

# 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
15I10A-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 1 — METAL TO-204, TO-204AE (continued)**

I <sub>C</sub> Cont Amps Max	V <sub>CE0(sus)</sub> Volts Min	Device Type		h <sub>FE</sub> 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			
25	60	2N5885	2N5883	20/100	10	1	0.8	10	4	200	
	80	2N5886	2N5884	20/100	10	1	0.8	10	4	200	
			2N6436	30/120	10	1	0.25	10	40	200	
	100	2N6338	2N6437	30/120	10	1	0.25	10	40	200	
	120	2N6339	2N6438	30/120	10	1	0.25	10	40	200	
	125	BUV10	BUV10N		10 min	20	1.2	0.25	20	8	150
					10 min	20	1.55	0.45	15	10	175
140	2N6340			30/120	10	1	0.25	10	40	200	
150	2N6341			30/120	10	1	0.25	10	40	200	
500	BUT14##			15 min	16	2.8	0.8	16		175	
28	400	BUT13##		20 min	20	2.6	0.8	18		175	
30	40	2N3771	2N4398	15/60	15				2	150	
		2N5301		15/60	15			10	2	200	
	60	2N5302	2N4399	15/60	15	2	1	10	2	200	
		MJ11012##	MJ11011##	1k min	20				4#	200	
	90	BUX39	MJ11013##	8 min	20	1	0.25	20	8	120	
		MJ11014##		1k min	20				4#	200	
	100	2N6328	MJ4502	6/30	30				3	200	
		MJ802		25/100	7.5				2	200	
	120	MJ11016##	MJ11015##	1k min	20				4#	200	
	325	BUV23•		8 min	16	1.8	0.4	16	8	250	
400	BUS98•		8 min	20	2.3	0.4	20		250		
	BUX98				3	0.8	20		250		
450	BUS98A•		8 min	16	2.3	0.4	16		250		
	BUX98A				3	0.8	16		250		
	MJ16020•		5 min	30	1.8	0.2	20		250		
	MJ16022•		7 min	30	1.5	0.15	20		250		
40	160	BUV21N•		10 min	40	1	0.2	40	8	250	
	200	BUV21•		10 min	25	1.8	0.4	25	8	150	
	250	BUS52•		15 min	40					350	
		BUV22•		10 min	20	1.1	0.35	20	8	250	
	350	MJ10022•##		50/600	120	2.5	0.9	20		250	
	400	MJ10023•##		50/600	10	2.5	0.9	20		250	
700	BUT35•##		15 min	24	4	1.2	24		250		
50	60	2N5685•	2N5683•	15/60	25	0.5 typ	0.3 typ	25	2	300	
		MJ11028•##	MJ11029•##	400 min	50					300	
	80	2N5686•	2N5684•	15/60	25	0.5 typ	0.3 typ	25	2	300	
			2N6377•	30/120	20	0.8	0.25	20	30	250	
	90	MJ11030•##	MJ11031•##	400 min	50					300	
	100	2N6274•	2N6378•	30/120	20	0.8	0.25	20	30	250	
	120	2N6275•	2N6379•	30/120	20	0.8	0.25	20	30	250	
		MJ11032•##	MJ11033•##	400 min	50					300	
125	BUV20•		10 min	50	1.2	0.25	50	8	250		
150	2N6277•		30/120	20	0.8	0.25	20	30	250		

• Modified TO-3 60 mil pins, # |h<sub>FE</sub>| @ 1 MHz, ## Darlington

(continued)

□ JAN, JTX, JTXV Available

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# MOTOROLA SEMICONDUCTOR TECHNICAL DATA

## 2N3771 2N3772

### HIGH POWER NPN SILICON POWER TRANSISTORS

... designed for linear amplifiers, series pass regulators, and inductive switching applications.

- Forward Biased Second Breakdown Current Capability

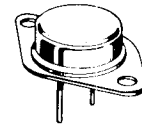
$$I_{S/b} = 3.75 I_{dc} @ V_{CE} = 40 \text{ Vdc} - 2N3771$$

$$= 2.5 I_{dc} @ V_{CE} = 60 \text{ Vdc} - 2N3772$$

20 and 30 AMPERE

POWER TRANSISTORS  
NPN SILICON

40 and 60 VOLTS  
150 WATTS



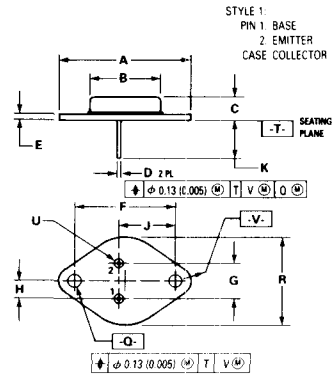
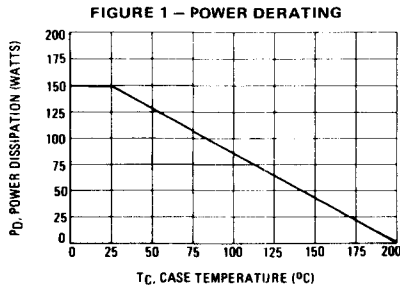
### \*MAXIMUM RATINGS

Rating	Symbol	2N3771	2N3772	Unit
Collector-Emitter Voltage	$V_{CEO}$	40	60	Vdc
Collector-Emitter Voltage	$V_{CEX}$	50	80	Vdc
Collector-Base Voltage	$V_{CB}$	50	100	Vdc
Emitter-Base Voltage	$V_{EE}$	5.0	7.0	Vdc
Collector Current - Continuous	$I_C$	30	20	A dc
Peak		30	30	
Base Current - Continuous	$I_B$	7.5	5.0	A dc
Peak		15	15	
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	150 0.855		Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200		$^\circ\text{C}$

### THERMAL CHARACTERISTICS

Characteristic	Symbol	2N3771, 2N3772	Unit
Thermal Resistance, Junction to Case	$\theta_{JC}$	1.17	$^\circ\text{C}/\text{W}$

\* Indicates JEDEC Registered Data



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO 204AA OUTLINE SHALL APPLY.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	39.37	—	1.550
B	—	21.08	—	0.830
C	6.35	8.25	0.250	0.325
D	0.97	1.09	0.038	0.043
E	1.40	1.77	0.055	0.070
F	30.15 BSC		1.187 BSC	
G	10.92 BSC		0.430 BSC	
H	5.46 BSC		0.215 BSC	
J	16.89 BSC		0.665 BSC	
K	11.18	12.19	0.440	0.480
Q	3.84	4.19	0.151	0.165
R	—	26.67	—	1.050
U	4.83	5.33	0.190	0.210
V	3.84	4.19	0.151	0.165

CASE 1-06  
TO-204AA  
(TO-3)

## 2N3771, 2N3772

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

Characteristic	Symbol	Min	Max	Unit	
<b>OFF CHARACTERISTICS</b>					
*Collector-Emitter Sustaining Voltage (1) ( $I_C = 0.2 \text{ Adc}, I_B = 0$ )	2N3771 2N3772	$V_{CEO(sus)}$	40 60	— —	Vdc
Collector-Emitter Sustaining Voltage ( $I_C = 0.2 \text{ Adc}, V_{EB(off)} = 1.5 \text{ Vdc}, R_{BE} = 100 \text{ Ohms}$ )	2N3771 2N3772	$V_{CEX(sus)}$	50 80	— —	Vdc
Collector-Emitter Sustaining Voltage ( $I_C = 0.2 \text{ Adc}, R_{BE} = 100 \text{ Ohms}$ )	2N3771 2N3772	$V_{CER(sus)}$	45 70	— —	Vdc
*Collector Cutoff Current ( $V_{CE} = 30 \text{ Vdc}, I_B = 0$ ) ( $V_{CE} = 50 \text{ Vdc}, I_B = 0$ ) ( $V_{CE} = 25 \text{ Vdc}, I_B = 0$ )	2N3771 2N3772	$I_{CEO}$	— —	10 10	mAdc
*Collector Cutoff Current ( $V_{CE} = 50 \text{ Vdc}, V_{EB(off)} = 1.5 \text{ Vdc}$ ) ( $V_{CE} = 100 \text{ Vdc}, V_{EB(off)} = 1.5 \text{ Vdc}$ ) ( $V_{CE} = 45 \text{ Vdc}, V_{EB(off)} = 1.5 \text{ Vdc}$ ) ( $V_{CE} = 30 \text{ Vdc}, V_{EB(off)} = 1.5 \text{ Vdc}, T_C = 150^\circ\text{C}$ ) ( $V_{CE} = 45 \text{ Vdc}, V_{EB(off)} = 1.5 \text{ Vdc}, T_C = 150^\circ\text{C}$ )	2N3771 2N3772 2N6257 2N3771 2N3772	$I_{CEV}$	— — — — —	2.0 5.0 4.0 10 10	mAdc
*Collector Cutoff Current ( $V_{CB} = 50 \text{ Vdc}, I_E = 0$ ) ( $V_{CB} = 100 \text{ Vdc}, I_E = 0$ )	2N3771 2N3772	$I_{CBO}$	— —	2.0 5.0	mAdc
*Emitter Cutoff Current ( $V_{BE} = 5.0 \text{ Vdc}, I_C = 0$ ) ( $V_{BE} = 7.0 \text{ Vdc}, I_C = 0$ )	2N3771 2N3772	$I_{EBO}$	— —	5.0 5.0	mAdc
<b>*ON CHARACTERISTICS</b>					
DC Current Gain (1) ( $I_C = 15 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$ ) ( $I_C = 10 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$ ) ( $I_C = 8.0 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$ ) ( $I_C = 30 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$ ) ( $I_C = 20 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$ )	2N3771 2N3772 2N3771 2N3772	$h_{FE}$	15 15 5.0 5.0	60 60 — —	—
Collector-Emitter Saturation Voltage ( $I_C = 15 \text{ Adc}, I_B = 1.5 \text{ Adc}$ ) ( $I_C = 10 \text{ Adc}, I_B = 1.0 \text{ Adc}$ )  ( $I_C = 30 \text{ Adc}, I_B = 6.0 \text{ Adc}$ ) ( $I_C = 20 \text{ Adc}, I_B = 4.0 \text{ Adc}$ )	2N3771 2N3772  2N3771 2N3772	$V_{CE(sat)}$	— — — —	2.0 1.4 4.0 4.0	Vdc
Base-Emitter On Voltage ( $I_C = 15 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$ ) ( $I_C = 10 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$ ) ( $I_C = 8.0 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$ )	2N3771 2N3772	$V_{BE(on)}$	— —	2.7 2.2	Vdc
<b>*DYNAMIC CHARACTERISTICS</b>					
Current-Gain-Bandwidth Product ( $I_C = 1.0 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}, f_{test} = 50 \text{ kHz}$ )		$f_T$	0.2	—	MHz
Small-Signal Current Gain ( $I_C = 1.0 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}, f = 1.0 \text{ kHz}$ )		$h_{fe}$	40	—	—
<b>SECOND BREAKDOWN</b>					
Second Breakdown Energy with Base Forward Biased, $t = 1.0 \text{ s}$ (non-repetitive) ( $V_{CE} = 40 \text{ Vdc}$ ) ( $V_{CE} = 60 \text{ Vdc}$ )	2N3771 2N3772	$I_{S/b}$	3.75 2.5	— —	Adc

\*Indicates JEDEC Registered Data  
(1) Pulse Test: 300  $\mu\text{s}$ , Rep. Rate 60 cps.

# 2N3771, 2N3772

FIGURE 2 — THERMAL RESPONSE — 2N3771, 2N3772

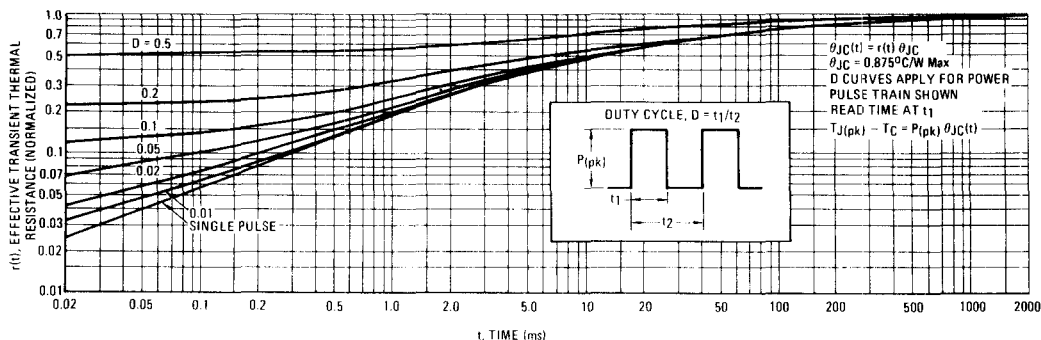
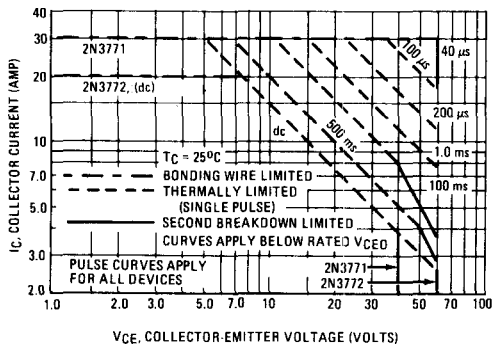


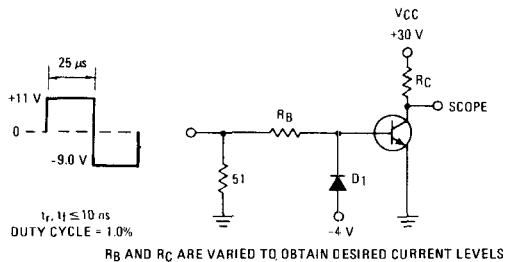
FIGURE 3 — ACTIVE-REGION SAFE OPERATING AREA — 2N3771, 2N3772



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.

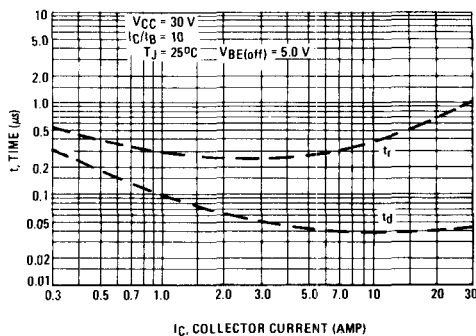
Figure 3 is based upon JEDEC registered Data. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} < 200^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data of Figure 2. Using data of Figure 2 and the pulse power limits of Figure 3,  $T_{J(pk)}$  will be found to be less than  $T_{J(max)}$  for pulse widths of 1 ms and less. When using Motorola transistors, it is permissible to increase the pulse power limits until limited by  $T_{J(max)}$ .

FIGURE 4 — SWITCHING TIME TEST CIRCUIT



D<sub>1</sub> MUST BE FAST RECOVERY TYPE, eg. MBD5300 USED ABOVE I<sub>B</sub> ≈ 100 mA  
MSD6100 USED BELOW I<sub>B</sub> ≈ 100 mA

FIGURE 5 — TURN-ON TIME



# 2N3771, 2N3772

FIGURE 6 – TURN-OFF TIME

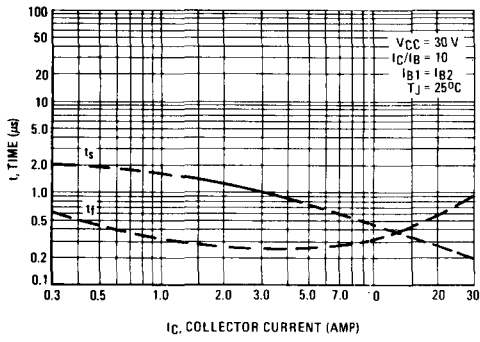


FIGURE 7 – CAPACITANCE

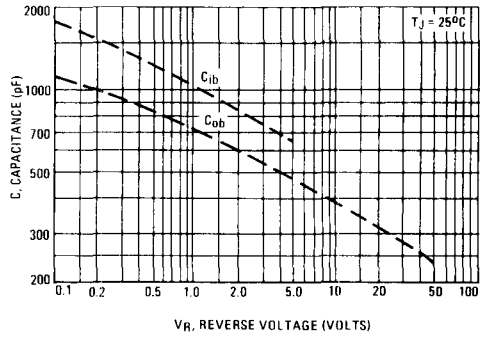


FIGURE 8 – DC CURRENT GAIN

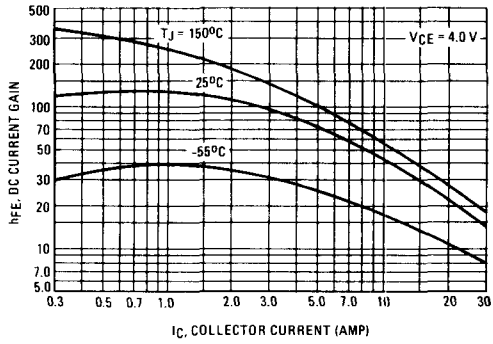


FIGURE 9 – COLLECTOR SATURATION REGION

