



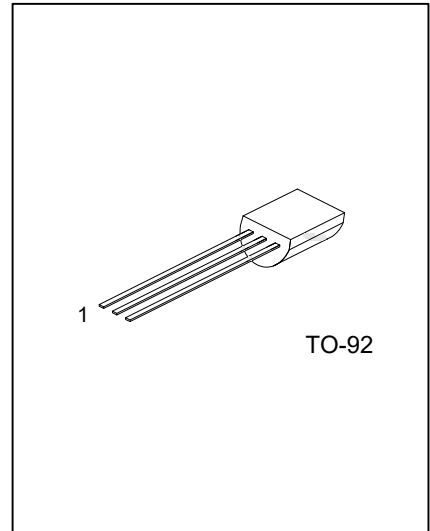
2N4401

NPN SILICON TRANSISTOR

NPN GENERAL PURPOSE AMPLIFIER

DESCRIPTION

The UTC **2N4401** is designed for use as a medium power amplifier and switch requiring collector currents up to 500mA.



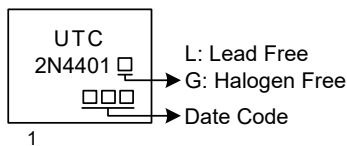
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2N4401L-T92-B	2N4401G-T92-B	TO-92	E	B	C	Tape Box
2N4401L-T92-K	2N4401G-T92-K	TO-92	E	B	C	Bulk

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

<p>2N4401G-T92-B</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) B: Tape Box, K: Bulk</p> <p>(2) T92: TO-92</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



1

■ ABSOLUTE MAXIMUM RATING ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Collector-Base Voltage	V_{CB0}	60	V
Collector-Emitter Voltage	V_{CE0}	40	V
Emitter-Base Voltage	V_{EB0}	6	V
Collector Current-Continuous	I_C	600	mA
Power Dissipation	P_D	625	mW
Derate above 25°C		5.0	mW/ $^{\circ}\text{C}$
Junction Temperature	T_J	+150	$^{\circ}\text{C}$
Storage Temperature	T_{STG}	-40 ~ +150	$^{\circ}\text{C}$

Notes: 1. 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.

2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

■ THERMAL DATA ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Junction to Ambient	θ_{JA}	200	$^{\circ}\text{C}/\text{W}$
Junction to Case	θ_{JC}	83.3	$^{\circ}\text{C}/\text{W}$

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage	BV _{CBO}	I _C =0.1mA, I _E =0	60			V
Collector-Emitter Breakdown Voltage (Note)	BV _{CEO}	I _C =1mA, I _B =0	40			V
Emitter-Base Breakdown Voltage	BV _{EBO}	I _E =0.1mA, I _C =0	6			V
Collector Cut-off Current	I _{CEX}	V _{CE} =35V, V _{EB} =0.4V				μA
Base Cut-off Current	I _{BL}	V _{CE} =35V, V _{EB} =0.4V				μA
ON CHARACTERISTICS (note)						
DC Current Gain	h _{FE1}	V _{CE} =1V, I _C =0.1mA	20			
	h _{FE2}	V _{CE} =1V, I _C =1mA	40			
	h _{FE3}	V _{CE} =1V, I _C =10mA	80			
	h _{FE4}	V _{CE} =1V, I _C =150mA	100		300	
	h _{FE5}	V _{CE} =2V, I _C =500mA	40			
Collector-Emitter Saturation Voltage	V _{CE(SAT1)}	I _C =150mA, I _B =15mA			0.4	V
	V _{CE(SAT2)}	I _C =500mA, I _B =50mA			0.75	V
Base-Emitter Saturation Voltage	V _{BE(SAT1)}	I _C =150mA, I _B =15mA	0.75		0.95	V
	V _{BE(SAT2)}	I _C =500mA, I _B =50mA			1.2	V
SMALL SIGNAL CHARACTERISTICS¹						
Current Gain Bandwidth Product	f _T	V _{CE} =10V, I _C =20mA, f=100MHz	250			MHz
Collector-Base Capacitance	C _{cb}	V _{CB} =5V, I _E =0, f=140kHz			6.5	pF
Emitter-Base Capacitance	C _{eb}	V _{BE} =0.5V, I _C =0, f=140kHz			30	pF
Input Impedance	h _{ie}	V _{CE} =10V, I _C =1mA, f=1kHz	1		15	kΩ
Voltage Feedback Ratio	h _{re}	V _{CE} =10V, I _C =1mA, f=1kHz	0.1		8	×10 ⁻⁴
Small-Signal Current Gain	h _{fe}	V _{CE} =10V, I _C =1mA, f=1kHz	40		500	
Output Admittance	h _{oe}	V _{CE} =10V, I _C =1mA, f=1kHz	1		30	μmhos
SWITCHING CHARACTERISTICS						
Delay Time	t _D	V _{CC} =30V, V _{EB} =2V I _C =150mA I _{B1} =15mA			15	ns
Rise Time	t _R	V _{CC} =30V, V _{EB} =2V I _C =150mA I _{B1} =15mA			20	ns
Storage Time	t _S				225	ns
Fall Time	t _F	V _{CC} =30V, I _C =150mA I _{B1} = I _{B2} =15mA			30	ns

Note: Pulse test: PulseWidth≤300μs, Duty Cycle≤2%

■ TEST CIRCUITS

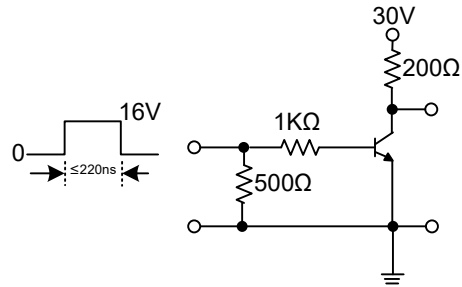


Figure1. Saturated Turn-On Switching Timer

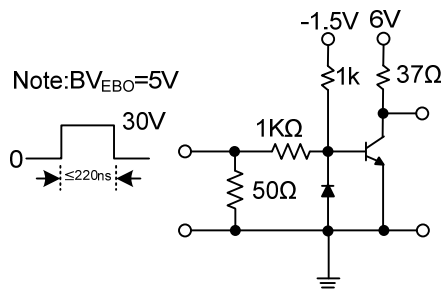
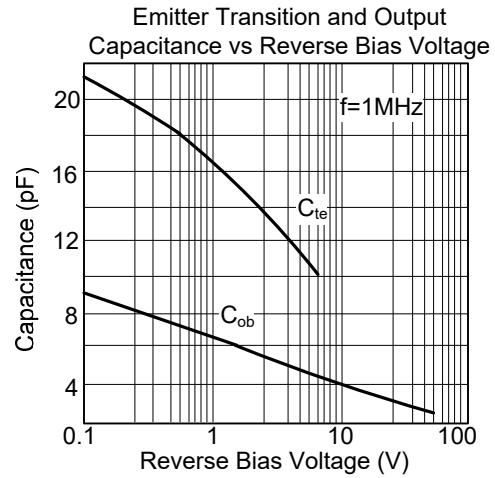
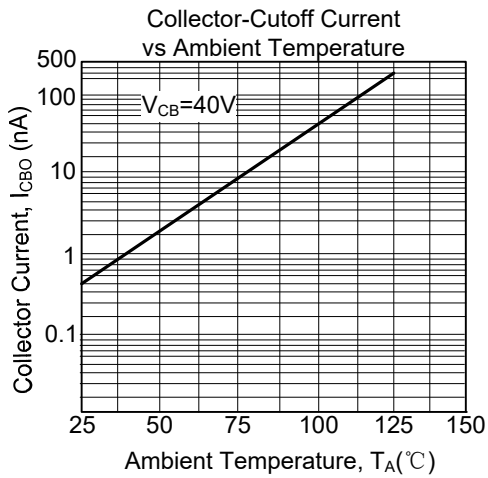
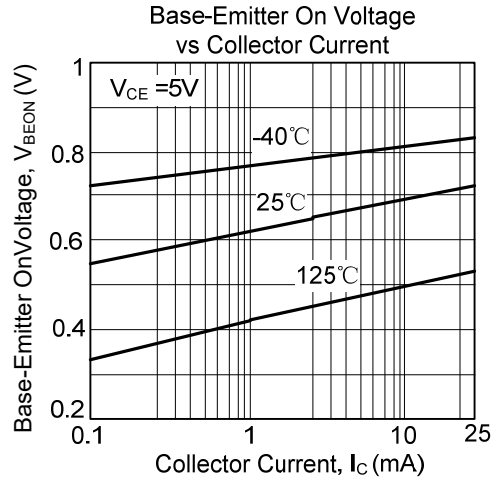
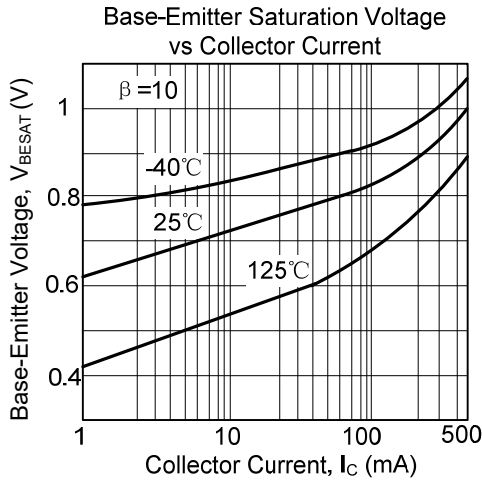
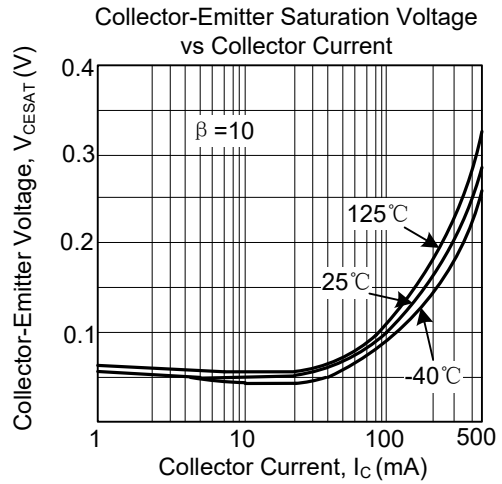
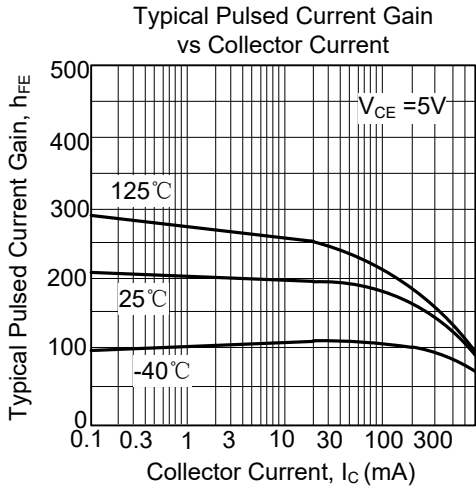
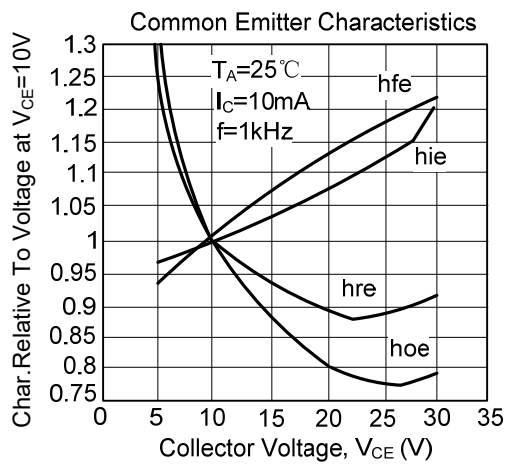
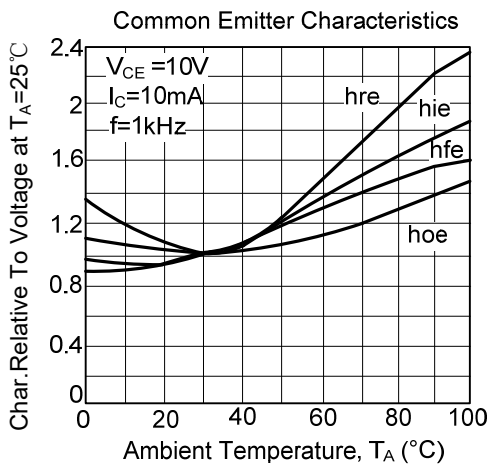
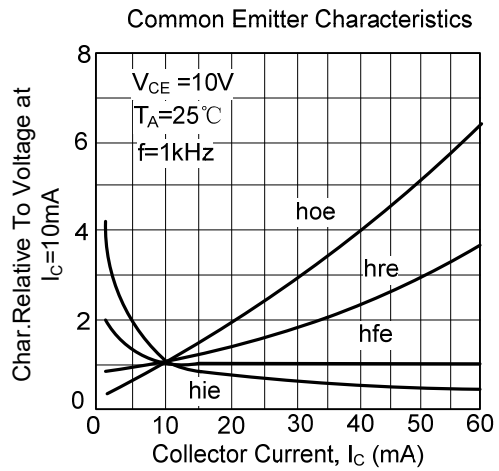
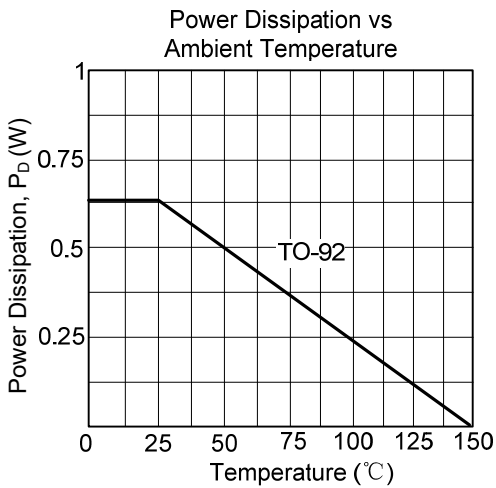
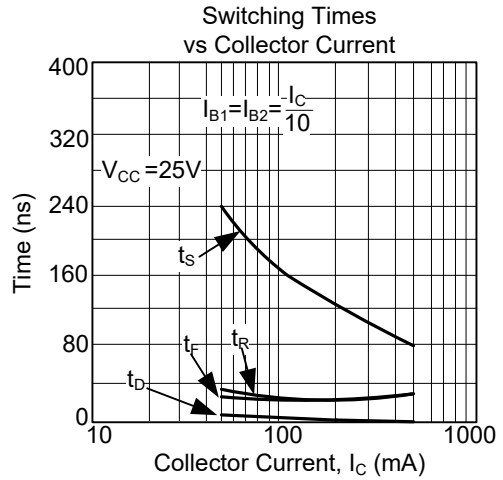
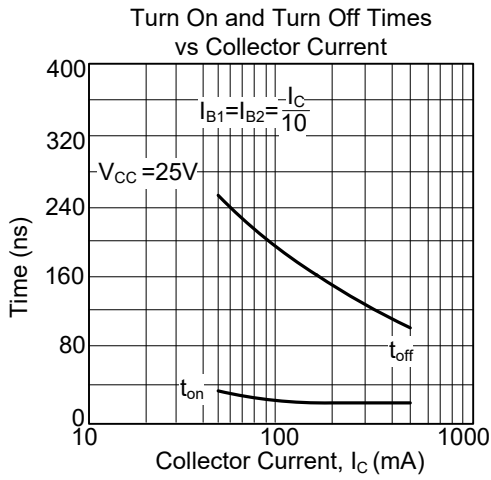


Figure2. Saturated Turn-Off Switching Timer

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



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