

2N4338-2N4876

TYPE	MATERIAL	POLARITY	REPLACE- MENT	PAGE NUMBER	USE	MAXIMUM RATINGS					ELECTRICAL CHARACTERISTICS									
						P _D @ 25°C	Ref Point	T _J °C	V _{CB} (volts)	V _{CE} — (volts)	Subscript	h _{FE} @ I _C		V _{CE(SAT)} @ I _C	Units	h _{FE}	Subscript	f _T	Units	Subscript
2N4338 thru 2N4343																				
2N4346	S	N			LPA	5.0W	A		140	60	O	15	60	2.0A						
2N4347	S	N			LPA	100W	C		140	120	O	15	60	5.0A						
2N4348	S	N			LPA	120W	C		140	120	O	15	60	5.0A						
2N4350	S	N			LPA	7.0W	C		65	40	O	10	200	0.35A				300M	T	
2N4351 thru 2N4352																				
2N4354	S	P			LNA	350M	A	125	60	60	O	25		0.1M				500M	T	
2N4355	S	P			LNA	350M	A	125	60	60	O	60		0.1M				500M	T	
2N4356	S	P			LNA	350M	A	125	80	80	O	25		0.1M				500M	T	
2N4359	S	P			LNA	360M	A	200	45	45	O	50	600	1.0M	0.25	10M	50	E		
2N4360																				
2N4361																				
thru 2N4380																				
2N4381																				
2N4382																				
2N4383	S	N			RFA	800M	A	200	40	30	O						1000	E	120M	T
2N4384	S	N			RFA	500M	A	200	40	30	O						1000	E	120M	T
2N4385	S	N			RFA	800M	A	200	40	30	O						1000	E	120M	T
2N4386	S	N			RFA	500M	A	200	40	30	O						1000	E	120M	T
2N4387	S	P				20W	A	200	40	40	O	25	100	500M						
2N4388	S	P				20W	A	200	60	60	O	25	100	500M						
2N4389	S	P			HSS	200M	A	125	12	12	O	30	180	10M	0.15	10M	4.0	E		
2N4390	S	N			MSS	500M	A	175	120	120	O	20		2.0M				50M	T	
2N4391																				
thru 2N4393																				
2N4395	S	N	2N3715	7-125	LPA	62.5W	C		60	40	O	50	170	2.0A					4M	T
2N4396	S	N	2N3715	7-125	LPA	62.5W	C		80	60	O	40	170	2.0A					4M	T
2N4398	S	P		7-167	LPA	200W	C	200	40	40	O	15	60	15A	1.0	15A	40	E	4M	T
2N4399	S	P		7-167	LPA	200W	C	200	60	60	O	15	60	15A	1.0	15A	40	E	4M	T
2N4400	S	N		5-34	HSA	310M	A	135	60	40	O	50	150	150M	0.4	150M	20	E	200M	T
2N4401	S	N		5-34	HSA	310M	A	135	60	40	O	100	300	150M	0.4	150M	40	E	250M	T
2N4402	S	P		5-39	HSA	310M	A	135	40	40	O	50	150	150M	0.4	150M	30	E	150M	T
2N4403	S	P		5-39	HSA	310M	A	135	40	40	O	100	300	150M	0.4	150M	60	E	200M	T
2N4409	S	N		5-45	MSS	310M	A	135	80	50	O	60	400	1.0M	0.2	1.0M				
2N4410	S	N		5-45	MSS	310M	A	135	120	80	O	60	400	1.0M	0.2	1.0M				
2N4411	S	P		8-302	MSA	150M	A	200	15	12	O	40		0.5M						
2N4412	S	N			RFA	600M	A	200	40	30	O						1000	E	400M	T
2N4412A	S	P			RFA	600M	A	200	60	60	O						120	E	100M	T
2N4413	S	P			RFA	400M	A	200	40	30	O						1000	E	100M	T
2N4413A	S	P			RFA	400M	A	200	60	60	O						120	E	20M	T
2N4414	S	P			RFA	600M	A	200	40	30	O						1000	E	100M	T
2N4414A	S	P			RFA	600M	A	200	60	60	O						100	E	20M	T
2N4415	S	P			RFA	400M	A	200	40	30	O						1000	E	100M	T
2N4415A	S	P			RFA	400M	A	200	60	60	O						100	E	20M	T
2N4416																				
2N4417																				
2N4418	S	N	2N4264	5-29	MSA	250M	A	125	40	40	S	40	120	10M					500M	T
2N4419	S	N	2N4264	5-29	MSA	250M	A	125	30	30	S	30		10M					400M	T
2N4420	S	N	MPS3646	5-95	MSA	250M	A	125	40	40	S	30	120	30M					350M	T
2N4421	S	N	MPS3646	5-95	MSA	250M	A	125	30	30	S	25		30M					300M	T
2N4422	S	N	MPS3646	5-95	MSA	250M	A	125	40	40	S	30	120	30M					350M	T
2N4423	S	N	MPS3640	5-93	MSA	250M	A	125	12	12	S	40	150	30M					400M	T
2N4424	S	N	MPS3711	5-100	MSA	360M	A	150	40	40	O						180	E		
2N4425	S	N			MSA	560M	A	150	40	40	O	180		2M						
2N4427	S	N			LPA	3.5W	C		40	20	O	10	200	0.1A					500M	T
2N4428	S	N			LPA	3.5W	C		55	35	O	20	200	0.05A					700M	T
2N4429	S	N			LPA	5.0W	C		55	35	O	20	200	0.05A					700M	T
2N4430	S	N			LPA	1.0W	C		55	40	O	20	200	0.1A					600M	T
2N4431	S	N			LPA	18W	C		55	40	O	20	200	0.1A					600M	T
2N4432	S	N			RFA	600M	A		50	30	O	40	130	6.0M			45	E		
2N4432A	S	N			RFA	600M	A		50	30	O	80	150	6.0M			90	E		
2N4440	S	N			LPA	11.6W	C		65	40	O	10	200	0.125A					400M	T
2N4441																				
thru 2N4444																				
2N4576	S	N	2N3716	7-125	HPA	150W	C	200	100	80	O	50	150	1.0A	0.8	5.0A	25	E	30K	E
2N4851																				
thru 2N4853																				
2N4854																			200M	T
2N4855																			200M	T
2N4856																				
thru 2N4861																				
2N4870																				
2N4871	S	P			HSS	700M	C	200	12	12	O	50	120	10M	0.13	1.0M	9.0	E		
2N4872	S	N			HSS	360M	A	200	40	15	O	110	150	10M	0.2	1.0M	7.0	E		
2N4873	S	N			RFA	720M	A	175	30	20	O						200	E	900M	T
2N4874	S	N			RFA	720M	A	175	40	25	O						200	E	800M	T
2N4875	S	N			RFA	720M	A	175	40	30	O						200	E	650M	T
2N4876	S	N			RFA	720M	A	175	40	30	O									

PLASTIC SILICON SMALL-SIGNAL TRANSISTORS

CURRENT versus VOLTAGE SELECTOR GUIDE

I_C	50 μ A - 5.0 mA		5.0 mA - 25 mA		25 mA - 75 mA		75 mA - 500 mA	
V_{CE0} Volts (Min)	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN
<10			MPS3639					
10		MPS918 MPS2711 MPS2712 MPS2713 MPS2714 MPS2715 MPS2716 MPS2926 MPS3721	MPS3640	2N4264 2N4265 MPS706 MPS2369 MPS3563		MPS3646		
19								
20	2N4126 MPS6519 MPS6579 MPS6580	2N4124 2N5089 MPS2923 MPS2924 MPS2925 MPS3392 MPS3393 MPS3394 MPS3395 MPS3396 MPS3397 MPS3398 MPS6507 MPS6514 MPS6515 MPS6539 MPS6542 MPS6546 MPS6547 MPS6571	MPS3638 MPS3638A	MPS6511 MPS2923 MPS6552 MPS6553 MPS6554 MPS6555 MPS6541 MPS6543 MPS6548 MPS6568 MPS6569 MPS6570	MPS3702	MPS3706	MPS6562 MPS6563	MPS6560 MPS6561
29								
30	2N4125	2N4123 2N5088 MPS3707 MPS3708 MPS3709 MPS3710 MPS3711 MPS3712 MPS3713 MPS6540 MPS6573 MPS6574		MPS5834	MPS3703	MPS3704 MPS3705	MPS6535	MPS6532
39								
40	MPS6516 MPS6517 MPS6518	MPS6575 MPS6576	2N3905 2N3906	2N3903 2N3904 MPS3693 MPS3694 MPS3826 MPS3827 MPS6564 MPS6565 MPS6566 MPS6567		MPS6544 MPS6545	2N4402 2N4403 MPS6533 MPS6534	2N4400 2N4401 MPS6530 MPS6531
49								
>50	2N5086 2N5087	2N4409 2N4410						

SMALL-SIGNAL AMPLIFIERS (LOW CURRENT) — All devices in Case 29 (1)

Type NPN	MAXIMUM RATINGS			ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted)													
	V _{CE0}	V _{CB}	V _{EB}	I _{CB0}	h _{FE}		β		I _C (mA)		V _{CE(sat)}	β	I _C	f _T	β	I _C	C _{ob}
	Volts	Volts	Volts	μA(Max)	0.1		1.0		2.0		Volts(Max)		mA	MHz(Min)		mA	pF(Max)
					Min	Max	Min	Max	Min	Max							
PNP *																	
2N5086*	50	50	3.0	0.01	150	500	150	-	-	-	0.3	10	40	0.5	-	4.0	-
2N5087*	50	50	3.0	0.01	250	800	250	-	-	-	0.3	10	40	0.5	-	4.0	-
2N5088	30	35	4.5	0.05	300	900	350	-	-	-	0.5	10	50/175**	0.5	-	4.0†	-
2N5089	25	30	4.5	0.05	400	1200	450	-	-	-	0.5	10	50/175**	0.5	-	4.0†	-
MPS918	15	30	3.0	0.01	-	-	-	-	20	-	0.4	10	600	4.0	-	1.7	-
MPS3707	30	30	6.0	0.1	100	400	-	-	-	-	1.0	10	-	-	-	-	-
MPS3708	30	30	6.0	0.1	-	-	45	660	-	-	1.0	10	-	-	-	-	-
MPS3709	30	30	6.0	0.1	-	-	45	165	-	-	1.0	10	-	-	-	-	-
MPS3710	30	30	6.0	0.1	-	-	90	330	-	-	1.0	10	-	-	-	-	-
MPS3711	30	30	6.0	0.1	-	-	180	660	-	-	1.0	10	-	-	-	-	-
MPS6520	25	40	4.0	0.05	100	-	-	-	200	400	0.5	50	390**	2.0	-	3.5	-
MPS6521	25	40	4.0	0.05	150	-	-	-	300	600	0.5	50	390**	2.0	-	3.5	-
MPS6522*	25	25	4.0	0.05	100	-	-	-	200	400	0.5	50	340**	2.0	-	4.0	-
MPS6523*	25	25	4.0	0.05	150	-	-	-	300	600	0.5	50	340**	2.0	-	4.0	-

** Typical † C_{cb}

SMALL-SIGNAL AMPLIFIERS (MEDIUM CURRENT) — All devices in Case 29 (1)

Type NPN	MAXIMUM RATINGS			ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted)											
	V _{CE0}	V _{CB}	V _{EB}	I _{CB0}	h _{FE} @ I _C (mA)				V _{CE(sat)} @ I _C		f _T @ I _C	C _{ob}			
	Volts	Volts	Volts	μA (Max)	2.0		10		100		Volts (Max)	mA	MHz (Min)	mA	pF (Max)
					Min	Max	Min	Max	Min	Max					
PNP *															
MPS2711	18	18	5.0	0.5	30	90	-	-	-	-	-	-	-	-	4.0
MPS2712	18	18	5.0	0.5	75	225	-	-	-	-	-	-	-	-	4.0
MPS2715	18	18	5.0	0.5	30	90	-	-	-	-	-	-	-	-	3.5
MPS2716	18	18	5.0	0.5	75	225	-	-	-	-	-	-	-	-	3.5
MPS2923	25	25	5.0	0.5	90	180	-	-	-	-	-	-	-	-	12
MPS2924	25	25	5.0	0.5	150	300	-	-	-	-	-	-	-	-	12
MPS2925	25	25	5.0	0.5	235	470	-	-	-	-	-	-	-	-	12
MPS2926	18	18	5.0	0.5	35	470#	-	-	-	-	-	300**	4.0	-	3.5
MPS3392	25	25	5.0	0.1	150	300	-	-	-	-	-	-	-	-	3.5
MPS3393	25	25	5.0	0.1	90	180	-	-	-	-	-	-	2.0	-	3.5
MPS3394	25	25	5.0	0.1	55	110	-	-	-	-	-	-	-	-	3.5
MPS3395	25	25	5.0	0.1	150	500	-	-	-	-	-	-	-	-	3.5
MPS3396	25	25	5.0	0.1	90	500	-	-	-	-	-	-	-	-	3.5
MPS3397	25	25	5.0	0.1	55	500	-	-	-	-	-	-	-	-	3.5
MPS3398	25	25	5.0	0.1	55	800	-	-	-	-	-	-	-	-	3.5
MPS3583	12	30	2.0	0.05	-	-	20	200	-	-	-	-	600	8.0	1.7
MPS3693	45	45	4.0	0.05	-	-	40	160	-	-	-	-	200	10	3.5
MPS3694	45	45	4.0	0.05	-	-	100	400	-	-	-	-	200	10	3.5
MPS3721	18	18	5.0	0.5	60	660#	-	-	-	-	-	-	-	-	3.5
MPS3826	45	60	4.0	0.1	-	-	40	160	-	-	-	-	200	10	3.5
MPS3827	45	60	4.0	0.1	-	-	100	400	-	-	-	-	200	10	3.5
MPS6507	20	30	3.0	0.05	25	-	-	-	-	-	-	-	700	10	2.5
MPS6511	20	30	3.0	0.05	-	-	25	-	-	-	-	-	-	-	2.5
MPS6512	30	40	4.0	0.05	50	100	-	-	30	-	0.5	50	250**	2.0	3.5
MPS6513	30	40	4.0	0.05	90	180	-	-	60	-	0.5	50	250**	2.0	3.5
MPS6514	25	40	4.0	0.05	150	300	-	-	90	-	0.5	50	390**	2.0	3.5
MPS6515	25	40	4.0	0.05	250	500	-	-	150	-	0.5	50	390**	2.0	3.5
MPS6516*	40	40	4.0	0.05	50	100	-	-	30	-	0.5	50	200**	2.0	4.0
MPS6517*	40	40	4.0	0.05	90	180	-	-	60	-	0.5	50	200**	2.0	4.0
MPS6518*	40	40	4.0	0.05	150	300	-	-	90	-	0.5	50	340**	2.0	4.0
MPS6519*	25	25	4.0	0.05	250	500	-	-	150	-	0.5	50	340**	2.0	4.0

** Typical * h_{FE} @ 1.0 kHz

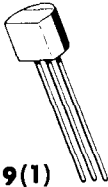
NIXIE DRIVERS All devices in Case 29 (1)

Type NPN	MAXIMUM RATINGS		ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted)																
	V _{CE0}	V _{EB}	βV _{CEX}	I _{CB0}	⊙	V _{CB}	h _{FE}	^{Min} Max	V _{CE(sat)} & V _{BE(sat)} & V _{BE(on)}			⊙	I _C	f _T	⊙	I _C	C _{cb}	⊙	V _{CB}
	Volts	Volts	Volts (Min)	μA (Max)	Volts	⊙	I _C (mA)	Volts (Max)			mA	MHz (Min/Max)	mA	pF (Max)	Volts				
																10	10	10	
2N4409	50	5.0	80*	0.01	60	60	400	0.2	0.8	0.8	1.0	60/300	10	12	10				
2N4410	80	5.0	120*	0.01	100	60	400	0.2	0.8	0.8	1.0	60/300	10	12	10				

* R_{BE} = 8.2 k ohms, V_{BB} = 5.0 V

2N4409 (SILICON)

2N4410



CASE 29(1)

(TO-92)

NPN silicon epitaxial transistors designed for driving neon display tubes. Features one-piece, injection-molded plastic package for high reliability.

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	2N4409	2N4410	Unit
Collector-Emitter Voltage	V_{CEO}	50	80	Vdc
Collector-Base Voltage	V_{CB}	80	120	Vdc
Emitter-Base Voltage	V_{EB}	5	5	Vdc
Collector Current - Continuous	I_C	250		mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	310 2.81		mW mW/°C
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-55 to +135		°C

THERMAL RESISTANCE: $\theta_{JA} = 0.357^\circ\text{C/mW}$

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage ($I_C = 1 \text{ mAdc}, I_B = 0$)	BV_{CEO}	50 80	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 500 \mu\text{Adc}, V_{BE} = 5 \text{ Vdc}, R_{BE} = 8.2 \text{ k ohms}$)	BV_{CEX}	80 120	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 10 \mu\text{Adc}, I_E = 0$)	BV_{CBO}	80 120	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$)	BV_{EBO}	5	—	Vdc
Collector Cutoff Current ($V_{CB} = 60 \text{ Vdc}, I_E = 0$)	I_{CBO}	—	0.01	μAdc
($V_{CB} = 60 \text{ Vdc}, I_E = 0, T_A = 100^\circ\text{C}$)		—	1.0	
($V_{CB} = 100 \text{ Vdc}, I_E = 0$)		—	0.01	
($V_{CB} = 100 \text{ Vdc}, I_E = 0, T_A = 100^\circ\text{C}$)		—	1.0	
Emitter Cutoff Current ($V_{BE} = 4 \text{ Vdc}, I_C = 0$)	I_{EBO}	—	0.1	μAdc
ON CHARACTERISTICS				
DC Current Gain ($I_C = 1 \text{ mAdc}, V_{CE} = 1 \text{ Vdc}$) ($I_C = 10 \text{ mAdc}, V_{CE} = 1 \text{ Vdc}$)	h_{FE}	60 60	400 —	—
Collector-Emitter Saturation Voltage ($I_C = 1 \text{ mAdc}, I_B = 0.1 \text{ mAdc}$)	$V_{CE(sat)}$	—	0.2	Vdc
Base-Emitter Saturation Voltage ($I_C = 1 \text{ mAdc}, I_B = 0.1 \text{ mAdc}$)	$V_{BE(sat)}$	—	0.8	Vdc
Base-Emitter On Voltage ($I_C = 1 \text{ mAdc}, V_{CE} = 5 \text{ Vdc}$)	$V_{BE(on)}$	—	0.8	Vdc

2N4409, 2N4410 (continued)

DYNAMIC CHARACTERISTICS

Current-Gain — Bandwidth Product ($I_C = 10 \text{ mAdc}$, $V_{CE} = 10 \text{ Vdc}$, $f = 30 \text{ MHz}$)	f_T	60	300	MHz
Collector-Base Capacitance ($V_{CB} = 10 \text{ Vdc}$, $I_E = 0$, $f = 100 \text{ kHz}$, emitter guarded)	C_{cb}	—	12	pF
Emitter-Base Capacitance ($V_{BE} = 0.5 \text{ Vdc}$, $I_C = 0$, $f = 100 \text{ kHz}$, collector guarded)	C_{eb}	—	50	pF

TYPICAL DC CHARACTERISTICS

FIGURE 1 — CURRENT GAIN

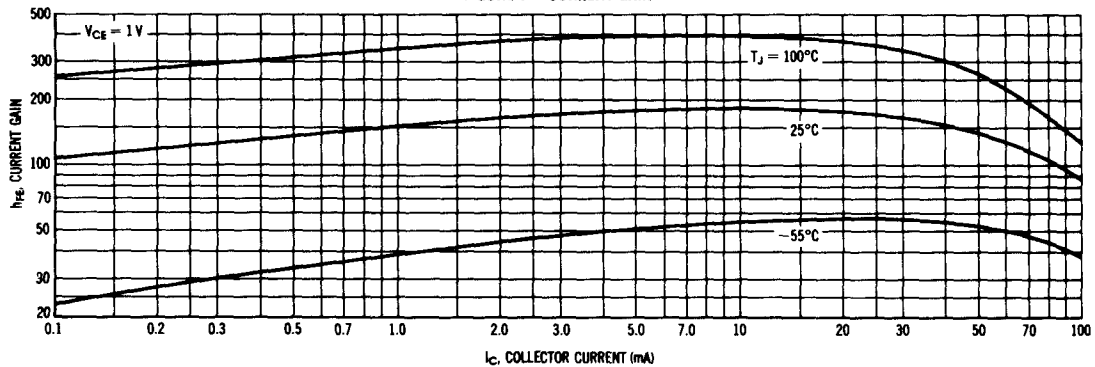


FIGURE 2 — SATURATION VOLTAGES

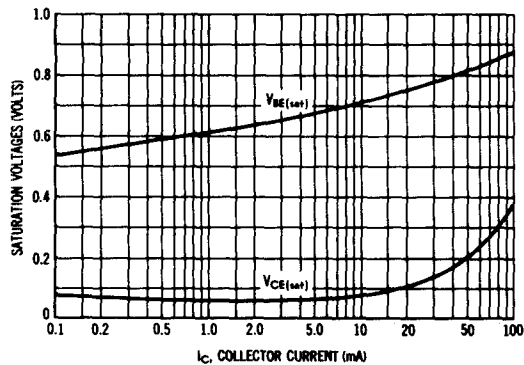


FIGURE 3 — TEMPERATURE COEFFICIENTS

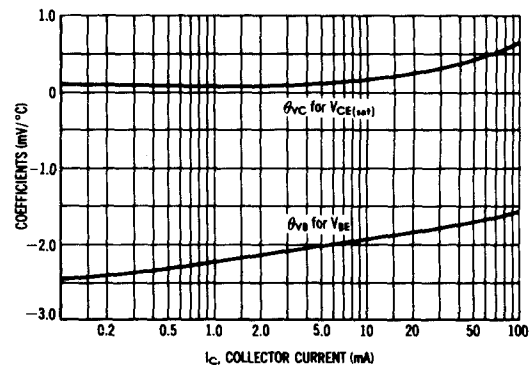


FIGURE 4 — CUTOFF CURRENT

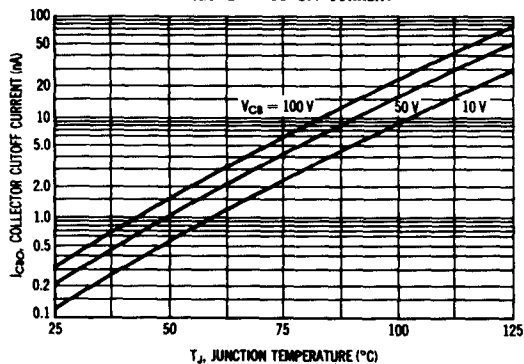


FIGURE 5 — TYPICAL NIXIE® DRIVER APPLICATION

