



## 13003CDH

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.

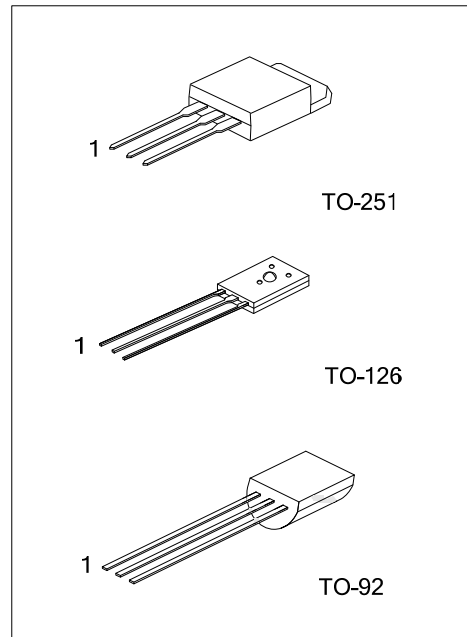
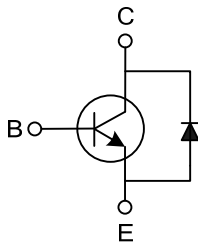
#### FEATURES

- \* 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.
- \* 900V 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	
13003CDHL-TM3-T	13003CDHG-TM3-T	TO-251	B	C	E	Tube
13003CDHL-T60-K	13003CDHG-T60-K	TO-126	B	C	E	Bulk
13003CDHL-T92-B	13003CDHG-T92-B	TO-92	B	C	E	Tape Box
13003CDHL-T92-K	13003CDHG-T92-K	TO-92	B	C	E	Bulk
13003CDHL-T92-R	13003CDHG-T92-R	TO-92	B	C	E	Tape Reel

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

<p>13003CDHL-TM3-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Free</p>	<p>(1) T: Tube, B: Bluk, K: Bulk, R: Tape Reel (2) TM3: TO-251, T60: TO-126, T92: TO-92 (3) L: Lead Free, G: Halogen Free</p>
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■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT	
Collector-Emitter Voltage		$V_{CEO(SUS)}$	400	V	
Collector-Base Voltage		$V_{CBO}$	900	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
<b>OFF CHARACTERISTICS (Note)</b>						
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
					5	
Emitter Cutoff Current	$I_{EBO}$	$V_{EB}=9\text{V}$ , $I_C=0$			1	mA
<b>SECOND BREAKDOWN</b>						
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		
<b>ON CHARACTERISTICS (Note)</b>						
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	
<b>DYNAMIC CHARACTERISTICS</b>						
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
<b>SWITCHING CHARACTERISTICS</b>						
<b>Resistive Load (Table 1)</b>						
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	$\mu\text{s}$
Rise Time	$t_R$			0.5	1	$\mu\text{s}$
Storage Time	$t_S$			2	4	$\mu\text{s}$
Fall Time	$t_F$			0.4	0.7	$\mu\text{s}$
<b>Inductive Load, Clamped (Table 1)</b>						
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	$\mu\text{s}$
Crossover Time	$t_C$			0.29	0.75	$\mu\text{s}$
Fall Time	$t_F$			0.15		$\mu\text{s}$
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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