

## RADIATION HARDENED NPN LOW POWER SILICON TRANSISTOR *Qualified per MIL-PRF-19500/368*

### DEVICES

<b>2N3439</b>	<b>2N3440</b>
<b>2N3439L</b>	<b>2N3440L</b>
<b>2N3439UA</b>	<b>2N3440UA</b>

### LEVELS

<b>JANSM – 3K Rads (Si)</b>
<b>JANSD – 10K Rads (Si)</b>
<b>JANSP – 30K Rads (Si)</b>
<b>JANSL – 50K Rads (Si)</b>
<b>JANSR – 100K Rads (Si)</b>

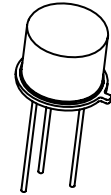
### ABSOLUTE MAXIMUM RATINGS ( $T_C = +25^\circ\text{C}$ unless otherwise noted)

Parameters / Test Conditions	Symbol	2N3439	2N3440	Unit
Collector-Emitter Voltage	$V_{CEO}$	350	250	Vdc
Collector-Base Voltage	$V_{CBO}$	450	300	Vdc
Emitter-Base Voltage	$V_{EBO}$	7.0		Vdc
Collector Current	$I_C$	1.0		A dc
Total Power Dissipation	$P_T$	0.8		W
UA		5.0		
		2.0		
Operating & Storage Temperature Range	$T_{op}, T_{stg}$	-65 to +200		$^\circ\text{C}$

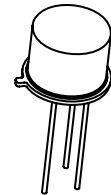
- 1) Derate linearly @ 4.57mW/ $^\circ\text{C}$  for  $T_A > +25^\circ\text{C}$
- 2) Derate linearly @ 28.5mW/ $^\circ\text{C}$  for  $T_C > +25^\circ\text{C}$
- 3) Derate linearly @ 14mW/ $^\circ\text{C}$  for  $T_{SP} > +25^\circ\text{C}$

### ELECTRICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise noted)

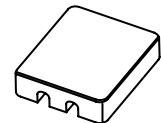
Parameters / Test Conditions	Symbol	Min.	Ma x.	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage $I_C = 10\text{mA dc}$ $R_{BB1} = 470\Omega; V_{BB1} = 6\text{V}$ $L = 25\text{mH (min)}; f = 30 - 60\text{Hz}$	$V_{(BR)CEO}$	350		Vdc
		250		
Collector-Emitter Cutoff Current $V_{CE}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



**TO-5 \***  
**2N3439L, 2N3440L**



**TO-39 \* (TO-205AD)**  
**2N3439, 2N3440**



**UA**  
**2N3439UA, 2N3440UA**

\* See Appendix A for Package Outline

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>ON CHARACTERISTICS</b> <sup>(3)</sup>				
Forward-Current Transfer Ratio $I_C = 20\text{mA}$ , $V_{CE} = 10\text{Vdc}$ $I_C = 2.0\text{mA}$ , $V_{CE} = 10\text{Vdc}$ $I_C = 0.2\text{mA}$ , $V_{CE} = 10\text{Vdc}$	$h_{FE}$	40 30 10	160	
Collector-Emitter Saturation Voltage $I_C = 50\text{mA}$ , $I_B = 4.0\text{mA}$	$V_{CE(sat)}$		0.5	Vdc
Base-Emitter Saturation Voltage $I_C = 50\text{mA}$ , $I_B = 4.0\text{mA}$	$V_{BE(sat)}$		1.3	Vdc

**DYNAMIC CHARACTERISTICS**

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

**SWITCHING CHARACTERISTICS**

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

**SAFE OPERATING AREA**

<b>DC Tests</b>	
$T_C = +25^\circ\text{C}$ , 1 Cycle, $t = 1.0\text{s}$	
<b>Test 1</b>	
$V_{CE} = 5.0\text{Vdc}$ , $I_C = 1.0\text{A}$	Both Types
<b>Test 2</b>	
$V_{CE} = 350\text{Vdc}$ , $I_C = 14\text{mA}$	2N3439
<b>Test 3</b>	
$V_{CE} = 250\text{Vdc}$ , $I_C = 20\text{mA}$	2N3440

(3) Pulse Test: Pulse Width =  $300\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$