Is Now Part of

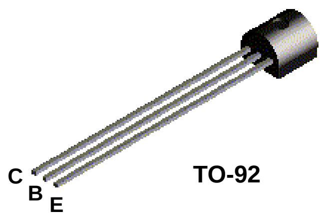
ON Semiconductor®

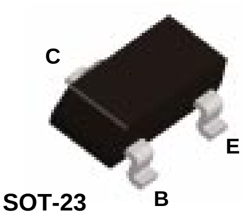
To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD
SEMICONDUCTOR TM

2N4400 MMBT4400





SOT-23
Mark: 83

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents 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
		2N4400	*MMBT4400	
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

NPN General Purpose Amplifier
(continued)

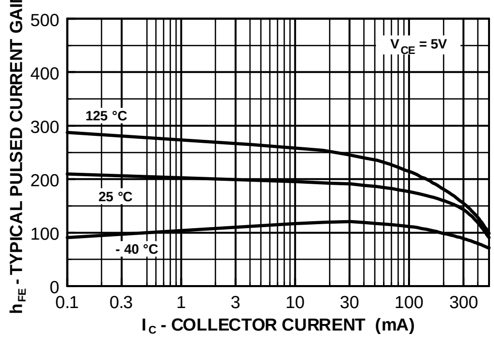
Electrical Characteristics
TA = 25°C unless otherwise noted

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	$I_C = 100\ \mu A$, $I_E = 0$	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 100\ \mu A$, $I_C = 0$	6.0		V
I_{CEX}	Collector Cutoff Current	$V_{CE} = 35$ V, $V_{EB} = 0.4$ V		0.1	µA
I_{BL}	Emitter Cutoff Current	$V_{CE} = 35$ V, $V_{EB} = 0.4$ V		0.1	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	$V_{CE} = 1.0$ V, $I_C = 1.0$ mA $V_{CE} = 1.0$ V, $I_C = 10$ mA $V_{CE} = 1.0$ V, $I_C = 150$ mA $V_{CE} = 2.0$ V, $I_C = 500$ mA	20 40 50 20	 150 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 150$ mA, $I_B = 15$ mA $I_C = 500$ mA, $I_B = 50$ mA		0.40 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					
C_{ob}	Output Capacitance	$V_{CB} = 5.0$ V, f = 140 kHz		6.5	pF
C_{ib}	Input Capacitance	$V_{EB} = 0.5$ V, f = 140 kHz		30	pF
h_{fe}	Small-Signal Current Gain	$I_C = 20$ mA, $V_{CE} = 10$ V, f = 100 MHz	2.0		
h_{fe}	Small-Signal Current Gain	$V_{CE} = 10$ V, $I_C = 1.0$ mA,	20	250	
h_{ie}	Input Impedance	f = 1.0 kHz	0.5	7.5	KΩ
h_{re}	Voltage Feedback Ratio		0.1	8.0	$x\ 10^{-4}$
h_{oe}	Output Admittance		1.0	30	µmhos
SWITCHING CHARACTERISTICS					
t_d	Delay Time	$V_{CC} = 30$ V, $I_C = 150$ mA,		15	ns
t_r	Rise Time	$I_{B1} = 15$ mA, $V_{EB} = 2$ V		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

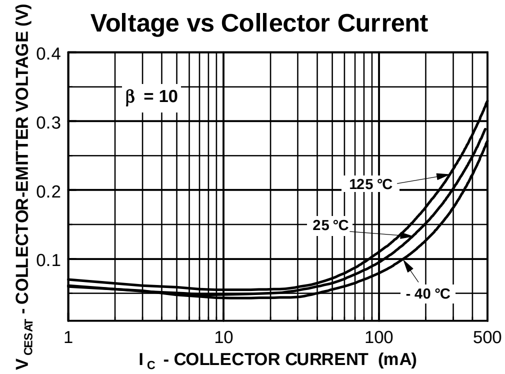
*Pulse Test: Pulse Width £ 300 ms, Duty Cycle £ 2.0%

Typical Characteristics

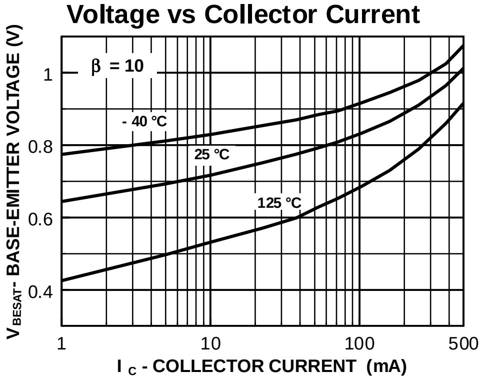
Typical Pulsed Current Gain vs Collector Current



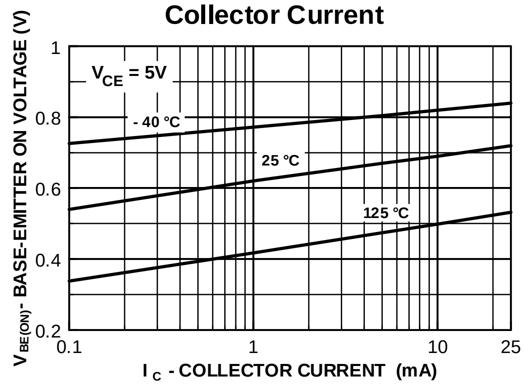
Collector-Emitter Saturation Voltage vs Collector Current



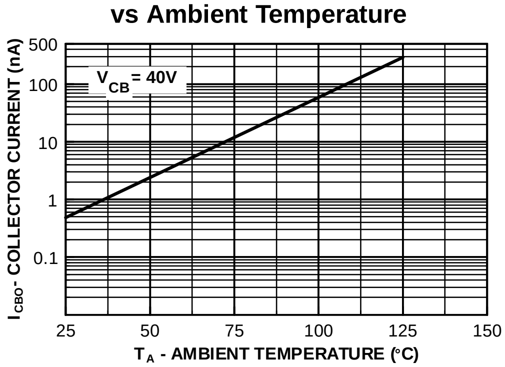
Base-Emitter Saturation Voltage vs Collector Current



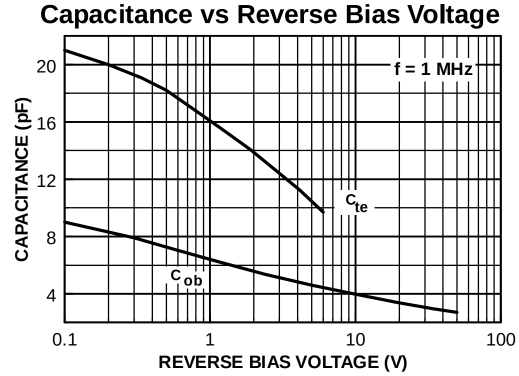
Base-Emitter ON Voltage vs Collector Current



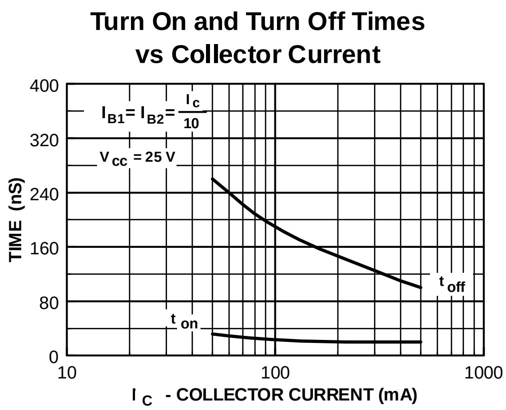
Collector-Cutoff Current vs Ambient Temperature

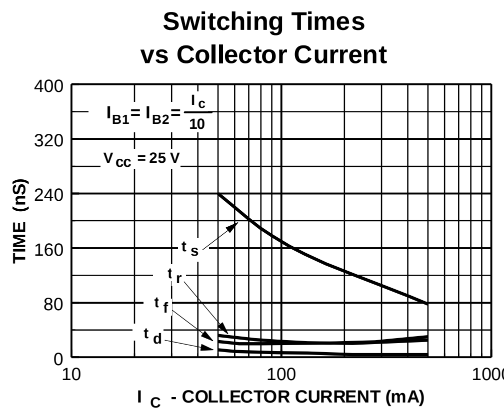


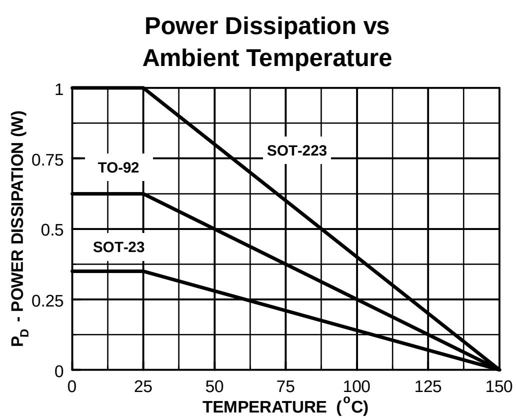
Emitter Transition and Output Capacitance vs Reverse Bias Voltage



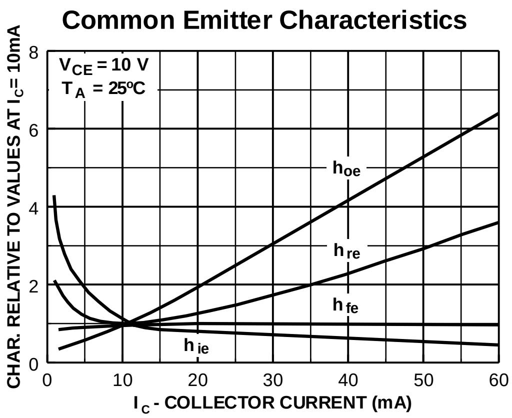
Typical Characteristics (continued)

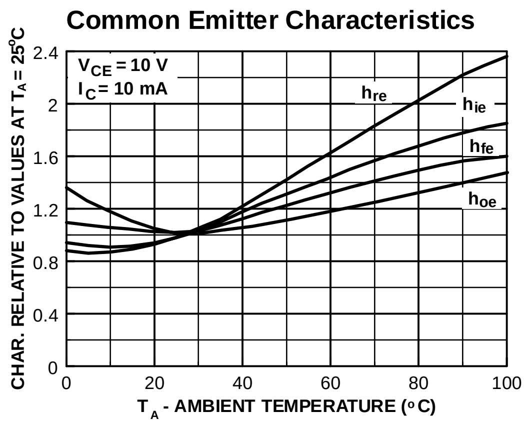


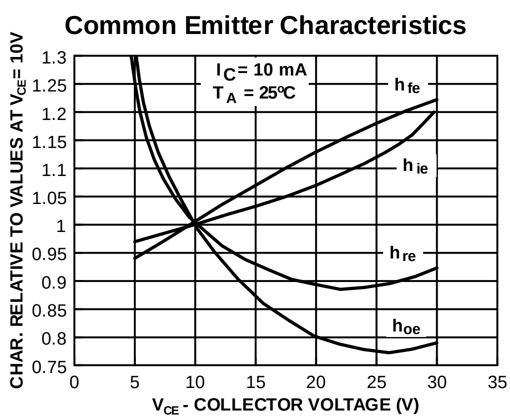




Typical Common Emitter Characteristics (f = 1.0kHz)







Test Circuits

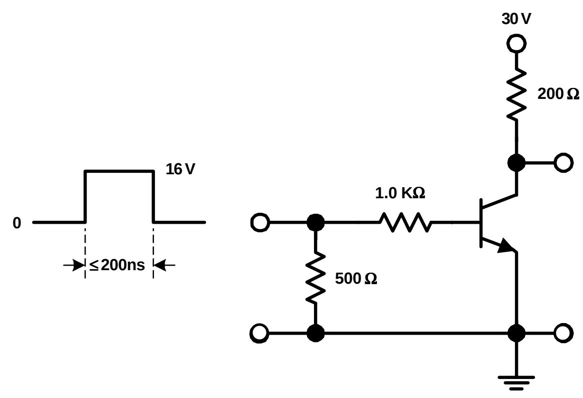


FIGURE 1: Saturated Turn-On Switching Timer

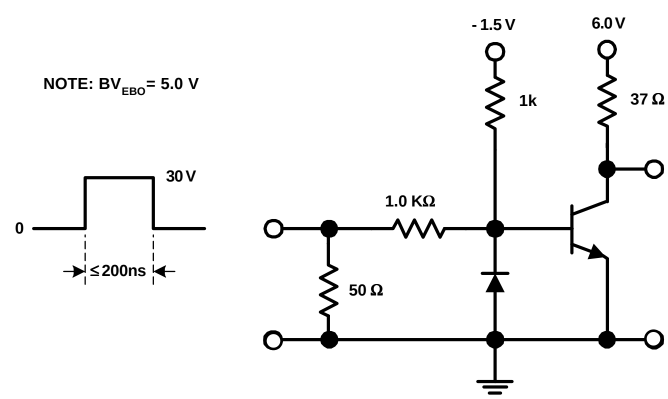


FIGURE 2: Saturated Turn-Off Switching Time

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FASTr™	PowerTrench®	SyncFET™
Bottomless™	GlobalOptoisolator™	QFET™	TinyLogic™
CoolFET™	GTO™	QS™	UHC™
CROSSVOLT™	HiSeC™	QT Optoelectronics™	VCX™
DOME™	ISOPLANAR™	Quiet Series™	
E^2CMOS™	MICROWIRE™	SILENT SWITCHER®	
EnSigna™	OPTOLOGIC™	SMART START™	
FACT™	OPTOPLANAR™	SuperSOT™-3	
FACT Quiet Series™	PACMAN™	SuperSOT™-6	
FAST®	POP™	SuperSOT™-8	

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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.

Rev. G

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative