



**13005EC**

Preliminary

**NPN SILICON TRANSISTOR**

**NPN SILICON POWER TRANSISTORS**

■ 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 220 V SWITCHMODE.

■ FEATURES

- \*  $V_{CE0(SUS)} = 850\text{ V}$
- \* Reverse bias SOA with inductive loads @  $T_C = 100^\circ\text{C}$
- \* Inductive switching matrix 2 to 4 Amp, 25 and  $100^\circ\text{C}$   
 $t_c @ 3\text{A}, 100^\circ\text{C}$  is 180 ns (Typ)
- \* 850V blocking capability
- \* SOA and switching applications information

■ APPLICATIONS

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

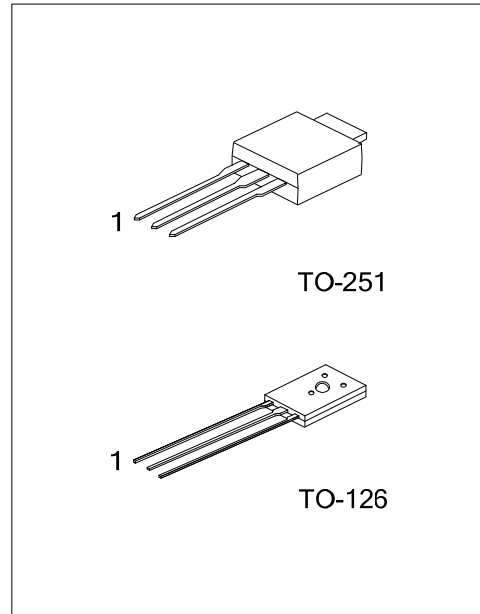
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
13005ECL-x-TM3-T	13005ECG-x-TM3-T	TO-251	B	C	E	Tube
13005ECL-x-T60-K	13005ECG-x-T60-K	TO-126	B	C	E	Bulk

<p>13005ECL-x-TM3-T</p> <p>(1)Packing Type (2)Package Type (3)Rank (4)Lead Free</p>	<p>(1) T: Tube, B: Bulk (2) TM3: TO-251, T60: TO-126 (3) x: refer to Classification of <math>h_{FE1}</math> (4) L: Lead Free, G: Halogen Free</p>
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■ MARKING INFORMATION

PACKAGE	MARKING
TO-251	<p>UTC 13005EC Lot Code Data Code L: Lead Free G: Halogen Free</p>
TO-126	<p>UTC 13005EC Data Code L: Lead Free G: Halogen Free</p>



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Collector-Emitter Voltage		$V_{CEO(SUS)}$	400	V
Collector-Emitter Voltage ( $V_{BE}=0$ )		$V_{CES}$	850	V
Collector-Base Voltage		$V_{CBO}$	850	V
Emitter Base Voltage		$V_{EBO}$	9	V
Collector Current	Continuous	$I_C$	4	A
	Peak (1)	$I_{CM}$	8	A
Base Current	Continuous	$I_B$	2	A
	Peak (1)	$I_{BM}$	4	A
Emitter Current	Continuous	$I_E$	6	A
	Peak (1)	$I_{EM}$	12	A
Power Dissipation at $T_C=25^\circ\text{C}$	TO-251	$P_D$	10	W
	TO-126		8	W
Junction Temperature		$T_J$	-65 ~ +150	$^\circ\text{C}$
Storage Temperature Range		$T_{STG}$	-65 ~ +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.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-251	$\theta_{JA}$	95	$^\circ\text{C/W}$
	TO-126		100	
Junction to Case	TO-251	$\theta_{JC}$	13	$^\circ\text{C/W}$
	TO-126		16.25	

■ ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b> (Note 1)						
Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}$	$I_C=10\text{mA}$ , $I_B=0$	850			V
Collector Cutoff Current	$I_{CBO}$	$V_{CBO}=\text{Rated Value}$ , $V_{BE(OFF)}=1.5\text{V}$			1	mA
		$V_{CBO}=\text{Rated Value}$ , $V_{BE(OFF)}=1.5\text{V}$ , $T_C=100^\circ\text{C}$			5	
Emitter Cutoff Current	$I_{EBO}$	$V_{EB}=9\text{V}$ , $I_C=0$			1	mA
<b>ON CHARACTERISTICS</b> (Note 1)						
DC Current Gain	$h_{FE1}$	$I_C=0.5\text{A}$ , $V_{CE}=5\text{V}$	15		50	
	$h_{FE2}$	$I_C=1\text{A}$ , $V_{CE}=5\text{V}$	10		60	
	$h_{FE3}$	$I_C=2\text{A}$ , $V_{CE}=5\text{V}$	8		40	
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_C=1\text{A}$ , $I_B=0.2\text{A}$			0.5	V
		$I_C=2\text{A}$ , $I_B=0.5\text{A}$			0.6	V
		$I_C=4\text{A}$ , $I_B=1\text{A}$			1	V
		$I_C=2\text{A}$ , $I_B=0.5\text{A}$ , $T_A=100^\circ\text{C}$			1	V
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	$I_C=1\text{A}$ , $I_B=0.2\text{A}$			1.2	V
		$I_C=2\text{A}$ , $I_B=0.5\text{A}$			1.6	V
		$I_C=2\text{A}$ , $I_B=0.5\text{A}$ , $T_C=100^\circ\text{C}$			1.5	V
<b>DYNAMIC CHARACTERISTICS</b>						
Current-Gain-Bandwidth Product	$f_T$	$I_C=500\text{mA}$ , $V_{CE}=10\text{V}$ , $f=1\text{MHz}$	4			MHz
Output Capacitance	$C_{OB}$	$V_{CB}=10\text{V}$ , $I_E=0$ , $f=0.1\text{MHz}$		65		pF
<b>SWITCHING CHARACTERISTICS</b>						
Resistive Load (Table 1)						
Delay Time	$t_D$	$V_{CC}=125\text{V}$ , $I_C=2\text{A}$ , $I_{B1}=I_{B2}=0.4\text{A}$ , $t_p=25\mu\text{s}$ , Duty Cycle $\leq 1\%$		0.025	0.1	$\mu\text{s}$
Rise Time	$t_R$			0.3	0.7	$\mu\text{s}$
Storage Time	$t_S$			1.7	4	$\mu\text{s}$
Fall Time	$t_F$			0.4	0.9	$\mu\text{s}$

Note: 1. Pulse Test: Pulse Width=5ms, Duty Cycle $\leq 10\%$

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

■ CLASSIFICATION OF  $h_{FE1}$

RANK	A	B	C	D	E
RANGE	15 ~ 20	20 ~ 25	25 ~ 30	30 ~ 40	40 ~ 50

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