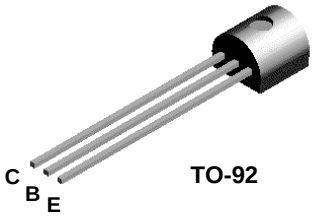
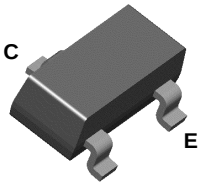
FAIRCHILD
SEMICONDUCTOR TM

2N4401



TO-92

MMBT4401



SOT-23
Mark: 2X

NPN General Pupose Amplifier

This device is designed for use as a medium power amplifier and switch requiring collector currents up to 500 mA.

Absolute Maximum Ratings* TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	6.0	V
I_C	Collector Current - Continuous	600	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N4401	*MMBT4401	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 0.1 mA, I_E = 0	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 0.1 mA, I_C = 0	6.0		V
I_{BL}	Base Cutoff Current	V_{CE} = 35 V, V_{EB} = 0.4 V		0.1	µA
I_{CEX}	Collector Cutoff Current	V_{CE} = 35 V, V_{EB} = 0.4 V		0.1	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	I_C = 0.1 mA, V_{CE} = 1.0 V I_C = 1.0 mA, V_{CE} = 1.0 V I_C = 10 mA, V_{CE} = 1.0 V I_C = 150 mA, V_{CE} = 1.0 V I_C = 500 mA, V_{CE} = 2.0 V	20 40 80 100 40	 300 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA		0.4 0.75	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA	0.75	0.95 1.2	V V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz	250		MHz
C_{cb}	Collector-Base Capacitance	V_{CB} = 5.0 V, I_E = 0, f = 140 kHz		6.5	pF
C_{eb}	Emitter-Base Capacitance	V_{BE} = 0.5 V, I_C = 0, f = 140 kHz		30	pF
h_{ie}	Input Impedance	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	1.0	15	kΩ
h_{re}	Voltage Feedback Ratio	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	0.1	8.0	x 10^{-4}
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	40	500	
h_{oe}	Output Admittance	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	1.0	30	µmhos
SWITCHING CHARACTERISTICS					
t_d	Delay Time	V_{CC} = 30 V, V_{EB} = 2 V,		15	ns
t_r	Rise Time	I_C = 150 mA, I_{B1} = 15 mA		20	ns
t_s	Storage Time	V_{CC} = 30 V, I_C = 150 mA		225	ns
t_f	Fall Time	I_{B1} = I_{B2} = 15 mA		30	ns

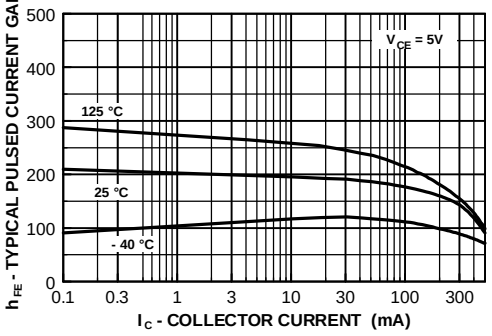
*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

NPN General Purpose Amplifier

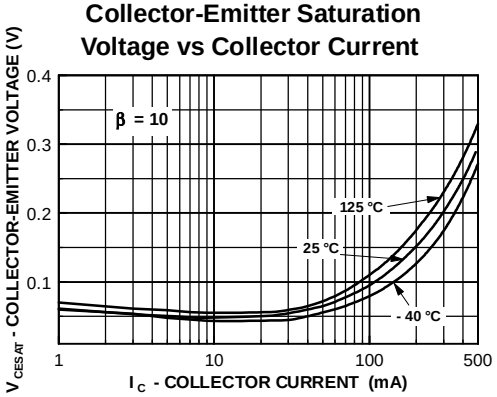
(continued)

Typical Characteristics

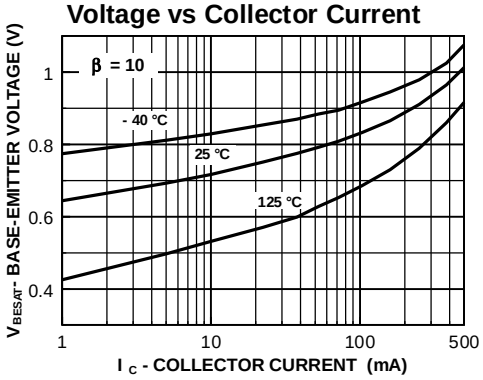
Typical Pulsed Current Gain vs Collector Current



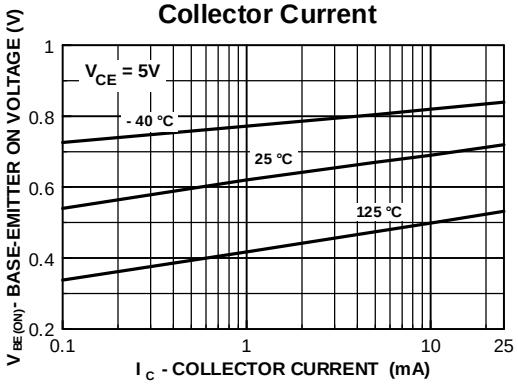
Collector-Emitter Saturation Voltage vs Collector Current



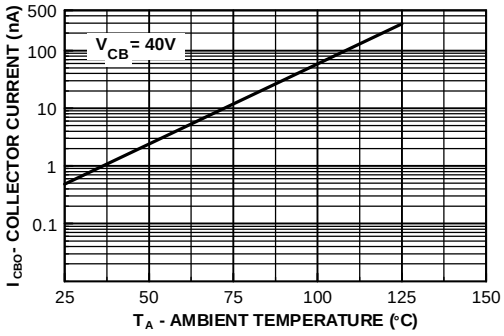
Base-Emitter Saturation Voltage vs Collector Current



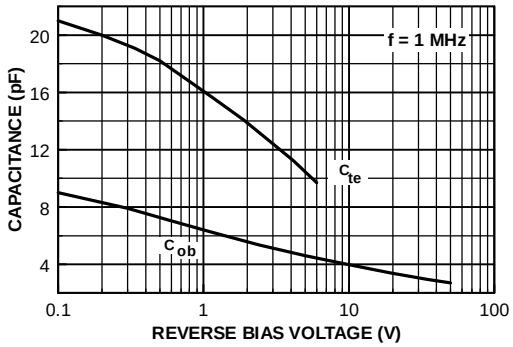
Base-Emitter ON Voltage vs Collector Current



Collector-Cutoff Current vs Ambient Temperature

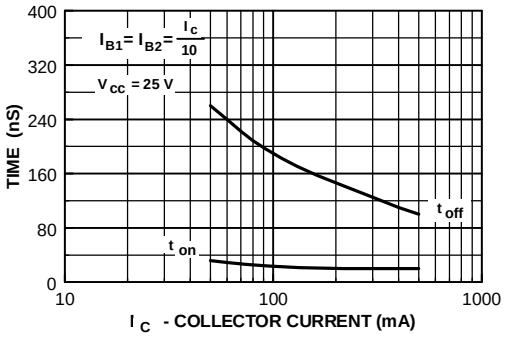


Emitter Transition and Output Capacitance vs Reverse Bias Voltage

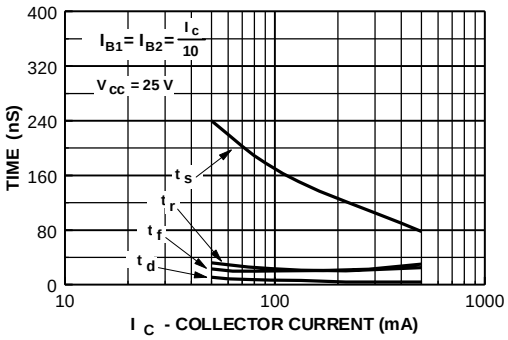


Typical Characteristics (continued)

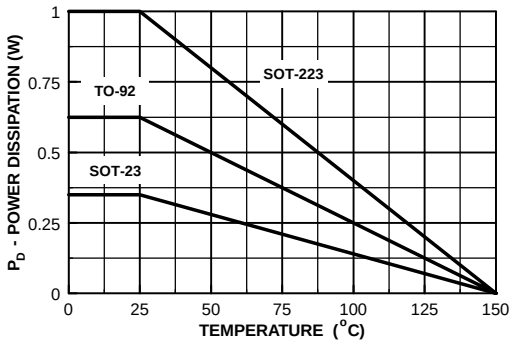
Turn On and Turn Off Times vs Collector Current



Switching Times vs Collector Current



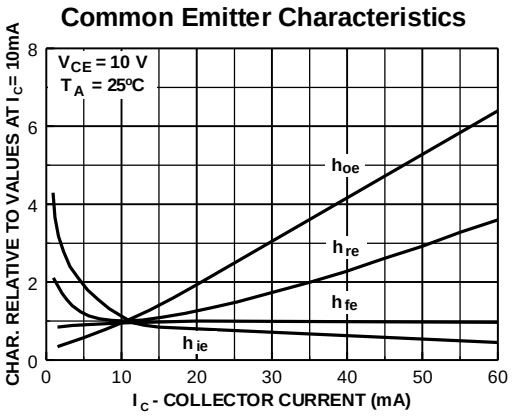
Power Dissipation vs Ambient Temperature

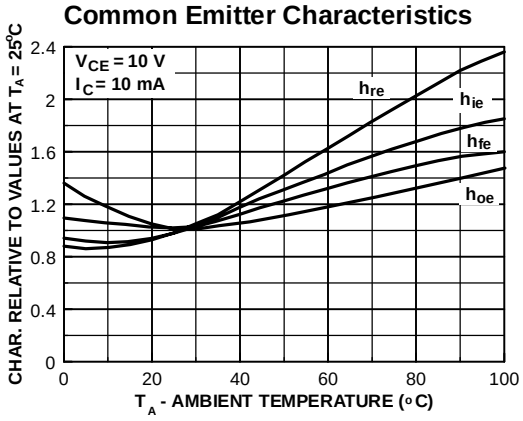


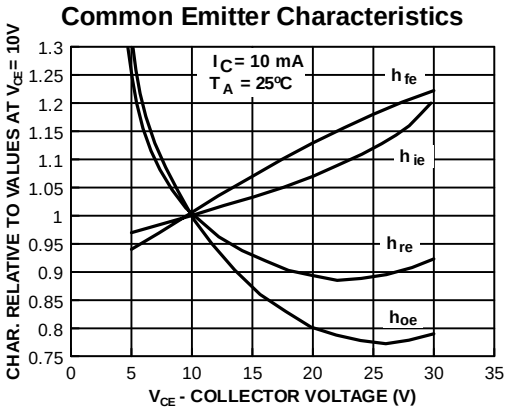
NPN General Purpose Amplifier

(continued)

Typical Common Emitter Characteristics (f = 1.0kHz)







Test Circuits

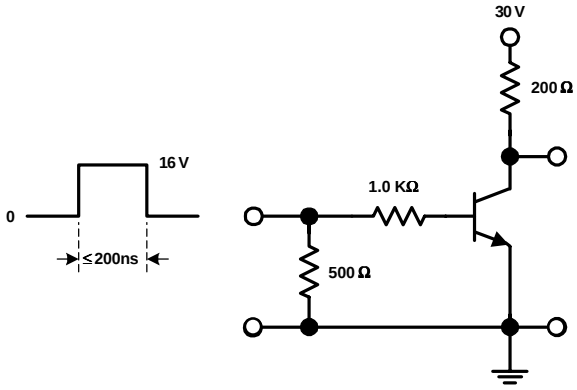


FIGURE 1: Saturated Turn-On Switching Timer

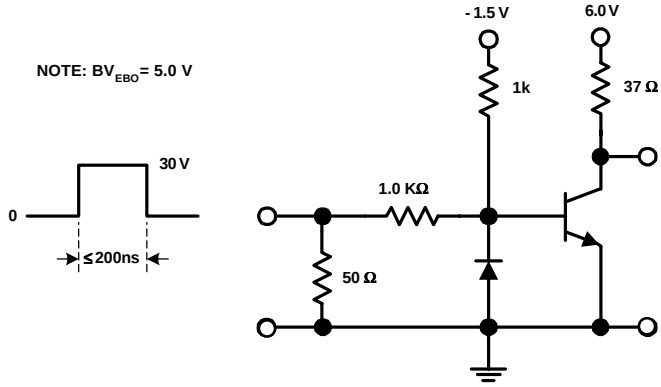


FIGURE 2: Saturated Turn-Off Switching Time

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

2N4401

NPN General Purpose Amplifier

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- Support
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- Quality and reliability
- Design center

General description

This device is designed for use as a medium power amplifier and switch requiring collector currents up to 500 mA.

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Product status/pricing/packaging

BUY

Product	Product status	Pb-free Status	Pricing*	Package type	Leads	Packing method	Package Marking Convention**
2N4401BU	Full Production	Full Production	$0.026	TO-92	3	BULK	Line 1: 2N Line 2: 4401 Line 3: -&3
2N4401NLBU	Full Production	Full Production	$0.026	TO-92	3	BULK	Line 1: 2N Line 2: 4401 Line 3: -&3
2N4401TA	Full Production	Full Production	$0.026	TO-92	3	AMMO	Line 1: 2N Line 2: 4401 Line 3: -&3
2N4401TAR	Full Production		$0.026	TO-92	3	AMMO	Line 1: 2N Line 2: 4401 Line 3: -&3

							
2N4401TA_NL	Full Production		N/A	TO-92	3	AMMO	Line 1: 2N Line 2: 4401 Line 3: -&3
2N4401TF	Full Production		$0.026	TO-92	3	TAPE REEL	Line 1: 2N Line 2: 4401 Line 3: -&3
2N4401TFR	Full Production		$0.026	TO-92	3	TAPE REEL	Line 1: 2N Line 2: 4401 Line 3: -&3
2N4401_D81Z	Full Production		N/A	TO-92	3	TAPE REEL	Line 1: **$Y** (Fairchild logo) &**Z** (Asm. Plant Code) &**3** (3-Digit Date Code) Line 2: 2N Line 3: 4401
2N4401_J05Z	Full Production		N/A	TO-92	3	BULK	Line 1: **$Y** (Fairchild logo) &**Z** (Asm. Plant Code) &**3** (3-Digit Date Code) Line 2: 2N Line 3: 4401
2N4401_J18Z	Full Production		N/A	TO-92	3	BULK	Line 1: **$Y** (Fairchild logo) &**Z** (Asm. Plant Code) &**3** (3-Digit Date Code) Line 2: 2N Line 3: 4401
2N4401_J60Z	Full Production		N/A	TO-92	3	BULK	Line 1: **$Y** (Fairchild logo) &**Z** (Asm. Plant Code) &**3** (3-Digit Date Code) Line 2: 2N Line 3: 4401
2N4401_J61Z	Full Production		N/A	TO-92	3	BULK	Line 1: **$Y** (Fairchild logo) &**Z** (Asm. Plant Code) &**3** (3-Digit Date Code) Line 2: 2N Line 3: 4401

* Fairchild 1,000 piece Budgetary Pricing
** A sample button will appear if the part is available through Fairchild's on-line samples program. If there is no sample button, please contact a Fairchild distributor to obtain samples

 Indicates product with Pb-free second-level interconnect. For more information click here.

Package marking information for product 2N4401 is available. Click here for more information .

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Models

Package & leads	Condition	Temperature range	Software version	Revision date
PSPICE				
TO-92-3	Electrical	25°C	N/A	N/A

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Application notes

AN-9006: IGBT Application Note for Camera Strobe (145 K) Jul 27, 2007

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Qualification Support

Click on a product for detailed qualification data

Product
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2N4401TA_NL
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2N4401_D81Z
2N4401_J05Z
2N4401_J18Z
2N4401_J60Z
2N4401_J61Z

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