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# NPN/PNP SILICON COMPLEMENTARY SMALL SIGNAL DUAL TRANSISTOR

Qualified per MIL-PRF-19500/421

*Qualified Levels:  
JAN, JANTX, and  
JANTXV*

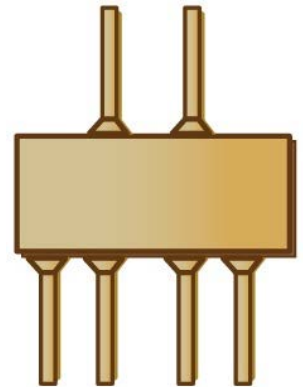
## DESCRIPTION

This 2N3838 device in a 6-pin Flatpack package is military qualified up to a JANTXV level for high-reliability applications. Microsemi also offers numerous other products to meet higher and lower power voltage regulation applications.

**Important:** For the latest information, visit our website <http://www.microsemi.com>.

## FEATURES

- JAN, JANTX, and JANTXV qualifications also available per MIL-PRF-19500/421.
- RoHS compliant versions available (commercial grade only).




**6-Pin Flatpack  
Package**

## APPLICATIONS / BENEFITS

- Two complementary small signal silicon transistors in a single package design.
- Lightweight.

Also available in:

 **TO-78 package**  
(leaded)  
[2N4854](#)

 **6-Pin U package**  
(surface mount)  
[2N4854U](#)

## MAXIMUM RATINGS

Parameters/Test Conditions	Symbol	Value per		Unit
		Each Transistor	Total Package	
Thermal Resistance Junction-to-Case	R <sub>θJC</sub>	250	125	°C/W
Thermal Resistance Junction-to-Ambient	R <sub>θJA</sub>	350	290	°C/W
Total Power Dissipation @ T <sub>A</sub> = +25 °C <sup>(1)</sup>	P <sub>T</sub>	0.25	0.35	W
Total Power Dissipation @ T <sub>C</sub> = +25 °C <sup>(2)</sup>	P <sub>T</sub>	0.7	1.4	W
Junction and Storage Temperature	T <sub>J</sub> and T <sub>STG</sub>	-65 to +200		°C
Collector-Base Voltage, Emitter Open	V <sub>CB0</sub>	60		V
Emitter-Base Voltage, Collector Open	V <sub>EB0</sub>	5		V
Collector-Emitter Voltage, Base Open	V <sub>CEO</sub>	40		V
Collector Current, dc	I <sub>C</sub>	600		mA
Lead to Case Voltage		+/- 120		V
Solder Temperature @ 10 s	T <sub>SP</sub>	260		°C

**Notes:** 1. For T<sub>A</sub> > +25 °C, derate linearly 1.43 mW/°C one transistor, 2.00 mW/°C both transistors.  
2. For T<sub>C</sub> > +25 °C, derate linearly 4.0 mW/°C one transistor, 8.0 mW/°C both transistors.

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**MECHANICAL and PACKAGING**

- CASE: Hermetic ceramic (white), Au over Ni plated kovar cover.
- TERMINALS: Au over Ni plated copper.
- MARKING: Manufacturer's ID, part number, date code, Pin 1 Identifier.
- POLARITY: See Case Outline.
- See [Package Dimensions](#) on last page.

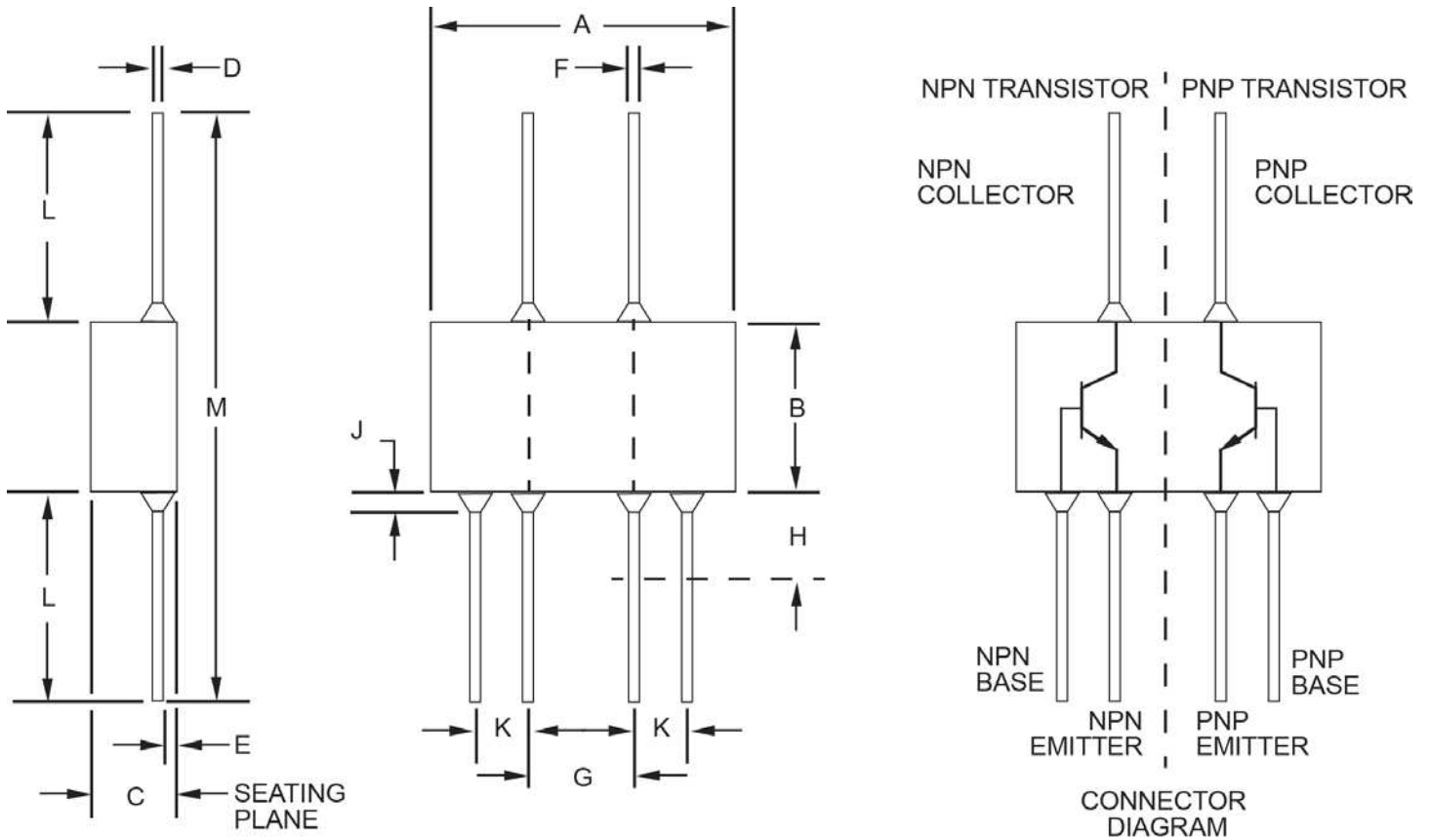
**PART NOMENCLATURE**

**SYMBOLS & DEFINITIONS**

Symbol	Definition
$I_B$	Base Current, dc.
$I_C$	Collector Current, dc.
$I_E$	Emitter Current, dc.
$I_O$	Average Rectified Output Current: The Output Current averaged over a full cycle with a 50 Hz or 60 Hz sine-wave input and a 180 degree conduction angle.
$V_{CB}$	Collector-Base Voltage (dc).
$V_{CE}$	Collector-Emitter Voltage, dc.
$V_{EB}$	Emitter-Base Voltage (dc).

**ELECTRICAL CHARACTERISTICS @  $T_A = 25\text{ }^\circ\text{C}$  unless otherwise noted.**

Characteristics	Symbol	Min.	Max.	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Current $I_C = 10\text{ mA}$ (pulsed)	$V_{(BR)CEO}$	40		V
Collector-Base Cutoff Current $V_{EB} = 5\text{ V}$	$I_{CBO(1)}$		10	$\mu\text{A}$
Collector-Base Cutoff Current $V_{CB} = 50\text{ V}$	$I_{CBO(2)}$		50	nA
Emitter-Base Cutoff Current $V_{EB} = 5.0\text{ V}$ $V_{EB} = 3.0\text{ V}$	$I_{EBO(1)}$ $I_{EBO(2)}$		10 10	$\mu\text{A}$ nA
<b>ON CHARACTERISTICS</b>				
Forward-Current Transfer Ratio $I_C = 150\text{ mA}$ , $V_{CE} = 1\text{ V}$ $I_C = 100\text{ }\mu\text{A}$ , $V_{CE} = 10\text{ V}$ $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ , $V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}$ , $V_{CE} = 10\text{ V}$ $I_C = 300\text{ mA}$ , $V_{CE} = 10\text{ V}$	$h_{FE}$	50 35 50 75 100 35	300	
Collector-Emitter Saturation Voltage $I_C = 150\text{ mA}$ , $I_B = 15\text{ mA}$	$V_{CE(sat)}$		0.40	V
Base-Emitter Saturation Voltage $I_C = 150\text{ mA}$ , $I_B = 15\text{ mA}$	$V_{BE(sat)}$	0.80	1.25	V
<b>DYNAMIC CHARACTERISTICS</b>				
Forward Current Transfer Ratio $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ kHz}$	$h_{fe}$	60	300	
Forward Current Transfer Ratio, Magnitude $I_C = 20\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 100\text{ MHz}$	$ h_{fe} $	2.0	10	
Small-Signal Common Emitter Input Impedance $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ kHz}$	$h_{ie}$	1.5	9.0	k $\Omega$
Small-Signal Common Emitter Output Admittance $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ kHz}$	$h_{oe}$		50	$\mu\text{hmo}$
Open Circuit Output Capacitance $V_{CB} = 10\text{ V}$ , $I_E = 0$ , $100\text{ kHz} \leq f \leq 1.0\text{ MHz}$	$C_{obo}$		8.0	pF
Noise Figure $I_C = 100\text{ }\mu\text{A}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ kHz}$ , $R_G = 1.0\text{ k}\Omega$	NF		8.0	dB
<b>SWITCHING CHARACTERISTICS</b>				
Turn-On Time (Saturated) (Reference MIL-PRF-19500/421, figure 7)	$t_{on}$		45	ns
Turn-Off Time (Saturated) (Reference MIL-PRF-19500/421, figure 8)	$t_{off}$		300	ns
Pulse Response (Non-Saturated) (Reference MIL-PRF-19500/421, figure 9)	$t_{on} + t_{off}$		18	ns
Collector-Emitter Non-Latching Voltage	$V_{CEO}$	40		V

**PACKAGE DIMENSIONS**


Ltr	Dimensions				Notes
	Inch		Millimeters		
	Min	Max	Min	Max	
A	.240	.290	6.10	7.37	
B	.115	.160	2.92	4.06	
C	.030	.080	0.76	2.03	
D	.003	.006	0.08	0.15	4
E	.005	.035	0.13	0.89	
F	.010	.019	0.25	0.48	4, 6

Ltr	Dimension				Notes
	Inch		Millimeters		
	Min	Max	Min	Max	
G	.100 TP		2.54 TP		6,7
H	-	.050	-	1.27	
J	-	.015	-	0.38	5
K	.050 TP		1.27 TP		6,7
L	.070	.250	1.78	6.35	3,4
M	.260	.650	6.60	16.51	

**NOTES:**

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Maximum limit of this dimension does not apply to device supplied in a carrier.
4. All six leads.
5. Lead dimensions are uncontrolled in this zone.
6. Dimensions "F", "G", and "K" to be measured in zone "H".
7. Leads within .005 inch (0.13 mm) total of true position (TP) at "H" with maximum material condition.
8. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.