

1.	VENDOR	PART NUMBER	CATALOG REFERENCE
A	SGS-THOMSON MICROELECTRONICS	2N3053	SMALL SIGNAL TRANSISTOR
B	MOTOROLA	2N3053	DL126 REV3
C			

2. DESCRIPTION.....NPN TRANSISTOR

3. VALUE.....  $V_{CE0} = 40V$  ,  $I_C = 0.7A$

4. SPECIFICATIONS NOT CALLED OUT IN VENDOR SPEC.....NONE


5. SPECIAL HANDLING REQUIREMENTS..... ESD PROTECTION: TO PROTECT AGAINST DAMAGE DUE TO ELECTROSTATIC DISCHARGE. THESE UNITS MUST BE PACKAGED AND SHIPPED IN ACCORDANCE WITH DOD-STD-1686.

6. FOR VENDOR'S MECHANICAL AND ELECTRICAL SPECIFICATION,SEE REVERSE SIDE OF THIS DOCUMENT OR ATTACHED SHEET(S).

7. SOLDERABILITY.....PARTS MUST MEET THE SOLDERABILITY REQUIREMENTS OF MIL-STD-202,METHOD 208.

8. THERMAL SHOCK ..... PARTS MUST MEET THE THERMAL SHOCK REQUIREMENTS OF MIL-STD-750, METHOD 1051.2.

9. THE VENDOR HAS SUPPLIED A WRITTEN CONFIRMATION OF THIS SPECIFICATION CONTROL DOCUMENT.

REVISIONS		APPROVALS			FIRST USED ON:	TITLE:	
REV.	DESCRIPTION	ENG	PUR	QUAL	ORIGINATED BY:	PK	NPN TRANSISTOR
G	ECO#A02568 10/28/88	JH			HANDLING:	ESD	
H	ECO#B13319 7/29/93	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	HAZARD:		 <b>LAMBDA ELECTRONICS</b>
					AGENCY:		
					DWG SIZE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND TOLERANCES ARE : DEC. ± .005 FRACTIONS: ±1/64 , ANGLES : ±1/2°	<b>FBN-L113</b>
					<b>A</b>		REV. <b>H</b>

**AMPLIFIERS AND SWITCH**

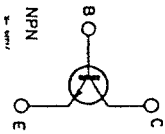
**DESCRIPTION**

The 2N3053 is a silicon planar epitaxial NPN transistor in Jedec TO-39 metal case. Intended for medium-current switching and amplifier applications.



TO-39

**INTERNAL SCHEMATIC DIAGRAM**



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>ceo</sub>	Collector-base Voltage (I <sub>e</sub> = 0)	60	V
V <sub>ceo</sub>	Collector-emitter Voltage (I <sub>b</sub> = 0)	40	V
V <sub>ebo</sub>	Emitter-base Voltage (I <sub>c</sub> = 0)	5	V
I <sub>c</sub>	Collector Current	700	mA
P <sub>tot</sub>	Total Power Dissipation at T <sub>case</sub> ≤ 25 °C	5	W
T <sub>stg</sub> , T <sub>j</sub>	Storage and Junction Temperature	- 65 to 200	°C

**2N3053**

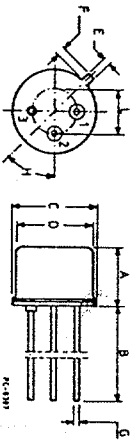
**THERMAL DATA**

Pin/Case	Thermal Resistance Junction-case	Max	35	°C/W

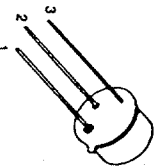
**ELECTRICAL CHARACTERISTICS (T<sub>amb</sub> = 25 °C unless otherwise specified)**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>oex</sub>	Collector Quiescent Current (V <sub>ce</sub> = -1.5 V)	V <sub>ce</sub> = 80 V			250	nA
V <sub>br(cso)</sub>	Collector-base Breakdown Voltage (I <sub>e</sub> = 0)	I <sub>c</sub> = 100 μA	60			V
V <sub>br(ceo)</sub>	Collector-emitter Breakdown Voltage (I <sub>b</sub> = 0)	I <sub>c</sub> = 100 μA	40			V
V <sub>br(icer)</sub>	Collector-emitter Breakdown Voltage (I <sub>ce</sub> = 10 mA)	I <sub>c</sub> = 10 mA	50			V
V <sub>br(ebo)</sub>	Emitter-base Breakdown Voltage (I <sub>c</sub> = 0)	I <sub>e</sub> = 100 μA	5			V
V <sub>ce(sat)</sub>	Collector-emitter Saturation Voltage	I <sub>c</sub> = 150 mA, I <sub>b</sub> = 15 mA		1.4		V
V <sub>be(sat)</sub>	Base-emitter Saturation Voltage	I <sub>c</sub> = 150 mA, V <sub>ce</sub> = 2.5 V		1.7		V
h <sub>FE</sub>	DC Current Gain	I <sub>c</sub> = 150 mA, I <sub>b</sub> = 15 mA, V <sub>ce</sub> = 2.5 V	25		1.7	V
f <sub>t</sub>	Transition Frequency	I <sub>c</sub> = 50 mA, V <sub>ce</sub> = 10 V, f = 20 MHz		100		MHz
C <sub>ebo</sub>	Emitter-base Capacitance	I <sub>c</sub> = 0, f = 1 MHz, V <sub>eb</sub> = 0.5 V			80	pF
C <sub>obo</sub>	Collector-base Capacitance	I <sub>e</sub> = 0, f = 1 MHz, V <sub>cb</sub> = 10 V			15	pF

Pulse: pulse duration = 300 μs, duty cycle = 1 %.



TO-39



	mm		Inches	
	min	max	min	max
A	—	6.6	—	0.260
B	12.7	—	0.500	—
C	—	9.4	—	0.370
D	—	8.5	—	0.334
E	—	0.9	—	0.035
F	—	1.2	—	0.047
G	—	0.49	—	0.019
H	—	4.5 <sup>typ</sup>	—	4.5 <sup>typ</sup>
L	—	5.08 <sup>typ</sup>	—	0.200 <sup>typ</sup>

pin 1: Emitter - pin 2: Base - pin 3: Collector

**MAXIMUM RATINGS**

Rating	Symbol	2N3053	2N3053A	Unit
Collector-Emitter Voltage(1)	V <sub>CEO</sub>	40	80	Vdc
Collector-Base Voltage	V <sub>CB0</sub>	60	80	Vdc
Emitter-Base Voltage	V <sub>EB0</sub>	5.0	700	Vdc
Collector Current — Continuous	I <sub>C</sub>	5.0	5.0	mA
Total Device Dissipation @ T <sub>C</sub> = 25°C	P <sub>D</sub>	5.0	28.6	Watts
Derate above 25°C				mW/°C
Operating and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-65 to +200		°C

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	35	°C/W

(1) Applicable 0 to 100 mA (Pulsed): Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2.0%, 0 to 700 mA; Pulse Width ≤ 10 μsec, Duty Cycle ≤ 2.0%.

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted.)**

Characteristic	Symbol	Min	Max	Unit
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**OFF CHARACTERISTICS**

Collector-Emitter Breakdown Voltage (I <sub>C</sub> = 100 μA, I <sub>B</sub> = 0)	V <sub>BRICE0</sub>	40	—	Vdc
Collector-Base Breakdown Voltage(2) (I <sub>C</sub> = 100 mA, I <sub>B</sub> = 10 ohm)	V <sub>BRICB0</sub>	50	—	Vdc
Collector-Base Breakdown Voltage (I <sub>C</sub> = 100 μA, I <sub>E</sub> = 0)	V <sub>BRICB0</sub>	60	—	Vdc
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 100 μA, I <sub>C</sub> = 0)	V <sub>BRIEB0</sub>	5.0	—	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 30 Vdc, V <sub>EB(off)</sub> = 1.5 Vdc) (V <sub>CE</sub> = 60 Vdc, V <sub>EB(off)</sub> = 1.5 Vdc)	I <sub>CEX</sub>	—	0.25	μA
Emitter Cutoff Current (V <sub>EB</sub> = 4.0 Vdc, I <sub>C</sub> = 0)	I <sub>EB0</sub>	—	0.25	μA
Base Cutoff Current (V <sub>CE</sub> = 60 Vdc, V <sub>EB(off)</sub> = 1.5 Vdc)	I <sub>BL</sub>	—	0.25	μA

**ON CHARACTERISTICS(2)**

DC Current Gain (I <sub>C</sub> = 150 mA, V <sub>CE</sub> = 2.5 Vdc) (I <sub>C</sub> = 150 mA, V <sub>CE</sub> = 10 Vdc)	h <sub>FE</sub>	25	—	—
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 150 mA, I <sub>B</sub> = 15 mA)	V <sub>CE(sat)</sub>	—	1.4	Vdc
Base-Emitter Saturation Voltage (I <sub>C</sub> = 150 mA, I <sub>B</sub> = 15 mA)	V <sub>BE(sat)</sub>	—	1.7	Vdc
Base-Emitter On Voltage (I <sub>C</sub> = 150 mA, V <sub>CE</sub> = 2.5 Vdc)	V <sub>BE(on)</sub>	—	1.7	Vdc

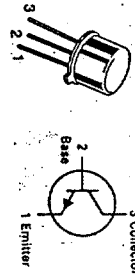
**SMALL-SIGNAL CHARACTERISTICS**

Current-Gain — Bandwidth Product (I <sub>C</sub> = 50 mA, V <sub>CE</sub> = 10 Vdc, f = 100 MHz)	f <sub>T</sub>	100	—	MHz
Output Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>ob0</sub>	—	15	pf
Input Capacitance (V <sub>EB</sub> = 0.5 Vdc, I <sub>C</sub> = 0, f = 1.0 MHz)	C <sub>ibo</sub>	—	80	pf

(2) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

**2N3053, A**

CASE 79-04, STYLE 1  
TO-39 (TO-205AD)



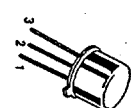
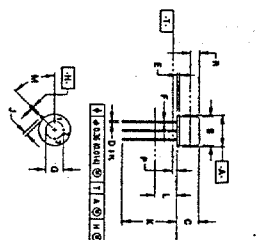
GENERAL PURPOSE TRANSISTORS  
NPN SILICON

Refer to 2N3019 for graphs.

**PACKAGE OUTLINE DIMENSIONS (continued)**

CASE 79-04 (TO-205AD) TO-39 METAL

CASE 79 STYLES



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.51	5.29	0.217	0.209
B	7.19	8.90	0.283	0.351
C	8.10	8.91	0.319	0.351
D	0.27	0.33	0.011	0.013
E	0.41	0.48	0.016	0.019
F	5.08	5.08	0.200	0.200
G	0.17	0.26	0.007	0.010
H	0.74	1.14	0.029	0.045
K	12.70	13.95	0.500	0.550
L	3.30	—	0.130	—
M	4.75	5.71	0.187	0.225
N	2.54	—	0.100	—

STYLE 1  
PIN 1: EMITTER  
PIN 2: COLLECTOR

NOTE:  
1. DIMENSIONS AND TOLERANCES SHOWN ARE IN MILLIMETERS.  
2. DIMENSIONS IN PARENTHESES ARE FOR REFERENCE ONLY.  
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