

Conversion of Bipolar Metal Can to Plastic

Metal P/N	Plastic Equivalent	Electrical Equivalency*	Process	Metal P/N	Plastic Equivalent	Electrical Equivalency*	Process
2N697	2N4400	A	13	2N2905	TN2905	E	63
2N706	MPS706	E	21	2N2905A	TN2905A	E	63
2N708	PN3646	N	22	2N2906	PN2906	E	63
2N718	2N4400	A	13	2N2906A	PN2906A	E	63
2N722	PN2906	N	63	2N2907	PN2907	E	63
2N744	PN2369	N	21	2N2907A	PN2907A	E	63
2N753	PN2369	N	21	2N3009	PN3646	N	22
2N760A	2N4409	N	07	2N3011	PN2369	N	21
2N834	MPS834	E	21	2N3012	PN3640	A	65
2N869A	PN3640	A	65	2N3013	PN3646	E	22
2N915	MPS6565	A	27	2N3019	TN3019	E	12
2N917	PN3563	E	43	2N3020	TN3020	E	12
2N918	PN918	E	43	2N3053	2N3053	E	12
2N929	2N4409	N	07	2N3117	2N5210	N	07
2N930	PN930	E	07	2N3133	MPS3703	N	63
2N956	PN2222A	N	19	2N3134	PN3645	N	63
2N995A	PN3640	A	65	2N3135	MPS3703	N	63
2N1132	PN2906	N	63	2N3136	PN3645	N	63
2N1613	PN2221A	N	19	2N3250	2N3905	A	66
2N1711	PN2222A	N	19	2N3251	2N3906	A	66
2N2218	TN2218	E	19	2N3300	2N4401	A	13
2N2218A	TN2218A	E	19	2N3301	2N4400	A	13
2N2219	TN2219	E	19	2N3302	2N4401	A	13
2N2219A	TN2219A	E	19	2N3304	PN3639	A	65
2N2221	PN2221	E	19	2N3440	TN3440	E	36
2N2221A	PN2221A	E	19	2N3724	TN3724	E	25
2N2222	PN2222	E	19	2N3725	TN3725	E	25
2N2222A	PN2222A	E	19	2N3944	2N3903	N	23
2N2369	PN2369	E	21	2N3947	2N3904	N	23
2N2369A	PN2369A	E	21	2N3962	2N5086	N	62
2N2483	2N5209	N	07	2N3964	2N5087	N	62
2N2484	2N5210	N	07	2N3965	2N5087	N	62
2N2604	2N5086	N	62	2N4033	TN4033	E	67
2N2605	2N5086	N	62	2N4036	TN4036	E	67
2N2894	PN3640	A	65	2N4037	TN4037	E	67
2N2894A	PN3639	A	65	2N4208	PN3640	N	65
2N2904	TN2904	E	63	2N4209	PN3640	N	65
2N2904A	TN2904A	E	63				

* E = Exact electrical equivalent

N = Near electrical equivalent

A = Approximate electrical equivalent

Note: On "N" and "A" categories please refer to device specification section for deviation from metal can specifications.

This list is for use when an alternative to a metal can transistor is needed.

To facilitate conversions on the most popular types National is offering the "PN" series, TO-92 devices that use the same die type and are screened to same electrical specifications. The TO-92 transistors produced by National Semiconductor are the most advanced Plastic Transistors ever manufactured. They utilize epoxy B encapsulation and a copper lead frame to give a power dissipation of up to 625 mW @ $T_A = 25^\circ\text{C}$. These transistors provide electrical performance and reliability equivalent to their metal can versions in most applications where T_J does not exceed 150°C .

The same situation is applicable to the "TN" series, except that the National-originated TO-237 (TO-92 +) case outline is used, which permits power dissipation of up to 1.0W @ $T_A = 25^\circ\text{C}$.



SATURATED SWITCHES (Continued)

Type No.	Case Style	V _{CBO} (V) Min	V _{CEO} (V) Min	V _{EBO} (V) Min	I _{CES} * I _{CBO} (nA) @ V _{CB} (V) Max	h _{FE} @ I _C & V _{CE}			V _{CE} (SAT) (V) & V _{BE} (SAT) (V) @ I _C (mA)				C _{ob} (pF) Max	f _T (MHz) @ I _C (mA)		t _{off} (ns) Max	NF (dB) Max	Test Conditions	Process No.	
						Min	Max	I _C (mA)	V _{CE} (V)	Max	Min	Max		I _C (mA)	Min					Max
2N3546	TO-52	15	12	4.5	10 10	15	100	1	0.15	0.7	0.9	10	6	700	10	30		9	64	
						25	50	1	0.25	0.8	1.3	50								
						30	120	1	0.5		1.6	100								
						20	1	1												
2N3576	TO-52	20	15	5	10 15	10	100	1	0.15	0.75	0.95	10	4.5	400	10	50		5	64	
						40	120	10	0.5	0.5		1.1								100
2N5056	TO-52	15	15	4.5	50* 10	20	100	1	0.13	0.72	0.92	10	4.5	600	30	35		3	64	
						30	100	0.5	0.19	0.8	1.15	30								
						20	10	0.3												
						12	1	0.5	0.45	0.95	1.5	100								
2N5057	TO-52	15	15	4.5	50* 10	30	100	1	0.13	0.72	0.92	10	4.5	800	30	35		3	64	
						40	100	0.5	0.19	0.8	1.15	30								
						30	10	0.3	0.45	0.95	1.5	100								
						20	1	0.5												
2N3304	TO-52	6	6	4	10* 3	20	50	1	0.15	0.7	0.8	1	3.5	500	10	60		7	65	
						30	120	10	0.3	0.16	0.8	1.0								10
						15	1	0.5	0.5		1.5	50								
2N3451	TO-52	6	6	4	10* 3	20	50	1	0.16	0.8	1.0	10	5.5	500	10	60		7	65	
						30	120	10	0.3	0.5		1.5								50
2N3639	TO-92 (92)	Same as PN3639, see page 2-4 for explanation																65		
2N3640	TO-92 (92)	Same as PN3640, see page 2-4 for explanation																65		
2N4208	TO-52	12	12	4.5	10* 6	30	50	1	0.13		0.8	1	3	700	10	20		5	65	
						30	120	10	0.3	0.15	0.8	0.95								10
						15	1	0.5	0.5		1.5	50								
2N4209	TO-52	15	15	4.5	10* 8	40	50	1	0.15		0.8	1	3	850	10	20		5	65	
						50	120	10	0.3	0.18	0.8	0.95								10
						35	1	0.5	0.6		1.5	50								
2N4258	TO-92 (92)	Same as PN4258, see page 2-4 for explanation																65		
2N4258A	TO-92 (92)	Same as PN4258A, see page 2-4 for explanation																65		
2N5140	TO-92 (92)	Same as PN5140, see page 2-4 for explanation																65		

TEST CONDITIONS:

(1) I_C = 30 mA, V_{CC} = 3V, I_B¹ = 3 mA, I_B² = 1.5 mA. (2) I_C = 30 mA, V_{CC} = 3V, I_B¹ = I_B² = 1.5 mA. (3) I_C = 30 mA, V_{CC} = 3V, I_B¹ = I_B² = 3 mA. (4) I_C = 500 mA, V_{CC} = 30V, I_B¹ = I_B² = 50 mA. (5) I_C = 10 mA, V_{CC} = 3V, I_B¹ = I_B² = 1 mA. (6) I_C = 10 mA, V_{CC} = 1.5V, I_B¹ = I_B² = 1 mA. (7) I_C = 10 mA, V_{CC} = 1.5V, I_B¹ = I_B² = 500 μA. (8) I_C = 10 mA, V_{CC} = 2V, I_B¹ = I_B² = 1 mA. (9) I_C = 50 mA, V_{CC} = 3V, I_B¹ = I_B² = 5 mA. (10) I_C = 1A, V_{CC} = 30V, I_B¹ = I_B² = 100 mA.