



## 13003ADG

Preliminary

**NPN SILICON TRANSISTOR**

### NPN SILICON POWER TRANSISTOR

#### DESCRIPTION

These devices are designed for high-voltage, high-speed power switching inductive circuits where fall time is critical. They are particularly suited for 115 and 220V applications in switch mode.

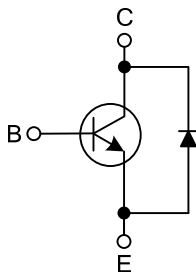
#### FEATURES

- \* Reverse biased SOA with inductive load @  $T_c=100^\circ\text{C}$
- \* Inductive switching matrix 0.5 ~ 1.5 Amp, 25 and  $100^\circ\text{C}$   
Typical  $t_c = 290\text{ns}$  @ 1A,  $100^\circ\text{C}$ .
- \* 700V blocking capability

#### APPLICATIONS

- \* Switching regulator's, inverters
- \* Motor controls
- \* Solenoid/relay drivers
- \* Deflection circuits

#### EQUIVALENT CIRCUIT

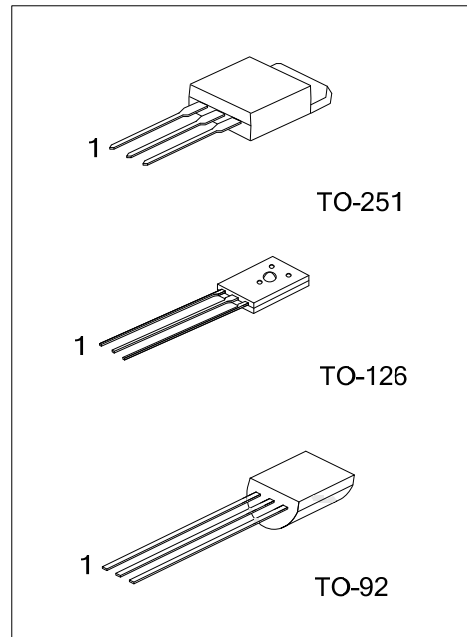


#### ORDERING INFORMATION

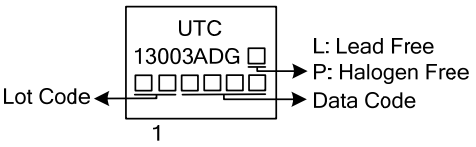
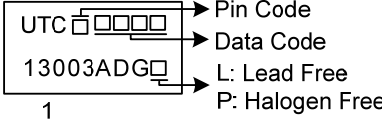
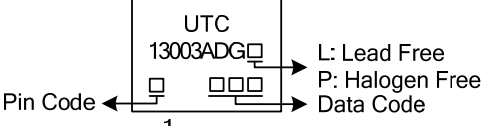
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
13003ADGL-TM3-T	13003ADGP-TM3-T	TO-251	B	C	E	Tube
13003ADGL-T60-F-K	13003ADGP-T60-F-K	TO-126	B	C	E	Bulk
13003ADGL-T92-F-B	13003ADGP-T92-F-B	TO-92	B	C	E	Tape Box
13003ADGL-T92-F-K	13003ADGP-T92-F-K	TO-92	B	C	E	Bulk

Note: Pin Assignment: B: Base C: Collector E: Emitter

<p>13003ADGL-T60-F-B</p>	<p>(1) T: Tube, B: Bluk, K: Bulk</p> <p>(2) refer to Pin Assignment</p> <p>(3) TM3: TO-251, T60: TO-126, T92: TO-92</p> <p>(4) L: Lead Free, P: Halogen Free</p>
--------------------------	--



■ MARKING

PACKAGE	MARKING
TO-251	 <p>Diagram showing marking on a TO-251 package. The marking includes 'UTC', '13003ADG', and a Lot Code (four squares). A '1' is located below the marking. Arrows point to 'L: Lead Free', 'P: Halogen Free', and 'Data Code'.</p>
TO-126	 <p>Diagram showing marking on a TO-126 package. The marking includes 'UTC', '13003ADG', and a Pin Code (four squares). A '1' is located below the marking. Arrows point to 'Pin Code', 'Data Code', 'L: Lead Free', and 'P: Halogen Free'.</p>
TO-92	 <p>Diagram showing marking on a TO-92 package. The marking includes 'UTC', '13003ADG', and a Pin Code (two squares). A '1' is located below the marking. Arrows point to 'L: Lead Free', 'P: Halogen Free', and 'Data Code'.</p>

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT	
Collector-Emitter Voltage		$V_{CEO(SUS)}$	400	V	
Collector-Base Voltage		$V_{CBO}$	700	V	
Emitter Base Voltage		$V_{EBO}$	9	V	
Collector Current	Continuous	$I_C$	1.5	A	
	Peak (1)	$I_{CM}$	3		
Base Current	Continuous	$I_B$	0.75	A	
	Peak (1)	$I_{BM}$	1.5		
Emitter Current	Continuous	$I_E$	2.25	A	
	Peak (1)	$I_{EM}$	4.5		
Power Dissipation	$T_A=25^\circ\text{C}$	TO-126	$P_D$	1.4	W
		TO-92		1.1	W
		TO-251		1.56	W
	$T_C=25^\circ\text{C}$	TO-126		20	W
		TO-92		1.5	W
		TO-251		25	W
Junction Temperature		$T_J$	+150	$^\circ\text{C}$	
Storage Temperature		$T_{STG}$	-55 ~ +150	$^\circ\text{C}$	

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.  
 Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS (Note)</b>						
Collector-Emitter Sustaining Voltage	V <sub>CEO(SUS)</sub>	I <sub>C</sub> =10mA, I <sub>B</sub> =0	400			V
Collector Cutoff Current	I <sub>CEO</sub>	V <sub>CEO</sub> =Rated Value, V <sub>BE(OFF)</sub> =1.5 V			1	mA
			T <sub>C</sub> =25°C			
Emitter Cutoff Current	I <sub>EBO</sub>	V <sub>EB</sub> =9V, I <sub>C</sub> =0			1	mA
<b>SECOND BREAKDOWN</b>						
Second Breakdown Collector Current with base forward biased	I <sub>S/b</sub>			See Fig.5		
Clamped Inductive SOA with base reverse biased	RB <sub>SOA</sub>			See Fig.6		
<b>ON CHARACTERISTICS (Note)</b>						
DC Current Gain	h <sub>FE1</sub>	I <sub>C</sub> =0.5A, V <sub>CE</sub> =5V	14		57	
	h <sub>FE2</sub>	I <sub>C</sub> =1A, V <sub>CE</sub> =5V	5		30	
Collector-Emitter Saturation Voltage	V <sub>CE(SAT)</sub>	I <sub>C</sub> =0.5A, I <sub>B</sub> =0.1A			0.5	V
		I <sub>C</sub> =1A, I <sub>B</sub> =0.25A			1	
		I <sub>C</sub> =1.5A, I <sub>B</sub> =0.5A			3	
		I <sub>C</sub> =1A, I <sub>B</sub> =0.25A, T <sub>C</sub> =100°C			1	
Base-Emitter Saturation Voltage	V <sub>BE(SAT)</sub>	I <sub>C</sub> =0.5A, I <sub>B</sub> =0.1A			1	V
		I <sub>C</sub> =1A, I <sub>B</sub> =0.25A			1.2	
		I <sub>C</sub> =1A, I <sub>B</sub> =0.25A, T <sub>C</sub> =100°C			1.1	
<b>DYNAMIC CHARACTERISTICS</b>						
Current-Gain-Bandwidth Product	f <sub>T</sub>	I <sub>C</sub> =100mA, V <sub>CE</sub> =10V, f=1MHz	4	10		MHz
Output Capacitance	C <sub>OB</sub>	V <sub>CB</sub> =10V, I <sub>E</sub> =0, f=0.1MHz		21		pF
<b>SWITCHING CHARACTERISTICS</b>						
<b>Resistive Load (Table 1)</b>						
Delay Time	t <sub>D</sub>	V <sub>CC</sub> =125V, I <sub>C</sub> =1A, I <sub>B1</sub> =I <sub>B2</sub> =0.2A, t <sub>p</sub> =25μs, Duty Cycle≤1%		0.05	0.1	μs
Rise Time	t <sub>R</sub>			0.5	1	μs
Storage Time	t <sub>S</sub>			2	4	μs
Fall Time	t <sub>F</sub>			0.4	0.7	μs
<b>Inductive Load, Clamped (Table 1)</b>						
Storage Time	t <sub>STG</sub>	I <sub>C</sub> =1A, V <sub>CLAMP</sub> =300V, I <sub>B1</sub> =0.2A, V <sub>BE(OFF)</sub> =5V <sub>DC</sub> , T <sub>C</sub> =100°C		1.7	4	μs
Crossover Time	t <sub>C</sub>			0.29	0.75	μs
Fall Time	t <sub>F</sub>			0.15		μs
Diode Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =0.5A			1.5	V

Note: Pulse Test: PW=300μs, Duty Cycle≤2%

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.