



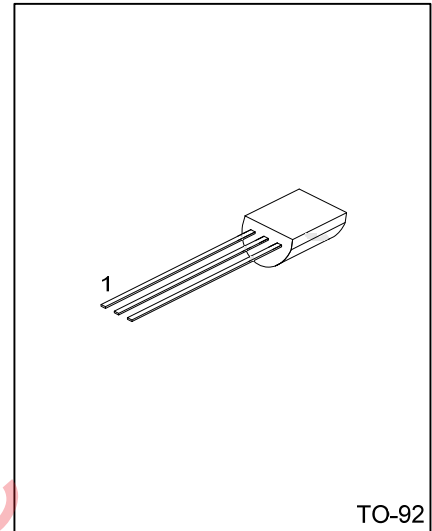
2N4401

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.



Lead-free: 2N4401L
Halogen-free: 2N4401G

ORDERING INFORMATION

Order Number			Package	Pin Assignment			Packing
Normal	Lead Free	Halogen Free		1	2	3	
2N4401-T92-B	2N4401L-T92-B	2N4401G-T92-B	TO-92	E	B	C	Tape Box
2N4401-T92-K	2N4401L-T92-K	2N4401G-T92-K	TO-92	E	B	C	Bulk

2N4401L-T92-R (1) Packing Type (2) Package Type (3) Lead Plating		(1) B: Tape Box, K: Bulk (2) T92: TO-92 (3) G: Halogen Free, L: Lead Free, Blank: Pb/Sn
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■ ABSOLUTE MAXIMUM RATING (Ta=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6	V
Collector Current-Continuous	I_C	600	mA
Power Dissipation	P_D	625	mW
Derate above 25°C		5.0	mW/°C
Junction Temperature	T_J	+150	°C
Storage Temperature	T_{STG}	-40 ~ +150	°C

Notes: 1. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

2. 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 (Ta=25°C, unless otherwise specified)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Junction to Ambient	θ_{JA}	200	°C/W
Junction to Case	θ_{JC}	83.3	°C/W

■ ELECTRICAL CHARACTERISTICS (Ta=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	k Ω
Voltage Feedback Ratio	h_{re}	$V_{CE}=10V, I_C=1mA, f=1kHz$	0.1		8	$\times 10^{-4}$
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	$\mu mhos$
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 $\leq$ 300 μs , Duty Cycle $\leq$ 2%

■ TEST CIRCUITS

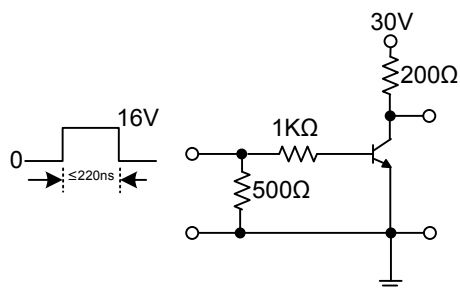


Figure1. Saturated Turn-On Switching Timer

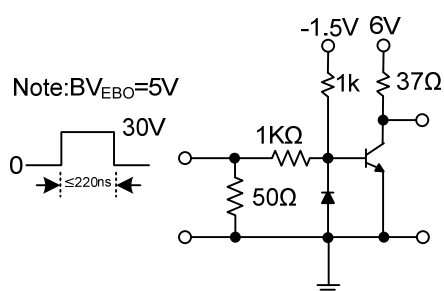
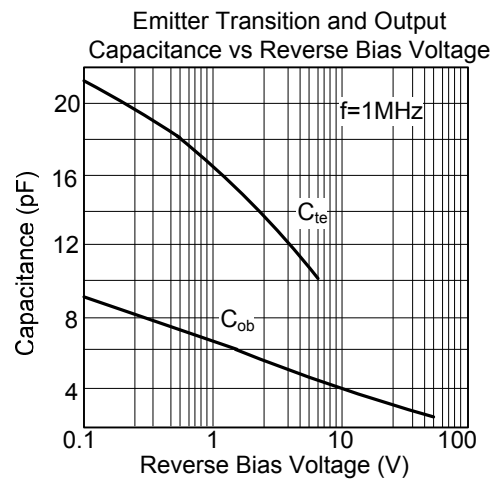
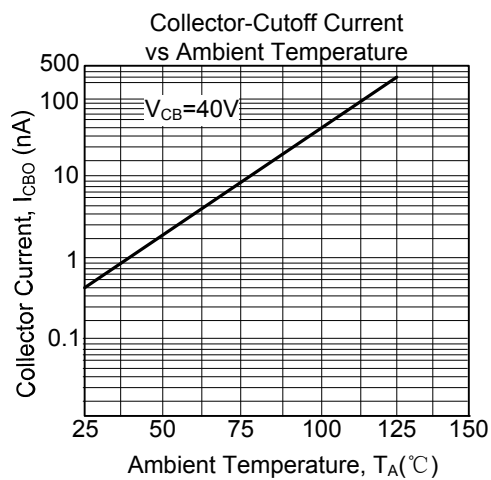
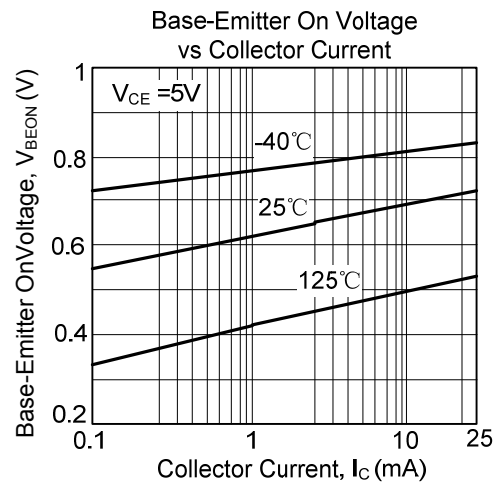
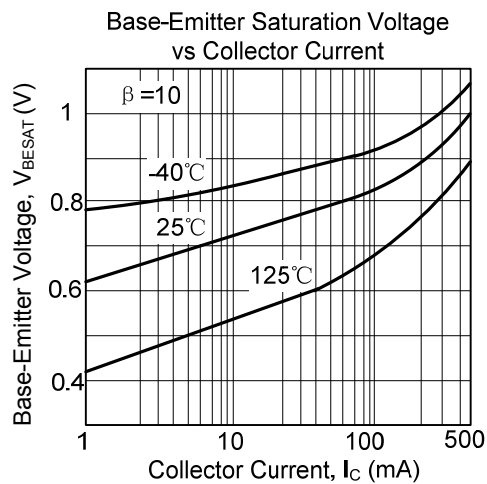
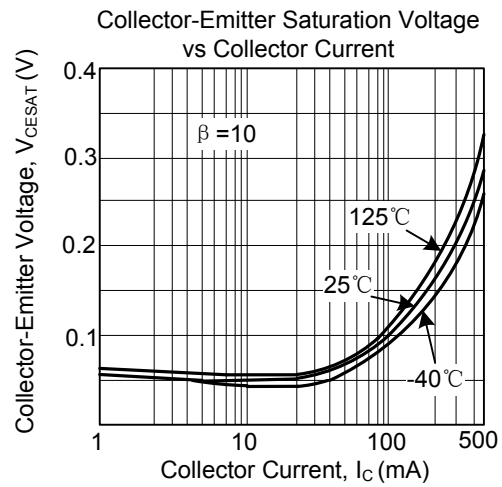
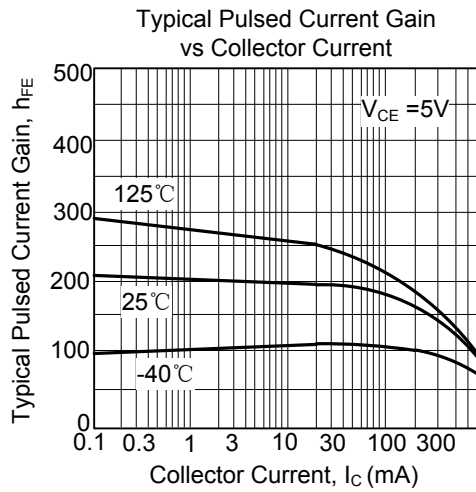
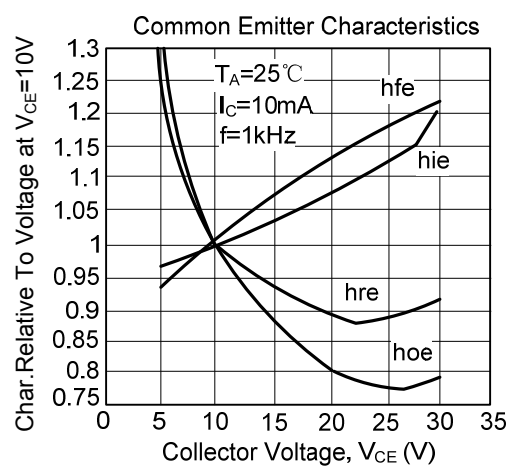
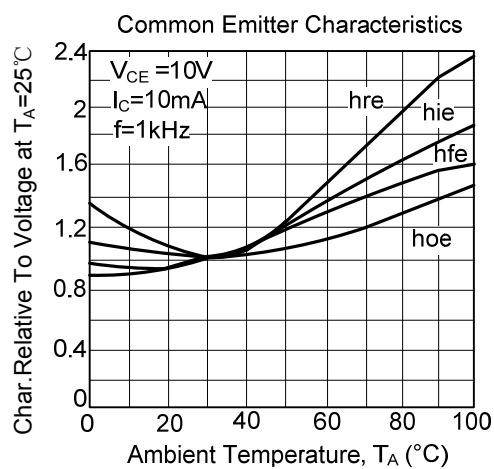
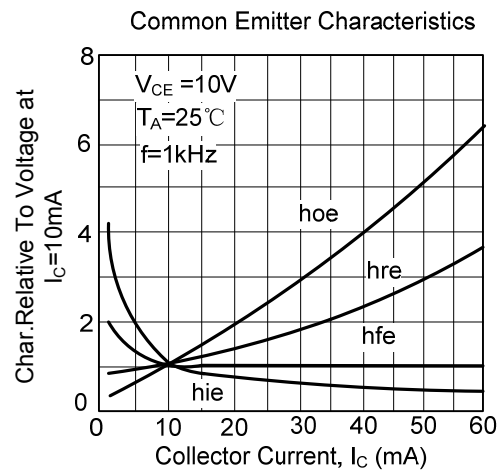
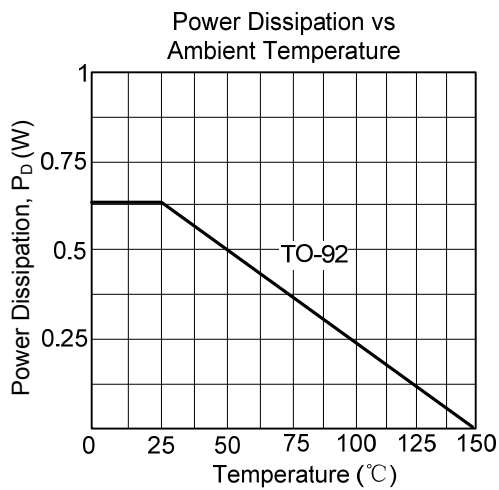
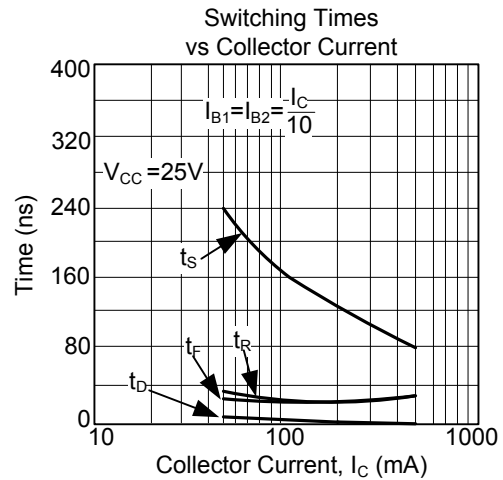
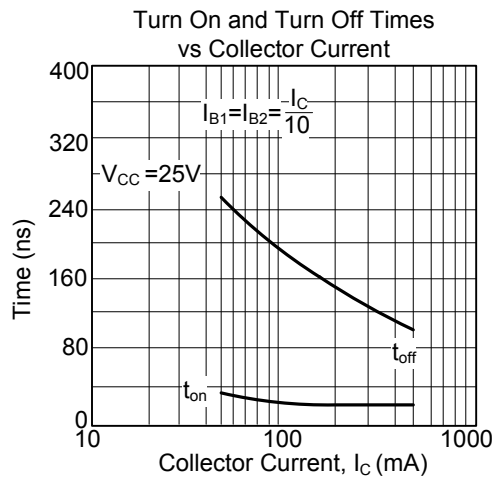


Figure2. Saturated Turn-Off Switching Timer

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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