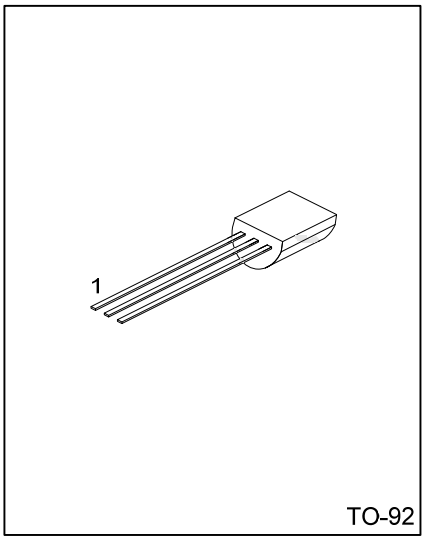
2N4401

NPN SILICON TRANSISTOR

NPN GENERAL PURPOSE AMPLIFIER



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

■ DESCRIPTION

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

■ 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

■ 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	hie	V_{CE}=10V, I_C=1mA, f=1kHz	1		15	kΩ
Voltage Feedback Ratio	hre	V_{CE}=10V, I_C=1mA, f=1kHz	0.1		8	$\times 10^{-4}$
Small-Signal Current Gain	hfe	V_{CE}=10V, I_C=1mA, f=1kHz	40		500	
Output Admittance	hoe	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

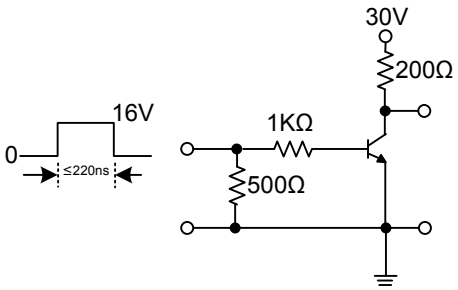


Figure1. Saturated Turn-On Switching Timer

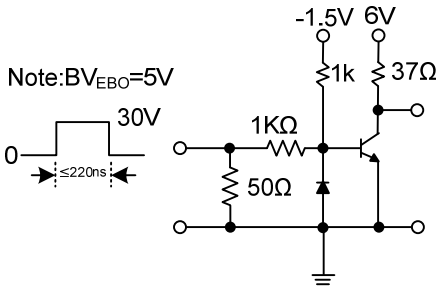
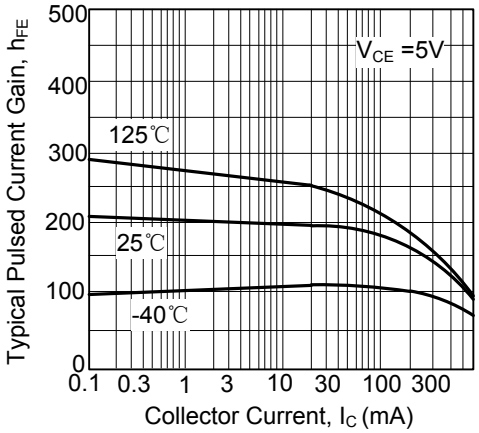


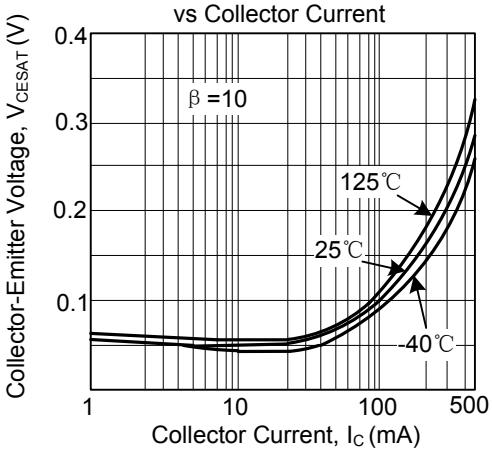
Figure2. Saturated Turn-Off Switching Timer

■ TYPICAL CHARACTERISTICS

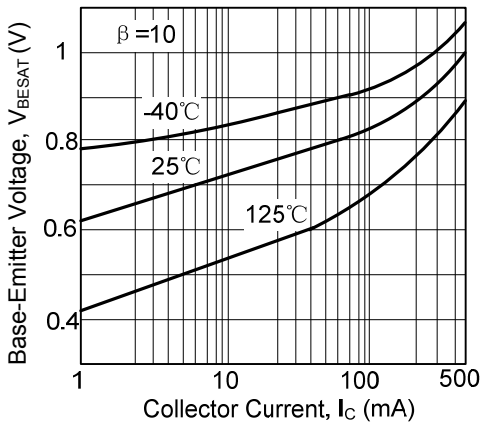
Typical Pulsed Current Gain vs Collector Current



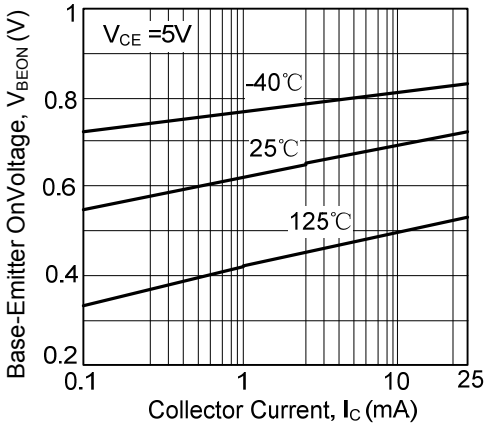
Collector-Emitter Saturation Voltage vs Collector Current



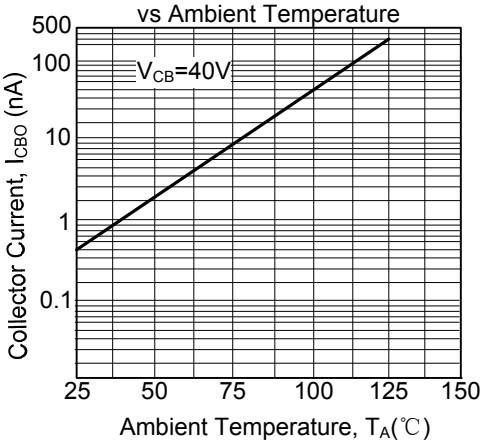
Base-Emitter Saturation Voltage vs Collector Current



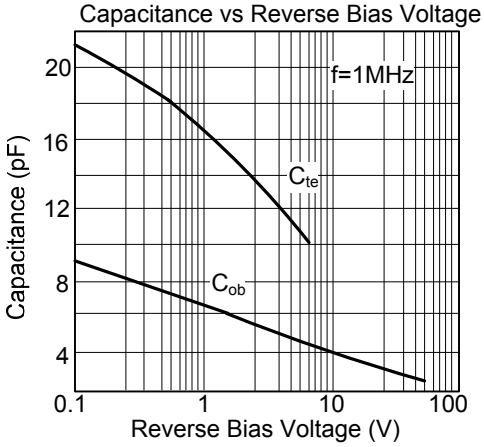
Base-Emitter On Voltage vs Collector Current



Collector-Cutoff Current vs Ambient Temperature

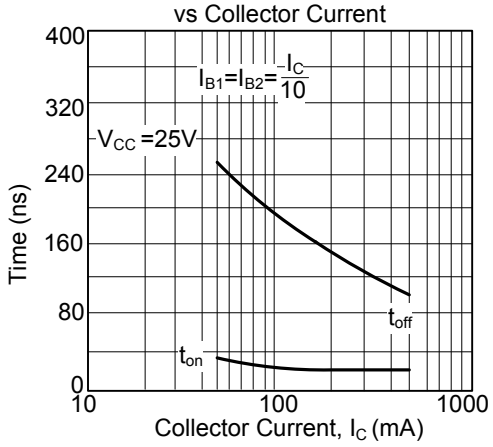


Emitter Transition and Output Capacitance vs Reverse Bias Voltage

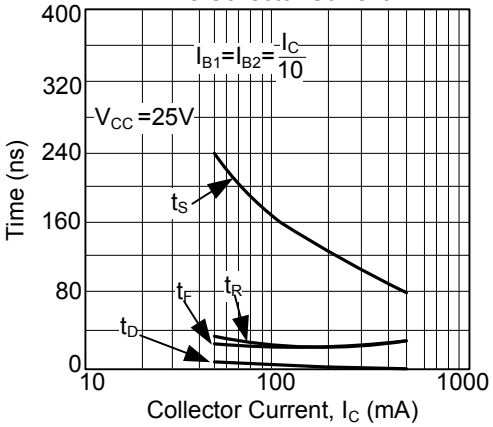


■ TYPICAL CHARACTERISTICS(Cont.)

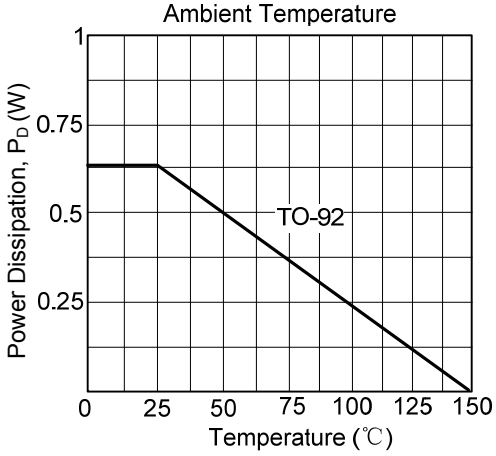
Turn On and Turn Off Times vs Collector Current



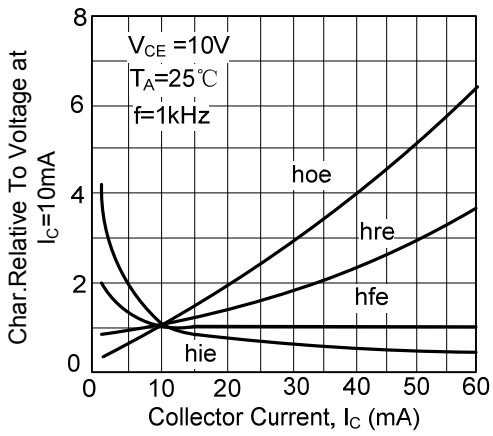
Switching Times vs Collector Current



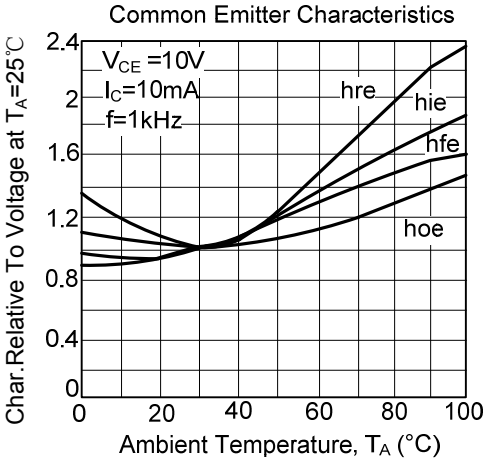
Power Dissipation vs Ambient Temperature



Common Emitter Characteristics



Common Emitter Characteristics



Common Emitter Characteristics