



# NPN/PNP SILICON COMPLEMENTARY SMALL SIGNAL DUAL TRANSISTOR

Qualified per MIL-PRF-19500/421

Qualified Levels:  
JAN, JANTX, and  
JANTXV

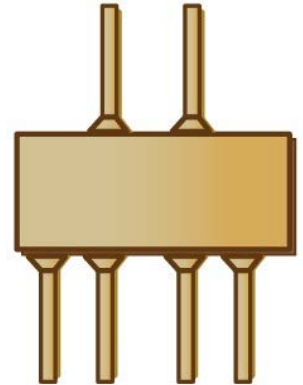
## DESCRIPTION

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.

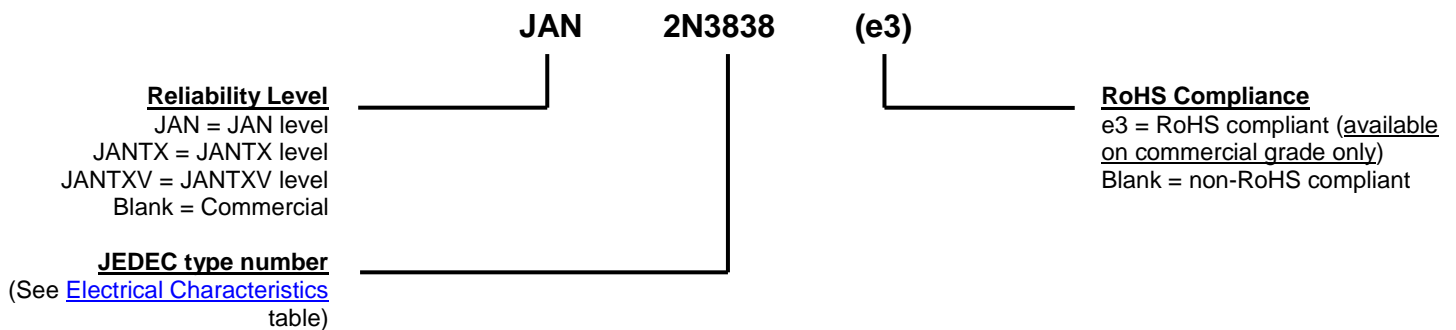
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**MECHANICAL and PACKAGING**

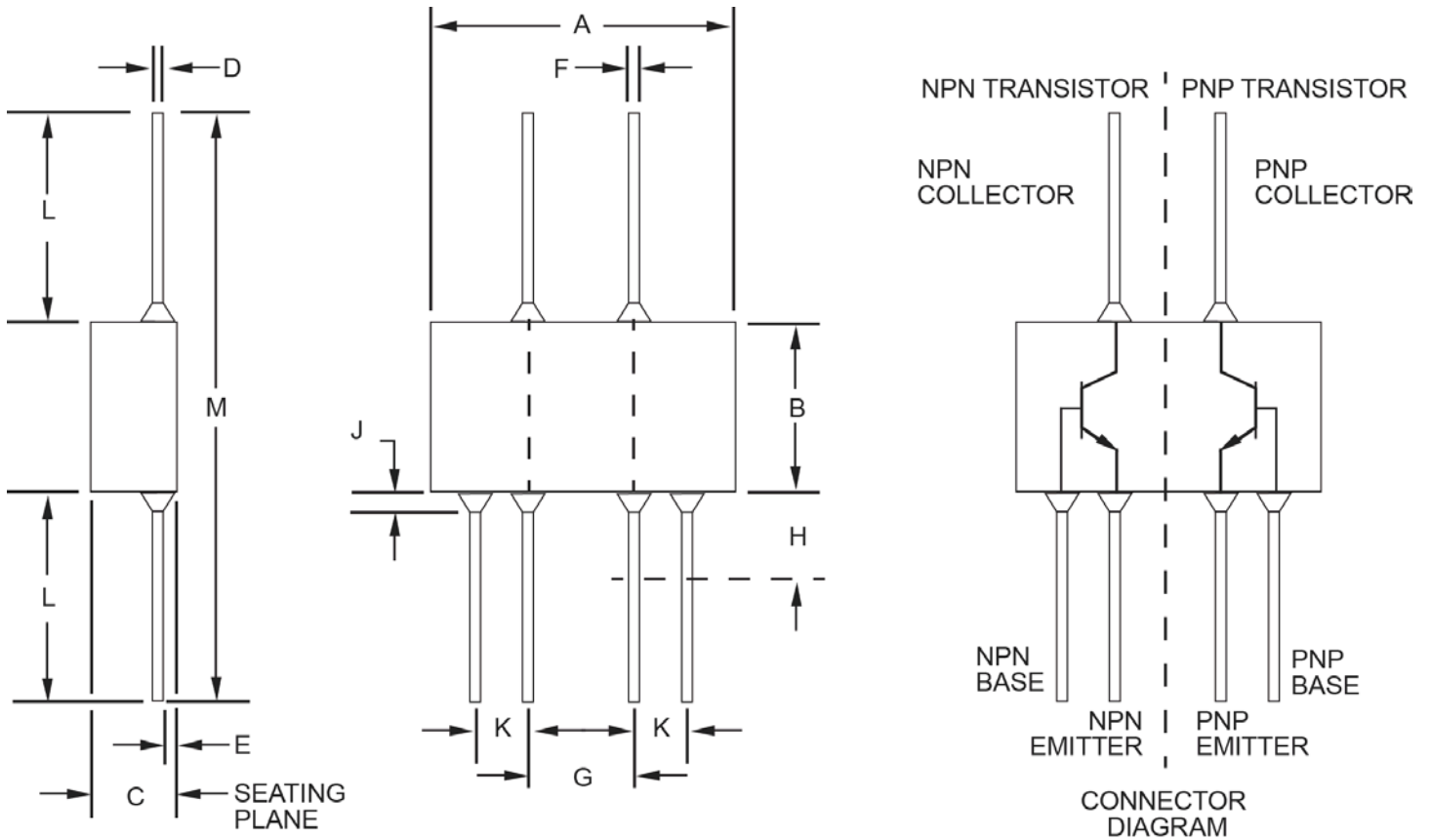
- CASE: Hermetic ceramic (white), Au over Ni plated kovar cover.
- TERMINALS: Au over Ni plated copper.
- MARKING: Manufacturer's ID, part number, date code, Pin 1 Identifier.
- POLARITY: See Case Outline.
- See [Package Dimensions](#) on last page.

**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	$\text{k}\Omega$
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:**

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

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