

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 1 — METAL TO-204, TO-204AE (continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C	
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp			
10	250	MJ15011	MJ15012	20/100	2					200	
	300	MJ3041##		250 min	2.5					175	
	325	MJ413 MJ423 MJ431			20/80	0.5				2.5	125
					30/90	1				2.5	125
					15/35	2.5				2.5	125
	350	BU323## MJ3042## MJ13014 MJ10002## MJ10006##			150 min	6	7.5 typ	5.2 typ	6		175
					250 min	2.5					175
					8/20	5	2	0.5	5		150
					3/300	5	2.5	1	5	10#	150
	400	BU323A## MJ10007## MJ10012## MJ13015			30/300	5	7.5 typ	5.2 typ	6		175
100/2k					6	15	15	6	10#	150	
8/20					5	2	0.5	5		175	
30/300					5	1.5	0.5	5		150	
600	MJ10014##			10/250	10	2.5	0.8	10		175	
700	MJ8504			7.5 min	1.5	4	2	5		175	
800	MJ8505 MJ16018			7.5 min	1.5	4	2	5		175	
				4 min	5	4.5 typ	0.2 typ	5		150	
950*	MJ12010			4.2 min	5		1	5		100	
12	60	2N6057##	2N6050##	750/18k	6	1.6 typ	1.5 typ	6	4#	150	
	80	2N6058##	2N6051##	750/18k	6	1.6 typ	1.5 typ	6	4#	150	
	100	2N6059##	2N6052##	750/18k	6	1.6 typ	1.5 typ	6	4#	150	
15	60	2N3055 2N3055A 2N6576## 2N5881	MJ2955 MJ2955A 2N5879	20/70	4	0.7 typ	0.3 typ	4	2.5	115	
				20/70	4			0.8	115		
				2k/20k	4	2	7	10	10-200#	120	
				20/100	6	1	0.8	6	4	160	
	80	2N5882	2N5880	20/100	6	1	0.8	6	4	160	
	90	2N6577##			2k/20k	4	2	7	10	10-200#	120
					2k/20k	4	2	7	10	10-200#	120
	120	MJ15015 2N6578##	MJ15016		20/70	4			1	180	
					2k/20k	4	2	7	10	10-200#	120
	140	MJ15001	MJ15002		25/150	4			2	200	
	150	MJ11018##	MJ11017##		100 min	15				3#	175
	200	BUX41 2N6249 MJ11020##	MJ11019##		8 min	8	1.5	0.4	8	8	120
					10/50	10	3.5	1	10	2.5	175
					100 min	15				3#	175
	250	MJ11022##	MJ11021##		100 min	15				3#	175
275	2N6250			8/50	10	3.5	1	10	2.5	175	
300	2N6546			6/30	10	4	0.7	10	6 to 24	175	
325	BUX13			8 min	8	2.5	0.8	8	8	150	
400	BUX48 2N6547 MJ13090 MJ16110			8 min	10	2	0.4	10		175	
				6/30	10	4	0.7	10	6 to 24	175	
				8 min	10	2.5	0.5	10		175	
				6/20	15	0.8 typ	0.1 typ	10		175	
450	BUX48A MJ16010			8 min	8	2	0.4	10		175	
				5 min	15	1.2 typ	0.2 typ	10		175	

* V_{BR}/I_CEX. # |h_{FE}| @ 1 MHz, ## Darlington

(continued)

JAN, JTX, JTXV Available

2

NPN
2N3055
PNP
MJ2955

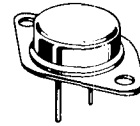
COMPLEMENTARY SILICON POWER TRANSISTORS

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

- DC Current Gain – $h_{FE} = 20-70 @ I_C = 4 \text{ Adc}$
- Collector-Emitter Saturation Voltage –
 $V_{CE(sat)} = 1.1 \text{ Vdc (Max) @ } I_C = 4 \text{ Adc}$
- Excellent Safe Operating Area

15 AMPERE
POWER TRANSISTORS
COMPLEMENTARY SILICON

60 VOLTS
115 WATTS



MAXIMUM RATINGS

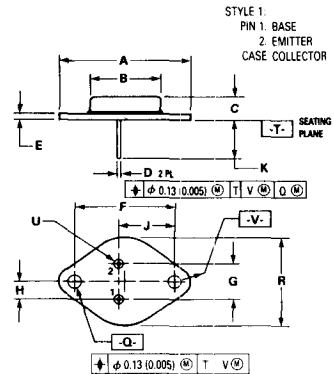
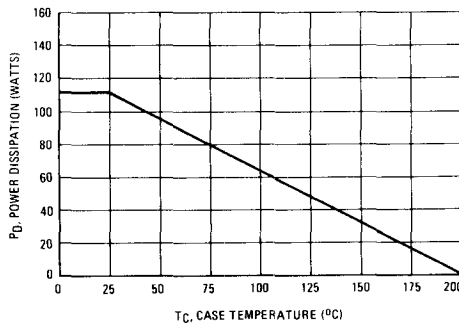
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	60	Vdc
Collector-Base Voltage	V_{CB}	100	Vdc
Collector-Base Voltage	V_{CEB}	7	Vdc
Collector Current – Continuous	I_C	15	A dc
Base Current	I_B	7	A dc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	115 0.657	Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.52	$^\circ\text{C/W}$

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FIGURE 1 – POWER DERATING



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

- 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.

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

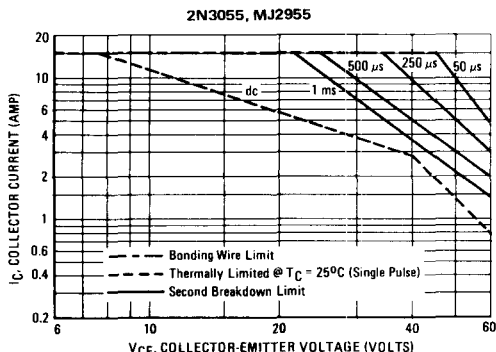
2N3055 NPN/MJ2955 PNP

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

Characteristic	Symbol	Min	Max	Unit
*OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (1) ($I_C = 200 \text{ mA dc}, I_B = 0$)	$V_{CE(sus)}$	60	—	Vdc
Collector-Emitter Sustaining Voltage (1) ($I_C = 200 \text{ mA dc}, R_{BE} = 100 \text{ Ohms}$)	$V_{CER(sus)}$	70	—	Vdc
Collector Cutoff Current ($V_{CE} = 30 \text{ Vdc}, I_B = 0$)	I_{CEO}	—	0.7	mA dc
Collector Cutoff Current ($V_{CE} = 100 \text{ Vdc}, V_{BE(off)} = 1.5 \text{ Vdc}$) ($V_{CE} = 100 \text{ Vdc}, V_{BE(off)} = 1.5 \text{ Vdc}, T_C = 150^\circ\text{C}$)	I_{CEX}	—	1.0 5.0	mA dc
Emitter Cutoff Current ($V_{BE} = 7.0 \text{ Vdc}, I_C = 0$)	I_{EBO}	—	5.0	mA dc
*ON CHARACTERISTICS (1)				
DC Current Gain ($I_C = 4.0 \text{ A dc}, V_{CE} = 4.0 \text{ Vdc}$) ($I_C = 10 \text{ A dc}, V_{CE} = 4.0 \text{ Vdc}$)	h_{FE}	20 5.0	70 —	—
Collector-Emitter Saturation Voltage ($I_C = 4.0 \text{ A dc}, I_B = 400 \text{ mA dc}$) ($I_C = 10 \text{ A dc}, I_B = 3.3 \text{ A dc}$)	$V_{CE(sat)}$	—	1.1 3.0	Vdc
Base-Emitter On Voltage ($I_C = 4.0 \text{ A dc}, V_{CE} = 4.0 \text{ Vdc}$)	$V_{BE(on)}$	—	1.5	Vdc
SECOND BREAKDOWN				
Second Breakdown Collector Current with Base Forward Biased ($V_{CE} = 40 \text{ Vdc}, t = 1.0 \text{ s}$; Nonrepetitive)	$I_{s/b}$	2.87	—	A dc
DYNAMIC CHARACTERISTICS				
Current Gain – Bandwidth Product ($I_C = 0.5 \text{ A dc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ MHz}$)	f_T	2.5	—	MHz
*Small-Signal Current Gain ($I_C = 1.0 \text{ A dc}, V_{CE} = 4.0 \text{ Vdc}, f = 1.0 \text{ kHz}$)	h_{fe}	15	120	—
*Small-Signal Current Gain Cutoff Frequency ($V_{CE} = 4.0 \text{ Vdc}, I_C = 1.0 \text{ A dc}, f = 1.0 \text{ kHz}$)	f_{hfe}	10	—	kHz

* Indicates Within JEDEC Registration. (2N3055)
(1) Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

FIGURE 2 – 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 2 is based on $T_C = 25^\circ\text{C}$; $T_J(\text{pk})$ is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10% but must be derated for temperature according to Figure 1.