - Epitaxial mesa
- F - Fused
- G - Grown
- GA - Gallium Arsenide
- H - Hometaxial
- MA - Mico alloy
- MD - Micro alloy diffused
- ME - Mesa
- MOS - Metal oxide silicon
- PA - Precision alloy
- PC - Point contact
- PD - Precision alloy diffused
- PE - Planar epitaxial
- PL - Planar
- S - Surface barrier
- * - Matched pair
- Δ - Switching, other uses
- \square - Chopper, other uses
- \emptyset - Noise figure 8db or below
- \dagger - Plastic package
- $\%$ - Overlay

2. GERMANIUM PNP 3. GERMANIUM NPN 4. SILICON PNP 5. SILICON NPN -- Low Power Transistors

LINE No.	TYPE No.	1. MAX. COLL. DISS. @25°C (W)	2. DERATE IN FREE AIR W/C (Hz)	3. M E X P (V)	4. ABS. MAX. RATINGS @25°C (V)	5. BV _{cb0} (V)	6. BV _{ceo} (V)	7. BV _{ebo} (V)	8. I _{cb0} @MAX V _{cb} (A)	9. I _c (A)	TYPICAL h _{FE} PARAMETERS				10. h _{oe} (mhos)	COMMON EMITTER			11. C _{ob} (F)	12. STRUC-TURE	13. DWG # s/a TO200 Ser.	14. I _c (A)	15. I _e (A)
											10. h _{fe}	11. h _{ie}	12. h _{re}	13. h _{re}									

\emptyset - With infinite heat sink
Following symbols indicate temperature at which derating starts:

\dagger - 40°C	\square - 60°C	\S - 100°C
* - 45°C	\S - 70°C	\blacklozenge - Min.
# - 50°C	Δ - 85°C	

\dagger - f_{ae}
 \S - Gain bandwidth product (f_t)
* - Maximum frequency of oscillation
 \emptyset - Figure of merit (frequency for unity power gain)
 Δ - Minimum
 \square - Maximum

\emptyset - With infinite heat sink

* - 50-65°C	A - Ambient
\emptyset - 70-80°C	C - Case
# - 85-100°C	J - Junction
\blacklozenge - 110-125°C	S - Storage
\dagger - 130-135°C	
\S - 140-165°C	
$\%$ - 170-200°C	
∇ - Over 200°C	

\emptyset - I_c Δ - I_B

\emptyset - V_{CE}

\emptyset - At $V_{CB} < \text{Max. } V_{CB}$ (See Mfr. Spec.)
- I_{CEX} \S - Typical
 \S - I_{CES} * - I_{CER}
 \dagger - At Temp. $> 25^\circ\text{C}$ Δ - I_{CEO}
 \blacklozenge - At Temp. 25°C Case

- Pulsed or Peak
 \S - Minimum

- BV_{CEX} or punch-through
 \emptyset - BV_{CES} \square - $BV_{ceo(sus)}$
 \S - BV_{CER} * - Pulsed
 $\%$ - Indicates min. values given for BV_{cb0} , BV_{ceo} , and BV_{ebo} .

11-13: b - h parameters are h_{ob} , h_{ib} , h_{rb}
 \square - Maximum

10: \dagger - h_{FE} Δ - Minimum
- Pulsed \square - Maximum
 \S - h_{FC}
* - Available in selected ranges

\square - Maximum \S - C_{cb} \dagger - C_{re}

\S - Tetrode
- Radiation Resistant Device (Also See Above)

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 * - Matched pair
 Δ - Switching, other uses
 □ - Chopper, other uses
 ∅ - Noise figure 8db or below
 † - Plastic package
 % - Overlay

12. SWITCHING TRANSISTORS * THESE TYPES ALSO INCLUDED ELSEWHERE WITH OTHER CHARACTERISTICS SEE TYPE NO. CROSS INDEX FOR ADDITIONAL PAGE & LINE NO.

LINE No.	TYPE No.	fab (Hz)	MAX RISE TIME tr (s)	MAX DELAY TIME td (s)	MAX STORE TIME ts (s)	MAX FALL TIME tf (s)	MAX. P _c IN FREE AIR @ 25°C (W)	BIAS			MAX. SAT. RES. (Ω)	C _{ob} (F)	r _{bb} X C _{ob} (s)	STRUCTURE	DESCRIPTION	MAX. TEMP (°C)	DWG. No.	LCODE
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

† - $f \alpha_e$
 § - Gain bandwidth product (f_T)
 * - Maximum frequency of oscillation
 ∅ - Figure of merit (frequency for unity power gain)
 Δ - Minimum □ - Maximum

§ - Charge storage time constant
 ▼ - Stored base charge - picocoulomb
 ♦ - Total switching time
 ∅ - $T_{on} = t_r + t_d$
 † - Typical Value

∅ - $T_{off} = t_s + t_f$
 † - Typical Value
 * - $T_{on} + T_{off} = t_d + t_r + t_f + t_s$

∅ - V_{CE}
 ∅ - I_c
 Δ - I_B
 † - h_{fe}
 # - Pulsed
 Δ - Minimum
 □ - Maximum
 * - Available to selected range narrower than indicated
 § - Y_{fs} in millimho (FET's only). Bias values are V_{DS} & I_D

∅ - With infinite heat sink
 Following symbols indicate temperature at which derating starts:
 † - 40°C § - 70°C
 * - 45°C ♦ - 100°C or greater
 # - 50°C ∅ - 80°C
 □ - 60°C Δ - Pulsed

† - r'_{bb}
 □ - Maximum
 § - C_{cb}
 § - C_{iss} (FET's only)

§ - R_{on} (FET's only)
 # - Pulsed

§ - Tetrode
 N - NPN or "N" Channel
 P - PNP or "P" Channel
 § - Field Effect Transistor
 # - Radiation Resistant Device (See above also)

A - Ambient
 C - Case
 J - Junction
 S - Storage

13. MISCELLANEOUS TRANSISTORS

LINE No.	TYPE No.	CATEGORY	STRUCTURE	MATERIAL	DWG. No.	LCODE	DESCRIPTION
1	2	3	4	5	6	7	8

- 1 - Avalanche Mode
- 2 - Bi-directional
- 3 - Field Effect
- 4 - Hook Collector
- 5 - Complementary Symmetry (PNP & NPN) Matched Pair
- 6 - Matched Pair
- 7 - Phototransistor
- 8 - Tetrode
- 9 - Unijunction: N-N-type emitter (P-type Base) P-P-type emitter (N-type Base)
- 10 - Chopper
- 11 - Unmatched Composite (Dual)
- 12 - Cryogenic
- 13 - Radiation Resistant Devices
- 14 - Pressure Sensitive
- 15 - Transistor chips
- 16 - Darlington
- 17 - Microwave

N - NPN or N Channel
 P - PNP or P Channel (See above also)

Ge - Germanium
 Si - Silicon

See "TECHNICAL TERM DEFINITIONS" Section

12. SWITCHING TRANSISTORS

IN ORDER OF (1) fab, (2) MAX RISE TIME & (3) TYPE No.

LINE No.	TYPE No.	fab (Hz)	MAX RISE TIME tr (s)	MAX DELAY TIME td (s)	MAX STORE TIME ts (s)	MAX FALL TIME tf (s)	MAX. Pc IN FREE AIR @ 25°C (W)	BIAS			MAX. SAT. RES. (Ω)	Cob (F)	r'bb X Cob (s)	STRUCTURE P-N-P N-PNP	M A T	MAX. TEMP (°C)	DWG # Y200 s/a TO200 Ser.	# L E A D E	C O D E
								Vcb (V)	le (A)	hFE									
1#	FM708	300M Δ	40n \emptyset			70n \emptyset	350m	1.0 \emptyset	10m \emptyset	30 # \square	40	6.0p \square	N	Si	200	TO46			
2#	FV914	300M Δ	40n \emptyset			40n \emptyset	350m	1.0 \emptyset	10m \emptyset	55 #	3.5	6.0p \square	N-PE	Si	300S	u5b			
3#	PEP2	300M	40n \emptyset		25n	75n \emptyset	300m	1.0 \emptyset	10m \emptyset	40		6.0p	N-PE	Si	200	TO18			
4#	PEP5	300M Δ	40n \emptyset		25n	75n \emptyset	300m	1.0 \emptyset	10m \emptyset	40		6.0p	N	Si	200	TO18			
5#	PEP6	300M Δ	40n \emptyset		25n	75n \emptyset	300m	1.0 \emptyset	10m \emptyset	40		6.0p	N	Si	200	TO18			
6#	PEP7	300M Δ	40n \emptyset		25n	75n \emptyset	300m	1.0 \emptyset	10m \emptyset	40		6.0p	N	Si	200	TO18			
7#	PEP8	300M Δ	40n \emptyset		25n	75n \emptyset	300m	1.0 \emptyset	10m \emptyset	40		6.0p	N	Si	200	TO18			
8#	ST59	300M Δ	40n \emptyset		20n	40n \emptyset	360m	1.0 \emptyset	10m \emptyset	30 # Δ		9.0p \square	N-PE	Si	150J	TO18			
9#	TE3606	300M Δ	40n \emptyset		35n	60n \emptyset	500m \emptyset	1.0 \emptyset	10m \emptyset	30 # Δ	25	6.0p \square	N-DPL	Si	150J	R97			
10	TE3606A	300M Δ	40n \emptyset		35n	60n \emptyset	320m	1.0 \emptyset	10m \emptyset	120 # \square		25p	N	Si	120J	TO106			
11	TIS46	300M Δ	40n \emptyset		20n	40n \emptyset	360m	1.0 \emptyset	10m \emptyset	120 # \square		6.0p \square	P-E	Si	150J	TO92			
12	TE3607	300M Δ	45n \emptyset		45n	70n \emptyset	500m \emptyset	1.0 \emptyset	10m \emptyset	30 # Δ	25	6.0p \square	N-DPL	Si	150J	R97			
13	D11E404	300M Δ	50n \emptyset		100n \emptyset		800m	5.0 \emptyset	800m	12 # Δ		10p \square	N-EP	Si	200J	TO5			
14	GME9022	300M Δ	50n \emptyset			70n \emptyset	625m \emptyset	1.0 \emptyset	10m \emptyset	30 # Δ		6.0p \square	N-PE	Si	125S	X45			
15	PET9001	300M	50n \emptyset		20n	70n \emptyset	250m	1.0 \emptyset	10m \emptyset	100		6.0p \square	N-PE	Si	125	TO18			
16	PET9022	300M Δ	50n \emptyset			70n \emptyset	800m \emptyset	1.0 \emptyset	10m \emptyset	40 # Δ	40	6.0p \square	N	Si	125J	R110		A	
17	XT300	300M Δ	50n \emptyset			70n \emptyset	75m	300m \emptyset	10m	40 # Δ	12	6.0p \square	P-D	Ge	100S	TO18			
18	D11E405	300M Δ	60n \emptyset		100n \emptyset		800m	5.0 \emptyset	800m	12 # Δ		10p \square	N-EP	Si	200J	TO5			
19	D11E406	300M Δ	70n \emptyset		130n \emptyset		800m	5.0 \emptyset	800m	12 # Δ		9.0p \square	N-EP	Si	200J	TO5			
20	D11E407	300M Δ	70n \emptyset		130n \emptyset		800m	5.0 \emptyset	800m	12 # Δ		9.0p \square	N-EP	Si	200J	TO5			
21#	BSW33	300M Δ	200n \emptyset	30n \emptyset	150n \emptyset	40n \emptyset	125m#	0.0	10m	180 # \square		3.0ps	N-PE \dagger	Si	125J	MM13		F	
22#	BSW34	300M Δ	200n \emptyset	30n \emptyset	150n \emptyset	40n \emptyset	125m#	0.0	10m	300 # \square		3.0ps	N-PE \dagger	Si	125J	MM13		F	
23#	BSW35	300M Δ	200n \emptyset	30n \emptyset	150n \emptyset	40n \emptyset	125m#	0.0	10m	200 # \square		3.0ps	N-PE \dagger	Si	125J	MM13		F	
24#	TC103	300M	400n \emptyset			150m	150m	5.0	10m	40		3.0p	P-ME	Ge	100J	TO18		F	
25	TE706	320M Δ		.08n	.15n	.08n	650n \emptyset	1.0 \emptyset	10m \emptyset	20 # Δ	60	6.0p \square	N-D	Si	175J	R97a			
26#	ZSC150H	320M Δ		.18n	.15n	.08n	750m	6.0 \emptyset	10m \emptyset	20 # Δ		7.0p	N	Si	175J	TO39			
27#	2N779B	320M Δ		.50n \emptyset	.18n		150m	.50 \emptyset	50m \emptyset	35 # Δ	4.0	2.5p \square	N	Si	100S	TO18		A	
28	2N846	320M Δ		.18n		.18n	60m	500m \emptyset	50m \emptyset	20 # Δ	5.0	2.5p \square	P	Ge	100S	TO18		A	
29	2N846B	320M Δ		.18n		.18n	150m	.50 \emptyset	50m \emptyset	20 # Δ	14	2.5p \square	P	Ge	100S	TO18		A	
30	101A	320M Δ		.80n \emptyset		.80n	150m	3.0 \emptyset	50m \emptyset	40	30		P-ME	Ge	100S	TO18			
31	101B	320M Δ		.80n \emptyset		.80n	150m	3.0 \emptyset	50m \emptyset	40	30		P-ME	Ge	100S	TO18		A	
32	101M	320M Δ		.80n \emptyset		.80n	150m	3.0 \emptyset	50m \emptyset	40	30		P-ME	Ge	100S	TO18		A	
33#	C722	350M Δ		35n \emptyset		240u \emptyset	360m	1.0 \emptyset	10m \emptyset	120		3.0p	N-PE	Si	200	TO18		A	
34#	ST64	350M Δ		.18n		.18n	360m	1.0 \emptyset	10m \emptyset	40 # Δ		4.0p	N-PE	Si	125J	TO18			
35#	GET2369	350M Δ	12n \emptyset	12n \emptyset	13n	18n \emptyset	360m	1.0 \emptyset	10m \emptyset	120 # \square	25	4.5ps \square	N-PE	Si	125J	TO18			
36	TE2369	350M Δ	12n \emptyset	12n \emptyset	13n	18n \emptyset	250m	2.0 \emptyset	100m	20 # Δ	25	4.0p	N-DPL	Si	150J	R97a		A	
37	TIS55	350M Δ	15n \emptyset		20n	15n	360m	500m \emptyset	100m \emptyset	25 # Δ		5.0p	N-PE	Si	125J	TO92			
38	TIS52	350M Δ	16n \emptyset		20n	25n \emptyset	360m	.40 \emptyset	30m \emptyset	25 # \square		5.0p	P-E	Si	150J	TO92			
39	MD1128	350M Δ	20n \emptyset	30n \emptyset	35n \emptyset		300m	1.0 \emptyset	10m \emptyset	120		4.0p	P-PE	Si	200J	L2d			
40	2N834/51	350M Δ	35n \emptyset		25n	50n	300m	1.0 \emptyset	10m \emptyset	25 # Δ	25	4.0p	N-E	Si	175J	TO51			
41	16J1	350M Δ	35n \emptyset		18n	45n \emptyset	200m	1.0 \emptyset	10m \emptyset	30 # Δ	25	6.0p	N-PE	Si	100J	R67		B	
42	40220	350M Δ	35n \emptyset	25n \emptyset		75n \emptyset	300m	1.0 \emptyset	10m \emptyset	25 # Δ	25	4.0p	N	Si	175	TO52			
43	16J2	350M Δ	45n \emptyset		40n	60n \emptyset	200m	1.0 \emptyset	10m \emptyset	30 # Δ	25	6.0p	N-PE	Si	100J	R67		B	
44#	ST58	360M Δ	40n \emptyset		25n	75n \emptyset	360m	1.0 \emptyset	10m \emptyset	30 # Δ		6.0p	N-PE	Si	100J	TO18			
46#	2SA548H	400M Δ			150n		200m	1.0 \emptyset	10m \emptyset	1.0 \square		8.0p	P	Si	175J				
46#	BSV53	400M		12n	13n	10n	300m	1.0 \emptyset	10m \emptyset	120 # \square	2.5	4.0p	N	Si	150	u34		E	
47#	BSV53P	400M		12n	13n	10n	150m	1.0 \emptyset	10m \emptyset	120 # \square	2.5	4.0p	N	Si	150	u17c		E	
48#	BSV54	400M		12n	13n	10n	300m	1.0 \emptyset	10m \emptyset	120 # \square	2.5	4.0p	N	Si	150	u34		E	
49#	BSV54P	400M Δ		12n	13n	10n	150m	1.0 \emptyset	10m \emptyset	120 # \square	2.5	4.0p	N	Si	150	u17c		E	
50#	ST60	400M Δ			18n		360m	1.0 \emptyset	10m \emptyset	30 # Δ		4.0p	N-PE	Si		TO18			
51#	ST61	400M Δ			18n		360m	1.0 \emptyset	10m \emptyset	20 # Δ		4.0p	N-PE	Si		TO18			
52#	ST62	400M Δ			18n		360m	1.0 \emptyset	10m \emptyset	40 # Δ		4.0p	N-PE	Si		TO18			
53#	ST80	400M Δ			10n		360m	1.0 \emptyset	10m \emptyset	25 # Δ		4.0p	N-PE	Si		TO18			
54	GME9001	400M Δ	9.0n \emptyset			13n \emptyset	625m \emptyset	1.0 \emptyset	10m \emptyset	120 # \square		4.0p	N-PE	Si	125S	X45			
55	GME9002	400M Δ	9.0n \emptyset			15n \emptyset	625m \emptyset	1.0 \emptyset	10m \emptyset	150 # \square		4.0p	N-PE	Si	125S	X45			
56	PET9001	400M Δ	9.0n \emptyset			13n \emptyset	800m \emptyset	1.0 \emptyset	10m \emptyset	120 # \square	25	4.0p	N	Si	125J	R110		A	
57	PET9002	400M Δ	9.0n \emptyset			13n \emptyset	800m \emptyset	1.0 \emptyset	10m \emptyset	150 # \square	25	4.0p	N	Si	125J	R110		A	
58	2N977	400M Δ	10n		20n		150m	.30 \emptyset	40m \emptyset	50 # Δ	2.5	8.0p	P	Ge	100S	TO18		A	
59#	97EPA	400M Δ	12n \emptyset			18n \emptyset	300m	1.0 \emptyset	10m \emptyset	60 # Δ		4.0p	N-PL \dagger	Si	125J	u46		A	
60#	97EPB	400M Δ	12n \emptyset			18n \emptyset	300m	1.0 \emptyset	10m \emptyset	150 # Δ		4.0p	N-PL \dagger	Si	125J	u46		A	
61#	BSW78	400M Δ	12n \emptyset		10n	15n \emptyset	200m	2.0 \emptyset	100m \emptyset	10 # Δ	25	2.5p	N-PE \dagger	Si	125J	X64		A	
62#	BSX19 \emptyset	400M Δ	12n \emptyset		10n	18n \emptyset	360m	1.0 \emptyset	10m \emptyset	60 # \square	30		N-PE S	Si	200J	TO18		A	
63#	C1001	400M	12n \emptyset			18n \emptyset	360m	1.0 \emptyset	10m \emptyset	40 # \square		4.0p	N	Si	200J	TO18		A	
64#	FM2368	400M Δ	12n \emptyset			15n \emptyset	300m	1.0 \emptyset	10m \emptyset	20 # Δ	25	4.0p	N	Si	200	TO46			
65#	P346	400M Δ	12n \emptyset		15n	18n \emptyset	300m	2.0 \emptyset	10m \emptyset	25 # Δ	25	4.5p	N-PE	Si	175A	TO18			
66	PET9001A	400M Δ	12n \emptyset			15n	800m \emptyset	1.0 \emptyset	10m \emptyset	120 # \square	25	4.0p	N	Si	125J	R110		A	
67	PET9002A	400M Δ	12n \emptyset			15n	800m \emptyset	1.0 \emptyset	10m \emptyset	150 # \square									