

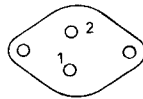
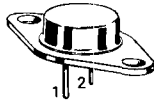
# ALPHANUMERIC INDEX — CROSS-REFERENCE

The following table represents an index and cross-reference guide for all low-frequency power transistors which are either manufactured directly by Motorola or for which Motorola manufactures a suitable equivalent. Where the Motorola part num-

ber differs from the industry part number, the Motorola device is a "form, fit and function" replacement for the industry type number — however, subtle differences in characteristics and/or specifications may exist.

Industry Part Number	Motorola Direct Replacement	Motorola Similar Replacement	Page Number	Industry Part Number	Motorola Direct Replacement	Motorola Similar Replacement	Page Number
1S110A-100		MJ16018	3-782	2N3441	2N3441		3-13
2N1487		2N5877	3-120	2N3442	2N3442		3-15
2N1488		2N5878	3-120	2N3445	2N3447		3-18
2N1489		2N5877	3-120	2N3446	2N3448		3-18
2N1490		2N5878	3-120	2N3447	2N3447		3-18
2N1702		2N5877	3-120	2N3448	2N3448		3-18
2N3016		2N5337	3-97	2N3583	2N3583		3-20
2N3021		2N3789	3-56	2N3584	2N3584		3-20
2N3022		2N3789	3-56	2N3585	2N3585		3-20
2N3023		2N3789	3-56	2N3667		2N5881	3-123
2N3024		2N3791	3-56	2N3713		2N5881	3-123
2N3025		2N3791	3-56	2N3714	2N3714		3-26
2N3026		2N3791	3-56	2N3715	2N3715		3-26
2N3054	2N3054		3-2	2N3715JAN	2N3715JAN		3-26
2N3054A	2N3054A		3-2	2N3715JTX	2N3715JTX		3-26
2N3055	2N3055		3-6	2N3715JTXV	2N3715JTXV		3-26
2N3055A	2N3055A		3-9	2N3716	2N3716		3-26
2N3055H		2N3055A	3-9	2N3716JAN	2N3716JAN		3-26
2N3055H		2N5302JAN	3-93	2N3716JTX	2N3716JTX		3-26
2N3055JAN		2N3055A	3-9	2N3716JTXV	2N3716JTXV		3-26
2N3055SD							
2N3055SUB		2N3055A	3-9	2N3719	2N3719		3-32
2N3076		2N6249	3-164	2N3720	2N3720		3-32
2N3079		2N6308	3-181	2N3738	2N3738		3-37
2N3080		2N6543	3-215	2N3739	2N3739		3-37
2N3171		2N3789	3-56	2N3739JAN	2N3739JAN		3-37
2N3172		2N3789	3-56	2N3739JTX	2N3739JTX		3-37
2N3173		2N3790	3-56	2N3739JTXV	2N3739JTXV		3-37
2N3174		MJ15016	3-9	2N3740	2N3740		3-41
2N3183		2N3789	3-56	2N3740A		2N3740	3-41
2N3184		2N3789	3-56	2N3740JAN	2N3740JAN		3-41
2N3185		2N3790	3-56	2N3740JTX	2N3740JTX		3-41
2N3186		MJ15016	3-9	2N3740JTXV	2N3740JTXV		3-41
2N3195		2N3789	3-56	2N3741	2N3741		3-41
2N3196		2N3790	3-56	2N3741A	2N3741A		3-41
2N3198		MJ15016	3-9	2N3741JAN	2N3741JAN		3-41
2N3202		2N3719	3-32	2N3741JTX	2N3741JTX		3-41
2N3203		2N3720	3-32	2N3741JTXV	2N3741JTXV		3-41
2N3204		2N6303	3-32	2N3766	2N3766		3-44
2N3232		2N5877	3-120	2N3766JAN	2N3766JAN		3-44
2N3233		2N5882	3-123	2N3766JTX	2N3766JTX		3-44
2N3234		2N5760	3-116	2N3766JTXV	2N3766JTXV		3-44
2N3235		2N3055	3-6	2N3767	2N3767		3-44
2N3236		2N5882	3-123	2N3767JAN	2N3767JAN		3-44
2N3237		2N5302	3-93	2N3767JTX	2N3767JTX		3-44
2N3238		2N5882	3-123	2N3767JTXV	2N3767JTXV		3-44
2N3239		2N5882	3-123	2N3771	2N3771		3-48
2N3240		2N5882	3-123	2N3772	2N3772		3-48
2N3419		2N5336	3-97	2N3773	2N3773		3-52
2N3420		2N5336	3-97	2N3788		2N6543	3-215
2N3421		2N5336	3-97	2N3789	2N3789		3-56

TABLE 3 — METAL TO-213 (Formerly TO-66)



STYLE 1:  
 PIN 1. BASE  
 2. EMITTER  
 CASE. COLLECTOR

CASE 80-02 (TO-213AA)

I <sub>C</sub> Cont Amps Max	V <sub>CE0</sub> (sus) Volts Min	Device Type		hFE Min/Max	@ I <sub>C</sub> Amp	Resistive Switching			f <sub>T</sub> MHz Min	P <sub>D</sub> (Case) Watts @ 25°C
		NPN	PNP			t <sub>s</sub> μs Max	t <sub>f</sub> μs Max	@ I <sub>C</sub> Amp		
1	80	2N4912		20/100	0.5	0.6 typ	0.3 typ	0.5	3	25
	175	2N3583	2N6420	40/200	0.5	2 typ	0.23 typ	0.5	10	35
	225	2N3738		40/200	0.1	3 typ	0.3 typ	0.1	10	20
	300	2N3739		40/200	0.1	3 typ	0.3 typ	0.1	10	20
2	225		2N6211	10/100	1	2.5	0.6	1	20	35
	250	2N3584	2N6421	25/100	1	4	3	1	10	35
	300	2N3585 2N4240	2N6212	10/100	1	2.5	0.6	1	20	35
			2N6422	25/100	1	4	3	1	10	35
350		2N6213	30/150	0.75	6	3	0.75	15	35	
3	140	2N3441		25/100	0.5				0.2	25
4	60	2N3054.A 2N3766 2N6294##	2N3740	30/100	0.25	1.3 typ	0.27 typ	0.25	4	25
				25/100	0.5	1 typ	0.3 typ	0.5	3	75
				40/160	0.5	0.9 typ	0.09 typ	0.5	10	20
				750/18k	2	0.9 typ	0.7 typ	2	4#	50
	80	2N3767 2N6295##	2N3741	30/100	0.25	1.3 typ	0.27 typ	0.25	4	25
				40/160	0.5	0.9 typ	0.09 typ	0.5	10	20
		2N6297##	750/18k	2	0.9 typ	0.7 typ	2	4	50	
5	80	2N4233A		25/100	1.5	0.5 typ	0.2 typ	1.5	4	75
7	60		2N6317	20/100	2.5	1	0.8	2.5	4	90
	80	2N5428		60/240	2	2	0.2	2	30	40
			2N6318	20/100	2.5	1	0.8	2.5	4	90
	100	2N5429 2N5430		30/120 60/240	2 2	2 2	0.2 0.2	2 2	30 30	40 40
8	60	2N6300##	2N6298##	750/18k	4	1.5 typ	1.5 typ	4	4#	75
	80	2N6301##	2N6299##	750/18k	4	1.5 typ	1.5 typ	4	4#	75

# |h<sub>FE</sub>| @ 1 MHz, ## Darlington

JAN, JTX, JTXV Available

2

**2N3054**  
**2N3054A**

**MEDIUM-POWER NPN SILICON TRANSISTORS**

... designed for general purpose switching and amplifier applications.

- Excellent Safe Operating Area
- DC Current Gain Specified to 3.0 Amperes
- Complement to PNP Type 2N6049 or 2N4912

**\*MAXIMUM RATINGS**

Rating	Symbol	2N3054A	2N3054	Unit
Collector-Emitter Voltage	$V_{CEO}$	55		Vdc
Collector-Emitter Voltage ( $R_{BE} = 100 \Omega$ )	$V_{CER}$	60		Vdc
Collector-Base Voltage	$V_{CB}$	90		Vdc
Emitter-Base Voltage	$V_{EB}$	7.0		Vdc
Collector Current -- Continuous Peak	$I_C$	4.0 10**		Adc
Base Current	$I_B$	2.0		Adc
Total Device Dissipation @ $T_C = 25^\circ C$ Derate above $25^\circ C$	$P_D$	75 0.43	25 0.143	Watts W/ $^\circ C$
Operating and Storage Junction, Temperature Range	$T_J, T_{stg}$	-65 to +200		$^\circ C$

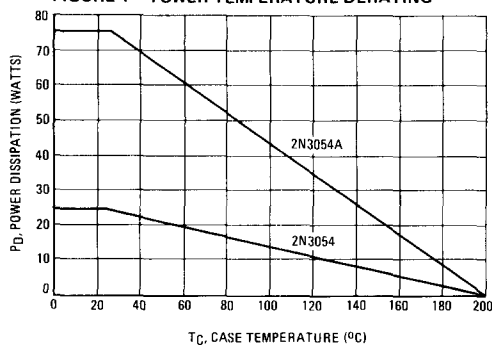
\*Indicates JEDEC Registered Data

\*\*Addition to JEDEC Registered Data

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	2N3054A	2N3054	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.33	7.0	$^\circ C/W$

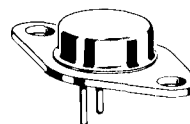
**FIGURE 1 - POWER-TEMPERATURE DERATING**



**4 AMPERE**

**POWER TRANSISTORS**  
**NPN SILICON**

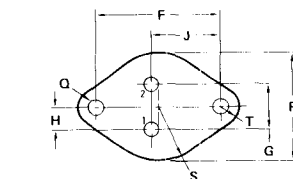
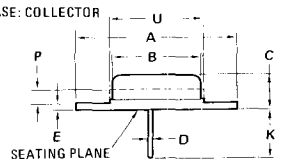
**55 VOLTS**  
**25 WATTS - 2N3054**  
**75 WATTS - 2N3054A**



STYLE 1:

PIN 1, BASE  
 2, EMITTER

CASE: COLLECTOR



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
B	11.94	12.70	0.470	0.500
C	6.35	8.64	0.250	0.340
D	0.71	0.86	0.028	0.034
E	1.27	1.91	0.050	0.075
F	24.33	24.43	0.958	0.962
G	4.83	5.33	0.190	0.210
H	2.41	2.67	0.095	0.105
J	14.48	14.99	0.570	0.590
K	9.14	-	0.360	-
P	-	1.27	-	0.050
Q	3.61	3.86	0.142	0.152
S	-	8.89	-	0.350
T	-	3.68	-	0.145
U	-	15.75	-	0.620

All JEDEC Dimensions and Notes Apply.

**CASE 80-02**  
**TO-213AA**  
**(TO-56)**

# 2N3054,A

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>*OFF CHARACTERISTICS</b>				
Collector-Emitter Sustaining Voltage (1) ( $I_C = 100 \text{ mAdc}, I_B = 0$ )	$V_{CE(sus)}$	55	--	Vdc
Collector-Emitter Sustaining Voltage (1) ( $I_C = 100 \text{ mAdc}, R_{BE} = 100 \Omega$ )	$V_{CER(sus)}$	60	--	Vdc
Collector Cutoff Current ( $V_{CE} = 30 \text{ Vdc}, I_B = 0$ )	$I_{CEO}$	--	500	$\mu\text{Adc}$
Collector Cutoff Current ( $V_{CE} = 90 \text{ Vdc}, V_{BE(off)} = 1.5 \text{ Vdc}$ ) ( $V_{CE} = 90 \text{ Vdc}, V_{BE(off)} = 1.5 \text{ Vdc}, T_C = 150^\circ\text{C}$ )	$I_{CEX}$	--	1.0 6.0	mAdc
Emitter Cutoff Current ( $V_{BE} = 7.0 \text{ Vdc}, I_C = 0$ )	$I_{EBO}$	--	1.0	mAdc

## \*ON CHARACTERISTICS (1)

DC Current Gain ( $I_C = 0.5 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$ ) ( $I_C = 3.0 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$ )	$h_{FE}$	25 5.0	150 --	--
Collector-Emitter Saturation Voltage ( $I_C = 500 \text{ mAdc}, I_B = 50 \text{ mAdc}$ ) ( $I_C = 3.0 \text{ Adc}, I_B = 1.0 \text{ Adc}$ )	$V_{CE(sat)}$	--	1.0 6.0	Vdc
Base-Emitter On Voltage ( $I_C = 500 \text{ mAdc}, V_{CE} = 4.0 \text{ Vdc}$ )	$V_{BE(on)}$	--	1.7	Vdc

## DYNAMIC CHARACTERISTICS

Current-Gain-Bandwidth Product ( $I_C = 200 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$ )	$f_T$	3.0	--	MHz
*Small-Signal Current Gain ( $I_C = 100 \text{ mAdc}, V_{CE} = 4.0 \text{ Vdc}, f = 1.0 \text{ kHz}$ )	$h_{fe}$	25	180	--
*Common-Emitter Cutoff Frequency ( $I_C = 100 \text{ mAdc}, V_{CE} = 4.0 \text{ Vdc}$ )	$f_{hfe}$	30	--	kHz

\*Indicates JEDEC Registered Data

(1) Pulse test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

3

FIGURE 2 -- SWITCHING TIME EQUIVALENT TEST CIRCUIT

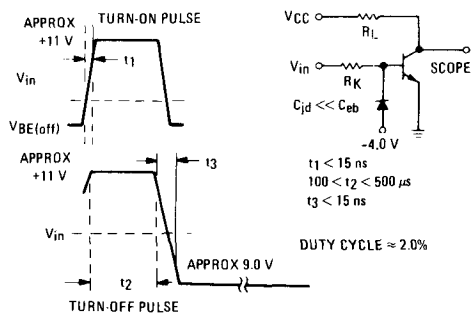


FIGURE 3 -- TURN-ON TIME

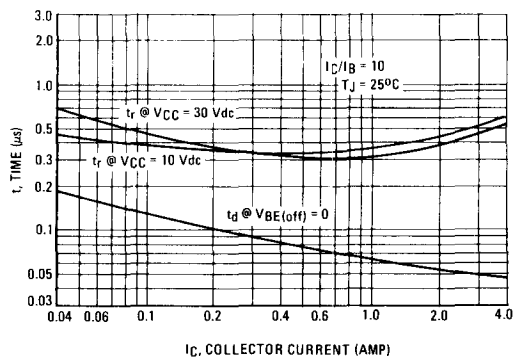


FIGURE 4 – THERMAL RESPONSE

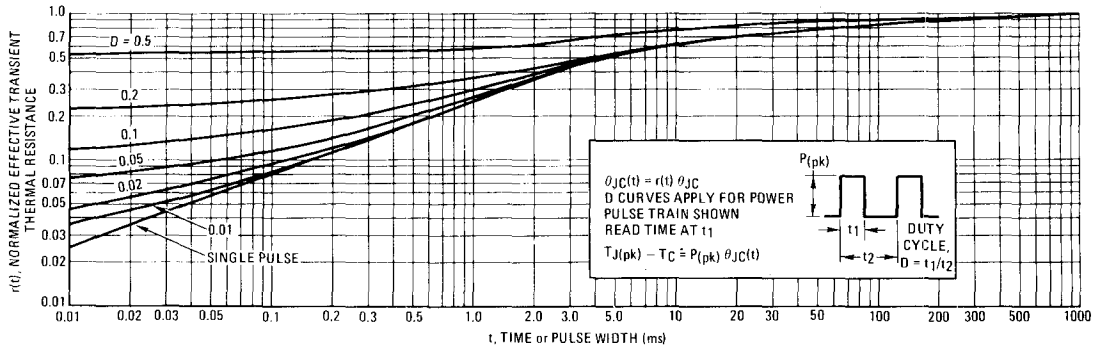
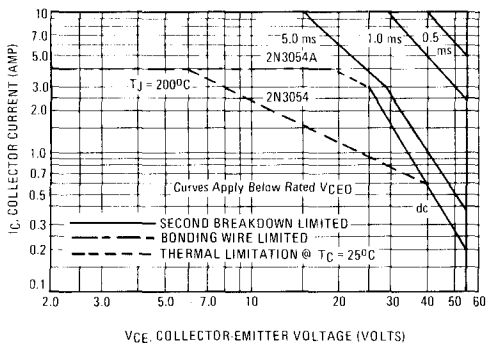


FIGURE 5 – ACTIVE-REGION SAFE OPERATING AREA



There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation, i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 is based on  $T_{J(pk)} = 200^\circ C$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} < 200^\circ C$ .  $T_{J(pk)}$  may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

3

FIGURE 6 – TURN-OFF TIME

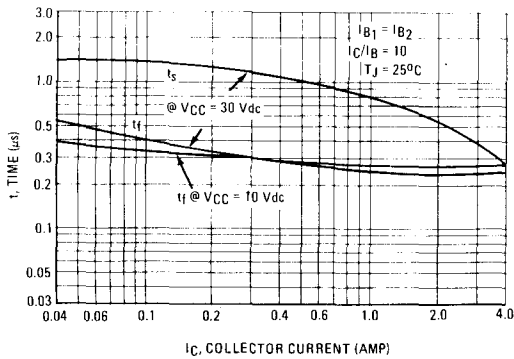


FIGURE 7 – CAPACITANCE

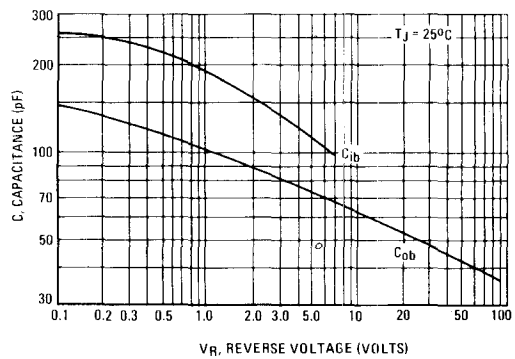


FIGURE 8 – DC CURRENT GAIN

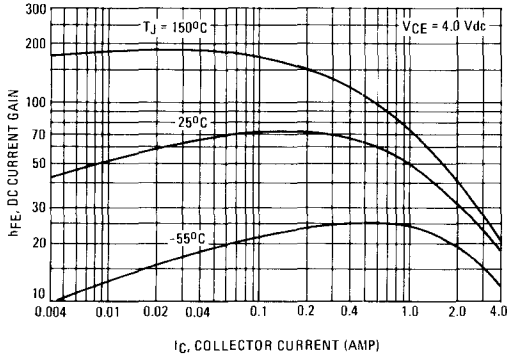


FIGURE 9 – COLLECTOR SATURATION REGION

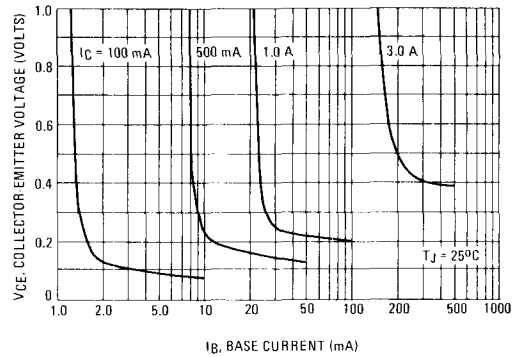


FIGURE 10 – TEMPERATURE COEFFICIENTS

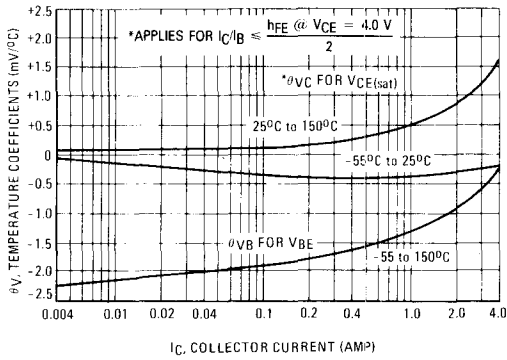


FIGURE 11 – "ON" VOLTAGES

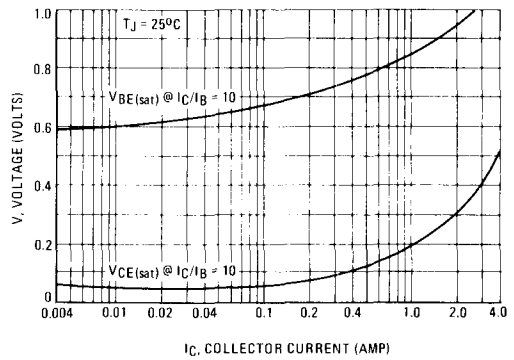


FIGURE 12 – COLLECTOR CUT-OFF REGION

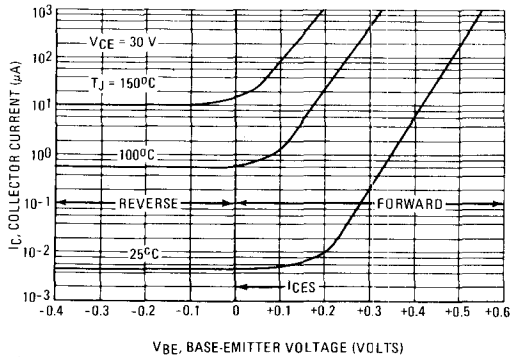


FIGURE 13 – EFFECTS OF BASE-EMITTER RESISTANCE

