



## NPN LOW POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/368

*Qualified Levels:  
JAN, JANTX, JANTXV  
and JANS\*  
(\*2N3440U4 only)*

### DESCRIPTION

This family of 2N3439U4 through 2N3440U4 high-frequency, epitaxial planar transistors feature low saturation voltage. The U4 package is hermetically sealed and provides a low profile for minimizing board height. These devices are also available in UA, TO-5 and TO-39 packaging. Microsemi also offers numerous other transistor products to meet higher and lower power ratings with various switching speed requirements in both through-hole and surface-mount packages.

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

### FEATURES

- JEDEC registered 2N3439U4 through 2N3440U4 series.
- RoHS compliant by design.
- $V_{ce(sat)} = 0.5\text{ V @ } I_C = 50\text{ mA}$ .
- Turn-On time  $t_{on} = 1.0\ \mu\text{s max @ } I_C = 20\text{ mA, } I_{B1} = 2.0\text{ mA}$ .
- Turn-Off time  $t_{off} = 10\ \mu\text{s max @ } I_C = 20\text{ mA, } I_{B1} = -I_{B2} = 2.0\text{ mA}$ .

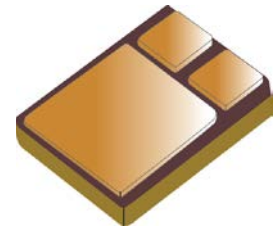
### APPLICATIONS / BENEFITS

- General purpose transistors for medium power applications requiring high frequency switching and low package profile.
- Military and other high-reliability applications.

### MAXIMUM RATINGS @ $T_C = +25^\circ\text{C}$ unless otherwise noted.

Parameters / Test Conditions	Symbol	2N3439U4	2N3440U4	Unit
Collector-Emitter Voltage	$V_{CEO}$	350	250	V
Collector-Base Voltage	$V_{CBO}$	450	300	V
Emitter-Base Voltage	$V_{EBO}$	7.0		V
Collector Current	$I_C$	1.0		A
Total Power Dissipation	$P_D$	@ $T_A = +25^\circ\text{C}$ <sup>(1)</sup>	0.8	W
		@ $T_C = +25^\circ\text{C}$ <sup>(2)</sup>	5.0	
Operating & Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200		$^\circ\text{C}$


- Notes:**
1. Derate linearly @ 4.57 mW/ $^\circ\text{C}$  for  $T_A > +25^\circ\text{C}$ .
  2. Derate linearly @ 28.5 mW/ $^\circ\text{C}$  for  $T_C > +25^\circ\text{C}$ .




**U4 Package**

Also available in:

**UA package**  
(surface mount)

 [2N3439UA – 2N3440UA](#)

**TO-5 package**  
(long leaded)

 [2N3439L – 2N3440L](#)

**TO-39 package**  
(leaded)

 [2N3439 – 2N3440](#)

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**MSC – Ireland**

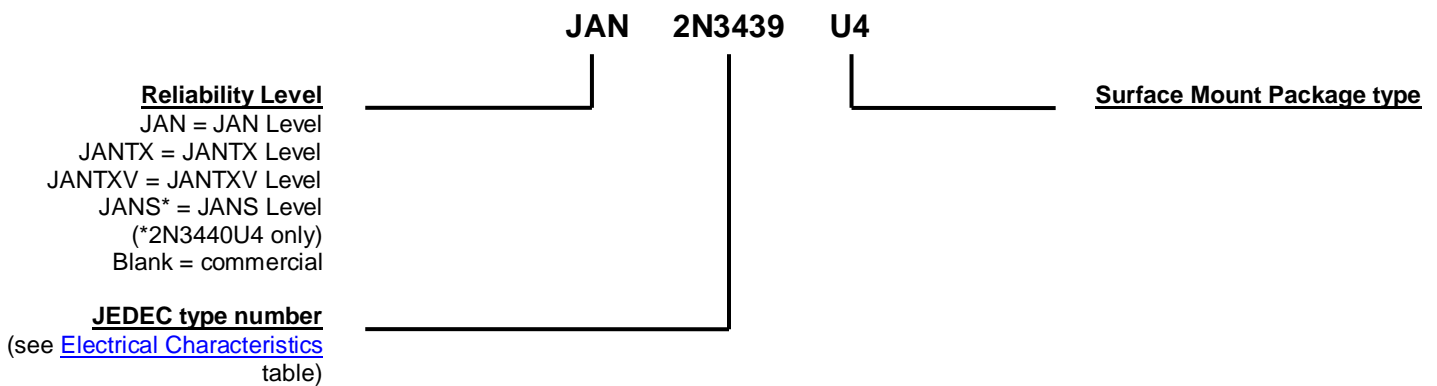
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**Website:**

[www.microsemi.com](http://www.microsemi.com)

**MECHANICAL and PACKAGING**

- CASE: Hermetically sealed, aluminum nitride (AlN) ceramic body with gold over nickel plated kovar lid.
- TERMINALS: Gold over nickel plated surface mount terminations.
- MARKING: Part number, date code, manufacturer's ID.
- POLARITY: See package dimensions.
- TAPE & REEL option: Standard per EIA-481D. Consult factory for quantities.
- WEIGHT: 0.125 grams (125 milligrams).
- See [Package Dimensions](#) on last page.

**PART NOMENCLATURE**

**SYMBOLS & DEFINITIONS**

Symbol	Definition
$C_{ibo}$	Common-base open-circuit input capacitance.
$C_{obo}$	Common-base open-circuit output capacitance.
$I_{CEO}$	Collector cutoff current, base open.
$I_{CEX}$	Collector cutoff current, circuit between base and emitter.
$I_{EBO}$	Emitter cutoff current, collector open.
$h_{FE}$	Common-emitter static forward current transfer ratio.
$V_{BE}$	Base-emitter voltage, dc.
$V_{CE}$	Collector-emitter voltage, dc.
$V_{CEO}$	Collector-emitter voltage, base open.
$V_{CBO}$	Collector-emitter voltage, emitter open.
$V_{EB}$	Emitter-base voltage, dc.
$V_{EBO}$	Emitter-base voltage, collector open.

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Collector-Emitter Breakdown Voltage $I_C = 10 \text{ mA}$ $R_{BB1} = 470 \Omega$ ; $V_{BB1} = 6 \text{ V}$ $L = 25 \text{ mH (min)}$ ; $f = 30 - 60 \text{ Hz}$	2N3439U4 2N3440U4 $V_{(BR)CEO}$	350 250		V
Collector-Emitter Cutoff Current $V_{CE} = 300 \text{ V}$ $V_{CE} = 200 \text{ V}$	2N3439U4 2N3440U4 $I_{CEO}$		2.0 2.0	$\mu\text{A}$
Emitter-Base Cutoff Current $V_{EB} = 7.0 \text{ V}$	$I_{EBO}$		10	$\mu\text{A}$
Collector-Emitter Cutoff Current $V_{CE} = 450 \text{ V}$ , $V_{BE} = -1.5 \text{ V}$ $V_{CE} = 300 \text{ V}$ , $V_{BE} = -1.5 \text{ V}$	2N3439U4 2N3440U4 $I_{CEX}$		5.0 5.0	$\mu\text{A}$
Collector-Base Cutoff Current $V_{CB} = 360 \text{ V}$ $V_{CB} = 250 \text{ V}$ $V_{CB} = 450 \text{ V}$ $V_{CB} = 300 \text{ V}$	2N3439U4 2N3440U4 2N3439U4 2N3440U4 $I_{CBO}$		2.0 2.0 5.0 5.0	$\mu\text{A}$

**ON CHARACTERISTICS <sup>(1)</sup>**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Forward-Current Transfer Ratio $I_C = 20 \text{ mA}$ , $V_{CE} = 10 \text{ V}$ $I_C = 2.0 \text{ mA}$ , $V_{CE} = 10 \text{ V}$ $I_C = 0.2 \text{ mA}$ , $V_{CE} = 10 \text{ V}$	$h_{FE}$	40 30 10	160	
Collector-Emitter Saturation Voltage $I_C = 50 \text{ mA}$ , $I_B = 4.0 \text{ mA}$	$V_{CE(sat)}$		0.5	V
Base-Emitter Saturation Voltage $I_C = 50 \text{ mA}$ , $I_B = 4.0 \text{ mA}$	$V_{BE(sat)}$		1.3	V

**DYNAMIC CHARACTERISTICS**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 10 \text{ mA}$ , $V_{CE} = 10 \text{ V}$ , $f = 5.0 \text{ MHz}$	$ h_{fe} $	3.0	15	
Forward Current Transfer Ratio $I_C = 5.0 \text{ mA}$ , $V_{CE} = 10\text{V}$ , $f = 1.0 \text{ kHz}$	$h_{fe}$	25		
Output Capacitance $V_{CB} = 10 \text{ V}$ , $I_E = 0$ , $100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	$C_{obo}$		10	pF
Input Capacitance $V_{CB} = 5.0 \text{ V}$ , $I_E = 0$ , $100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	$C_{ibo}$		75	pF

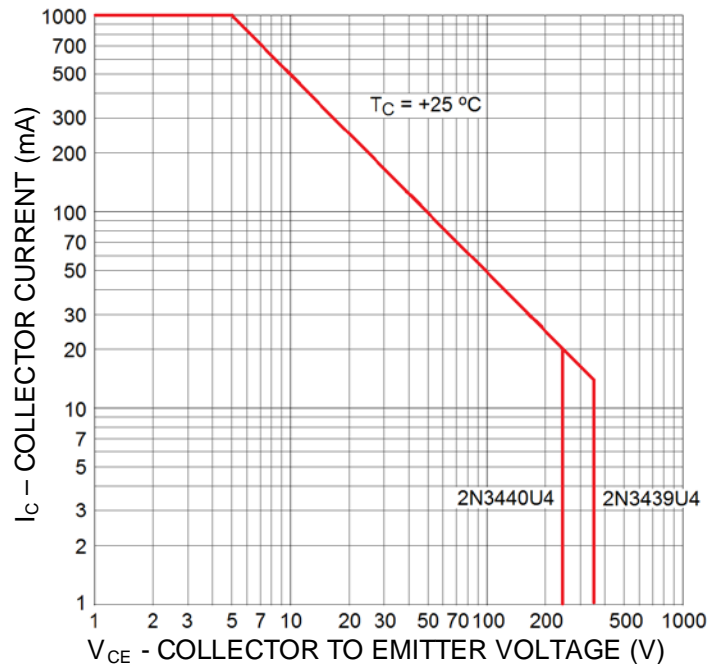
(1) Pulse Test: Pulse Width = 300  $\mu\text{s}$ , duty cycle  $\leq 2.0\%$ .

**ELECTRICAL CHARACTERISTICS @  $T_A = +25^\circ\text{C}$ , unless otherwise noted. (continued)**
**SWITCHING CHARACTERISTICS**

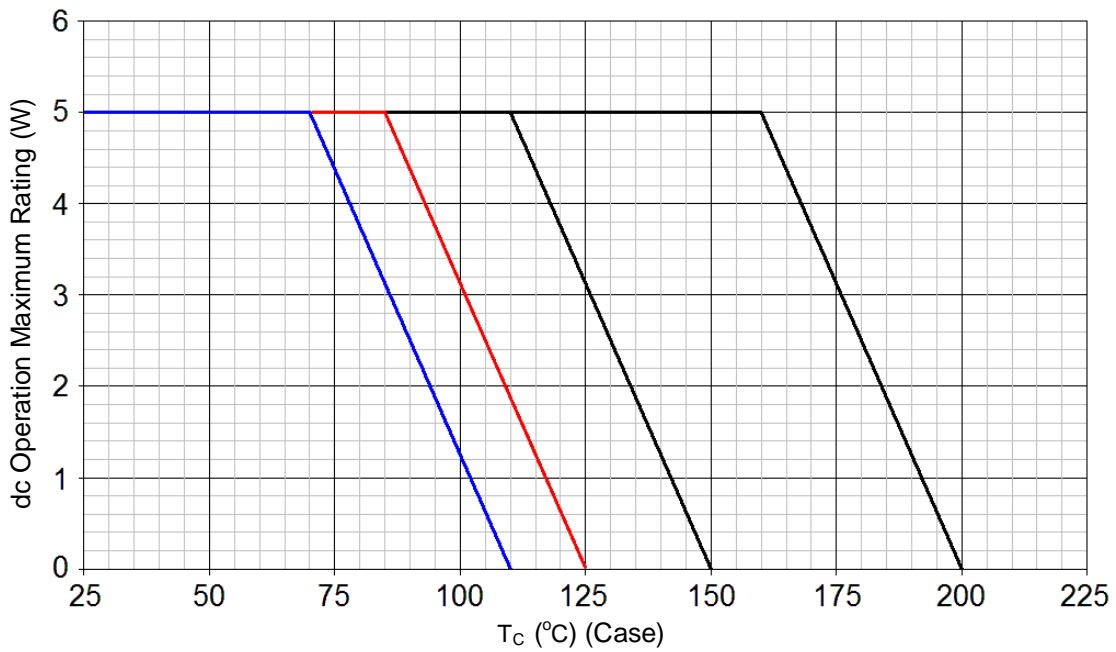
Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Turn-On Time $V_{CC} = 200\text{ V}; I_C = 20\text{ mA}, I_{B1} = 2.0\text{ mA}$	$t_{on}$		1.0	$\mu\text{s}$
Turn-Off Time $V_{CC} = 200\text{ V}; I_C = 20\text{ mA}, I_{B1} = -I_{B2} = 2.0\text{ mA}$	$t_{off}$		10	$\mu\text{s}$

**SAFE OPERATING AREA** (See graph below and reference [MIL-STD-750, method 3053](#))

DC Tests	
$T_C = +25^\circ\text{C}$ , 1 Cycle, $t = 1.0\text{ s}$	
<b>Test 1</b> $V_{CE} = 5.0\text{ V}, I_C = 1.0\text{ A}$	Both Types
<b>Test 2</b> $V_{CE} = 350\text{ V}, I_C = 14\text{ mA}$	2N3439U4
<b>Test 3</b> $V_{CE} = 250\text{ V}, I_C = 20\text{ mA}$	2N3440U4


Maximum Safe Operating Area (continuous dc)

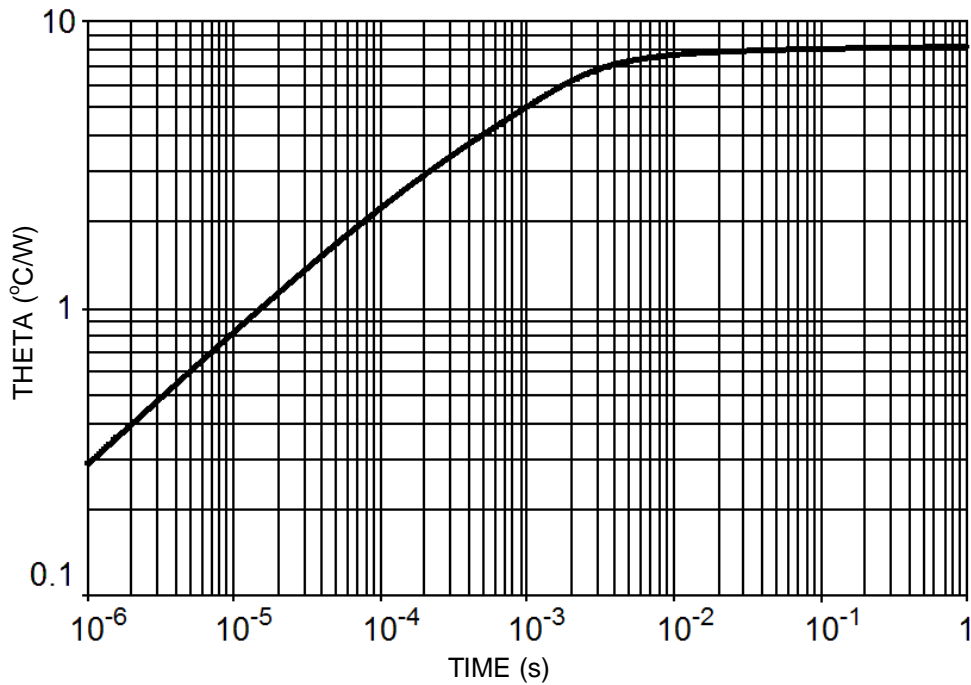
GRAPHS



**FIGURE 1**

Temperature-Power Derating Curve

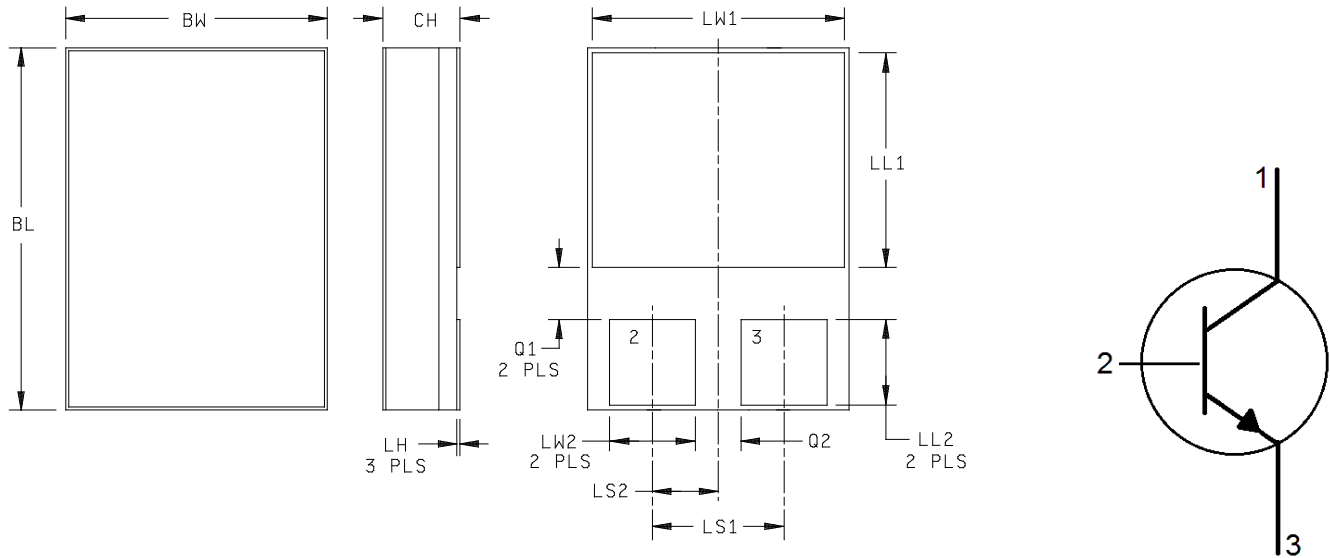
**NOTES:** Thermal Resistance Junction to Case = 8.0 °C/W  
Max Finish-Alloy Temp = 175 °C



**FIGURE 2**

Maximum Thermal Impedance

**NOTE:** T<sub>C</sub> = +25 °C, Thermal Resistance R<sub>θJC</sub> = 8.0 °C/W

**PACKAGE DIMENSIONS**

**NOTES:**

1. Dimensions are in inches.
2. Millimeter equivalents are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
<b>BL</b>	0.215	0.225	5.46	5.72
<b>BW</b>	0.145	0.155	3.68	3.94
<b>CH</b>	0.049	0.075	1.24	1.91
<b>LH</b>		0.020		0.51
<b>LW1</b>	0.135	0.145	3.43	3.68
<b>LW2</b>	0.047	0.057	1.19	1.45
<b>LL1</b>	0.085	0.125	2.16	3.17
<b>LL2</b>	0.045	0.075	1.14	1.90
<b>LS1</b>	0.070	0.095	1.78	2.41
<b>LS2</b>	0.035	0.048	0.89	1.21
<b>Q1</b>	0.030	0.070	0.76	1.78
<b>Q2</b>	0.020	0.035	0.51	0.89
<b>TERMINAL</b>				
<b>1</b>	COLLECTOR			
<b>2</b>	BASE			
<b>3</b>	EMITTER			

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