



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.

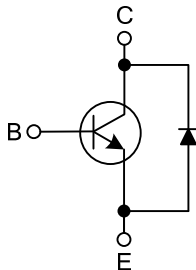
FEATURES

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

APPLICATIONS

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

EQUIVALENT CIRCUIT

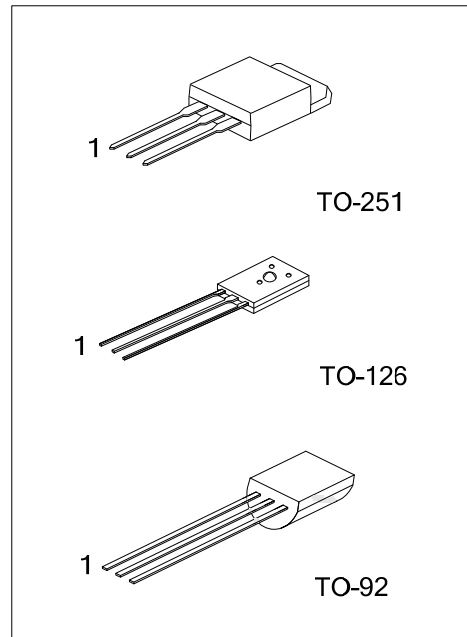


ORDERING INFORMATION

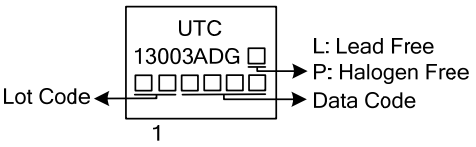
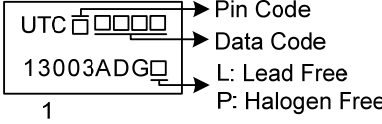
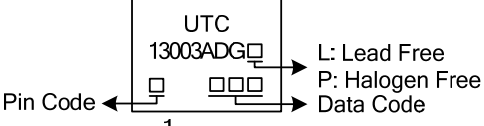
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
13003ADGL-TM3-T	13003ADGP-TM3-T	TO-251	B	C	E	Tube
13003ADGL-T60-F-K	13003ADGP-T60-F-K	TO-126	B	C	E	Bulk
13003ADGL-T92-F-B	13003ADGP-T92-F-B	TO-92	B	C	E	Tape Box
13003ADGL-T92-F-K	13003ADGP-T92-F-K	TO-92	B	C	E	Bulk

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

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

PACKAGE	MARKING
TO-251	 <p>UTC 13003ADG □ Lot Code ← □ □ □ □ □ → Data Code 1</p> <p>L: Lead Free P: Halogen Free</p>
TO-126	 <p>UTC □ □ □ □ □ → Pin Code Data Code 13003ADG □ → L: Lead Free P: Halogen Free 1</p>
TO-92	 <p>UTC 13003ADG □ → L: Lead Free P: Halogen Free Data Code Pin Code ← □ □ □ → 1</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 ($T_C=25^\circ\text{C}$, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS (Note)						
Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}$	$I_C=10\text{mA}$, $I_B=0$	400			V
Collector Cutoff Current	I_{CEO}	$V_{CEO}=\text{Rated Value}$, $V_{BE(OFF)}=1.5\text{V}$			1	mA
			$T_C=25^\circ\text{C}$		5	
Emitter Cutoff Current	I_{EBO}	$V_{EB}=9\text{V}$, $I_C=0$			1	mA
SECOND BREAKDOWN						
Second Breakdown Collector Current with base forward biased	$I_{S/b}$			See Fig.5		
Clamped Inductive SOA with base reverse biased	RB_{SOA}			See Fig.6		
ON CHARACTERISTICS (Note)						
DC Current Gain	h_{FE1}	$I_C=0.5\text{A}$, $V_{CE}=5\text{V}$	14		57	
	h_{FE2}	$I_C=1\text{A}$, $V_{CE}=5\text{V}$	5		30	
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_C=0.5\text{A}$, $I_B=0.1\text{A}$			0.5	V
		$I_C=1\text{A}$, $I_B=0.25\text{A}$			1	
		$I_C=1.5\text{A}$, $I_B=0.5\text{A}$			3	
		$I_C=1\text{A}$, $I_B=0.25\text{A}$, $T_C=100^\circ\text{C}$			1	
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	$I_C=0.5\text{A}$, $I_B=0.1\text{A}$			1	V
		$I_C=1\text{A}$, $I_B=0.25\text{A}$			1.2	
		$I_C=1\text{A}$, $I_B=0.25\text{A}$, $T_C=100^\circ\text{C}$			1.1	
DYNAMIC CHARACTERISTICS						
Current-Gain-Bandwidth Product	f_T	$I_C=100\text{mA}$, $V_{CE}=10\text{V}$, $f=1\text{MHz}$	4	10		MHz
Output Capacitance	C_{OB}	$V_{CB}=10\text{V}$, $I_E=0$, $f=0.1\text{MHz}$		21		pF
SWITCHING CHARACTERISTICS						
Resistive Load (Table 1)						
Delay Time	t_D	$V_{CC}=125\text{V}$, $I_C=1\text{A}$, $I_{B1}=I_{B2}=0.2\text{A}$, $t_P=25\mu\text{s}$, Duty Cycle $\leq 1\%$		0.05	0.1	μs
Rise Time	t_R			0.5	1	μs
Storage Time	t_S			2	4	μs
Fall Time	t_F			0.4	0.7	μs
Inductive Load, Clamped (Table 1)						
Storage Time	t_{STG}	$I_C=1\text{A}$, $V_{CLAMP}=300\text{V}$, $I_{B1}=0.2\text{A}$, $V_{BE(OFF)}=5V_{DC}$, $T_C=100^\circ\text{C}$		1.7	4	μs
Crossover Time	t_C			0.29	0.75	μs
Fall Time	t_F			0.15		μs
Diode Forward Voltage	V_F	$I_F=0.5\text{A}$			1.5	V

Note: Pulse Test: $PW=300\mu\text{s}$, Duty Cycle $\leq 2\%$

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