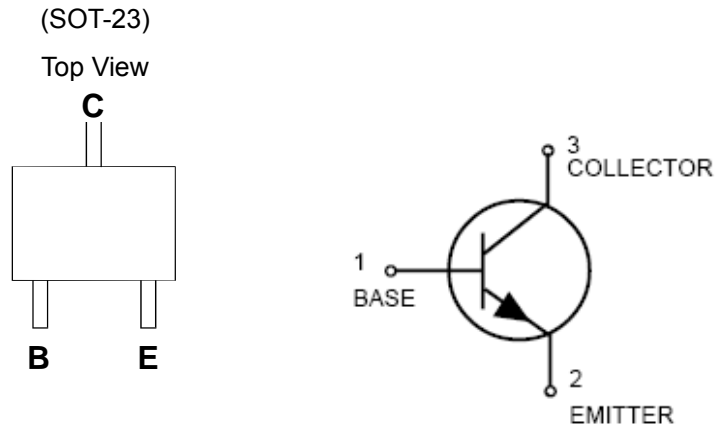


General Purpose Transistor (NPN)

FEATURES

- NPN silicon epitaxial planar transistor for switching and amplifier applications.
- As complementary type, the PNP transistor METR3906 is recommended.

PIN CONFIGURATION



Maximum Ratings & Thermal Characteristics

Parameter	Symbol	Limit	Unit
Collector-Emitter Voltage	V_{CEO}	40	V
Collector-Base Voltage	V_{CBO}	60	V
Emitter-Base Voltage	V_{EBO}	6.0	V
Collector Current-Continuous	I_C	200	mA
Total Device Dissipation FR-5 Board, (1) $T_A=25^\circ\text{C}$	P_D	225	mW
Derate above 25°C		1.8	mW/ $^\circ\text{C}$
Thermal Resistance-Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate, (2) $T_A=25^\circ\text{C}$	P_D	300	mW
Derate above 25°C		2.4	mW/ $^\circ\text{C}$
Thermal Resistance-Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Operating Junction Temperature	T_J	-55 to 150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55 to 150	$^\circ\text{C}$

Note :

- (1) FR-5 = 1.0 x 0.75 x 0.062 in.
- (2) Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

General Purpose Transistor (NPN)

Electrical Characteristics (T_A=25°C Unless Otherwise Specified)

Symbol	Parameter	Limit	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
V _{(BR)CEO}	Collector-Emitter Breakdown Voltage(3)	I _C =1.0mA	40	-	-	V
V _{(BR)CBO}	Collector-Base Breakdown Voltage(3)	I _C =1.0mA	60	-	-	V
V _{(BR)EBO}	Emitter-Base Breakdown Voltage(3)	I _C =1.0mA	6.0	-	-	V
I _{BL}	Base Cutoff Current	V _{CE} =30V, V _{EB} =3.0V	-	-	50	nA
I _{CEx}	Collector Cutoff Current	V _{CE} =30V, V _{EB} =3.0V	-	-	50	nA
ON CHARACTERISTICS(3)						
h _{FE}	DC Current Gain(1)	I _C =0.1mA, V _{CE} =1.0V	40	-	-	-
		I _C =1.0mA, V _{CE} =1.0V	70	-	-	
		I _C =10mA, V _{CE} =1.0V	100	-	300	
		I _C =50mA, V _{CE} =1.0V	60	-	-	
		I _C =100mA, V _{CE} =1.0V	30	-	-	
V _{CE(sat)}	Collector-Emitter Saturation Voltage(3)	I _C =10mA, I _B =1.0mA	-	-	0.2	V
		I _C =50mA, I _B =5.0mA	-	-	0.3	
V _{BE(sat)}	Base-Emitter Saturation Voltage(3)	I _C =10mA, I _B =1.0mA	0.65	-	0.85	V
		I _C =50mA, I _B =5.0mA	-	-	0.95	
SMALL-SIGNAL CHARACTERISTICS						
f _T	Current-Gain-Bandwidth Product	I _C =10mA, V _{CE} =20V, f=100MHz	300	-	-	MHz
C _{obo}	Output Capacitance	V _{CB} =5.0V, I _E =0, f=1.0MHz	-	-	4.0	pF
C _{ibo}	Input Capacitance	V _{EB} =0.5V, I _C =0, f=1.0MHz	-	-	8.0	pF
h _{ie}	Input Impedance	V _{CE} =10V, I _C =1.0mA, f=1.0KHz	1.0	-	10	kΩ
h _{re}	Voltage Feedback Ratio	V _{CE} =10V, I _C =1.0mA, f=1.0KHz	0.5	-	8.0	X10 ⁻⁴
h _{fe}	Small-Signal Current Gain	V _{CE} =10V, I _C =1.0mA, f=1.0KHz	100	-	400	-
h _{oe}	Output Admittance	V _{CE} =10V, I _C =1.0mA, f=1.0KHz	1.0	-	40	μmhos
NF	Noise Figure	V _{CE} =5.0V, I _C =100μA, R _s =1.0 kΩ, f=1.0KHz	-	-	5.0	dB
SWITCHING CHARACTERISTICS						
t _d	Delay Time	V _{CC} =3.0V, V _{BE} =-0.5V,	-	-	35	ns
t _r	Rise Time	I _C =10mA, I _{B1} =1.0mA	-	-	35	
t _s	Storage Time	V _{CC} =3.0V,	-	-	250	ns
t _f	Fall Time	I _C =10mA, I _{B1} =I _{B2} =1.0mA	-	-	50	

Note : (3) Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%

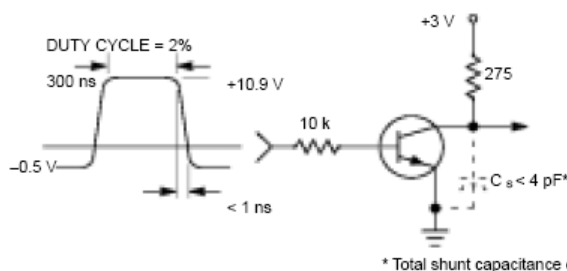


Figure 1. Delay and Rise Time
Equivalent Test Circuit

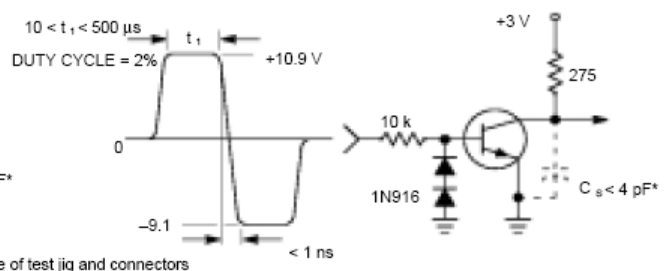


Figure 2. Storage and Fall Time
Equivalent Test Circuit

— T_J = 125°C
 - - - T_J = 25°C

Figure 3. Capacitance

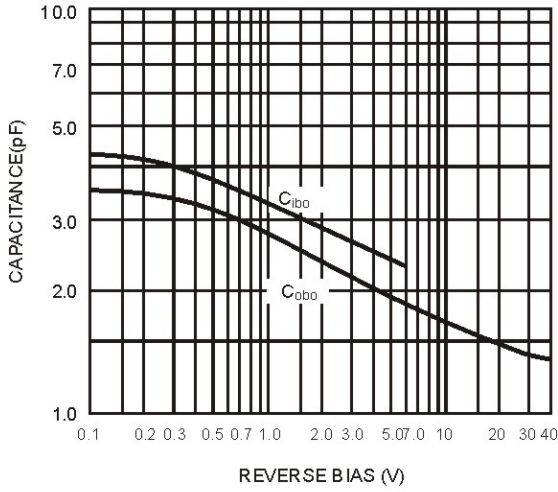


Figure 4. Charge Date

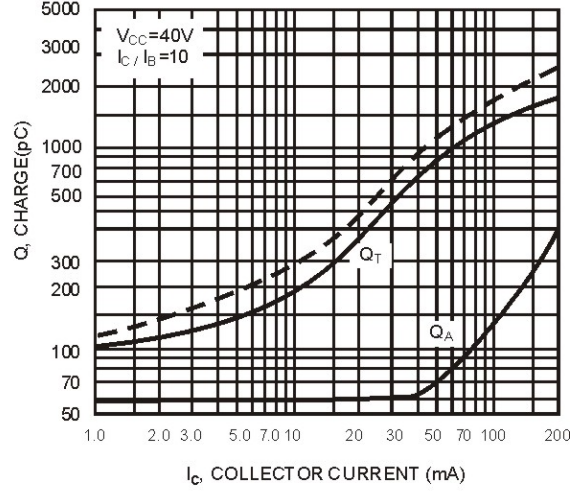


Figure 5. Turn-On Time

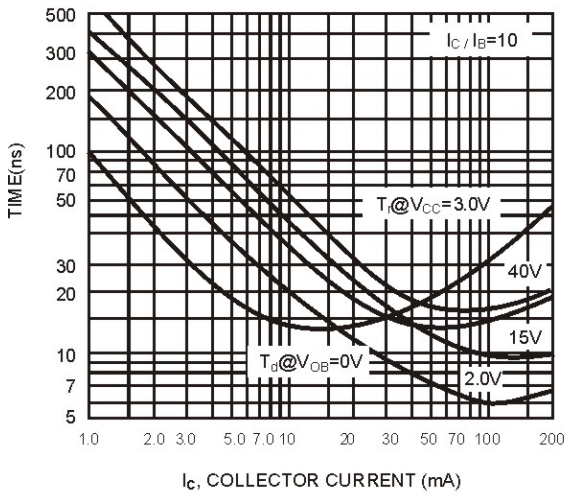


Figure 6. Rise Time

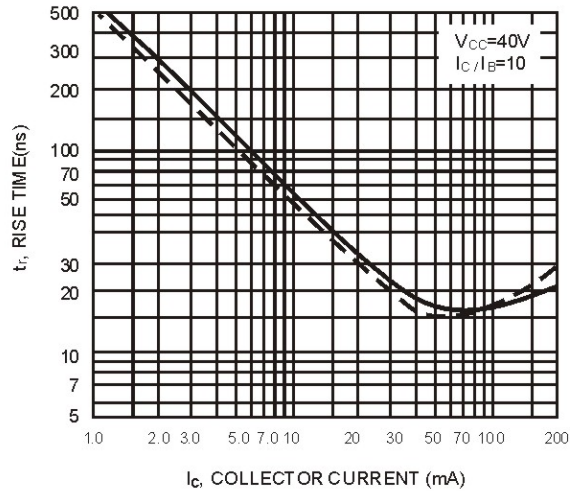


Figure 7. Storage Time

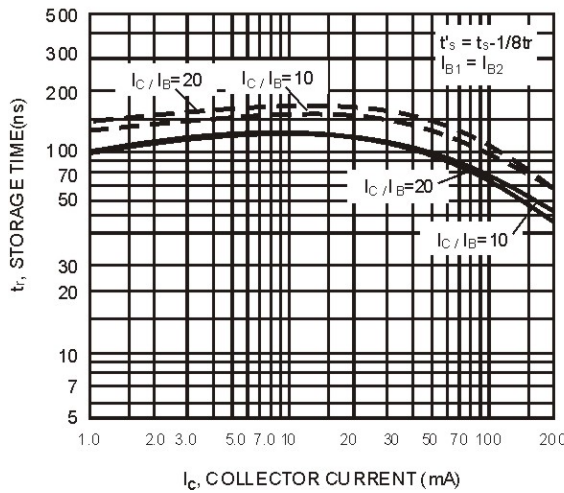
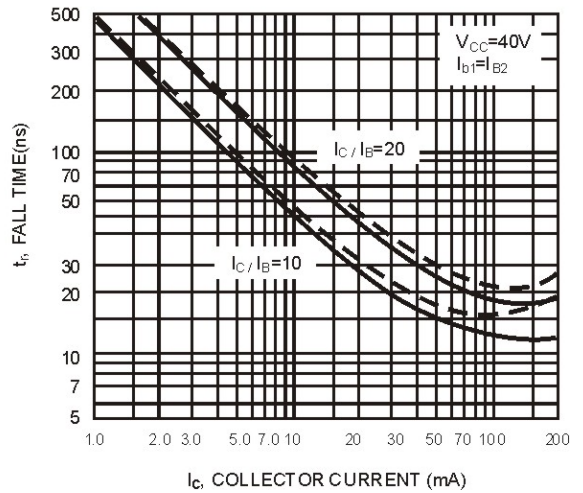


Figure 8. Fall Time



TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS
NOISE FIGURE VARIATIONS

($V_{CE}=5.0$ Vdc, $T_A=25^\circ\text{C}$, Bandwidth = 1.0 Hz)

Figure 9. Noise Figure

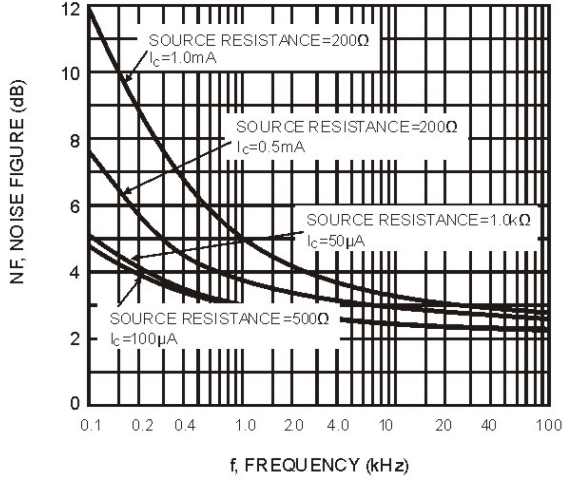
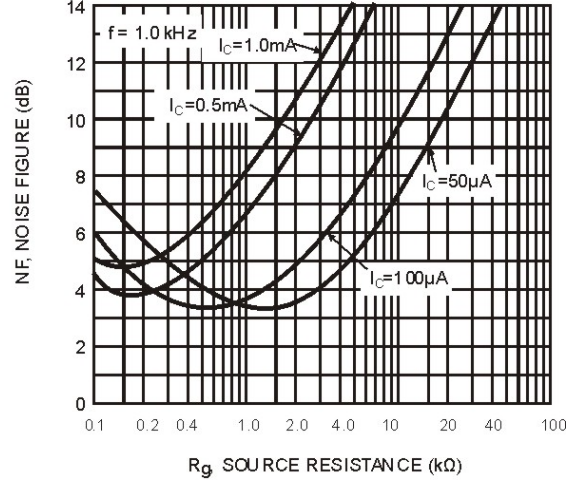


Figure 10. Noise Figure



h PARAMETERS

($V_{CE}=10$ Vdc, $f = 1.0$ kHz, $T_A=25^\circ\text{C}$)

Figure 11. Current Gain

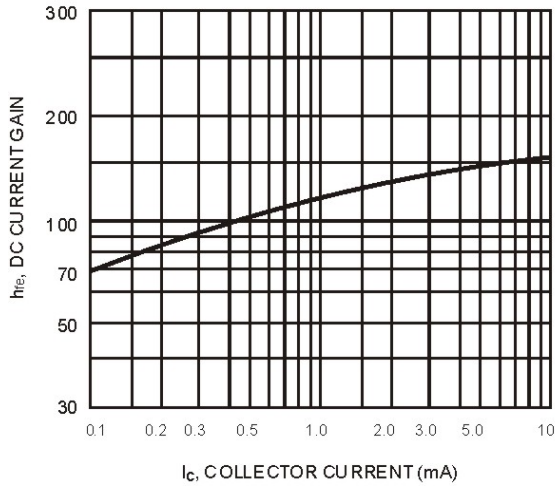


Figure 12. Output Admittance

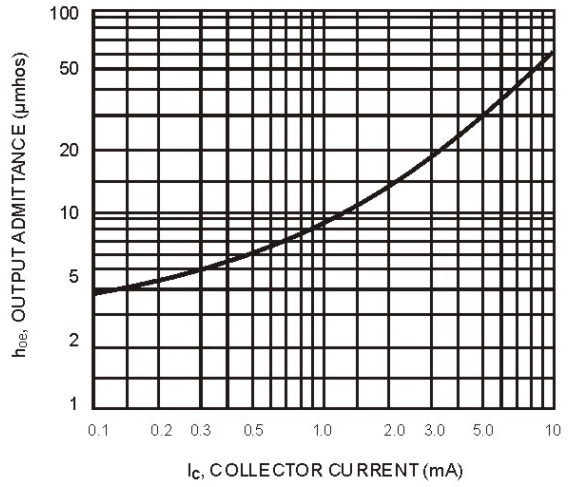


Figure 13. Input Impedance

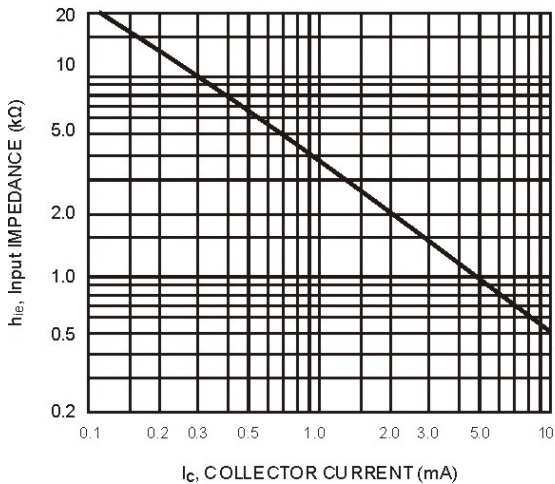


Figure 14. Voltage Feedback Ratio

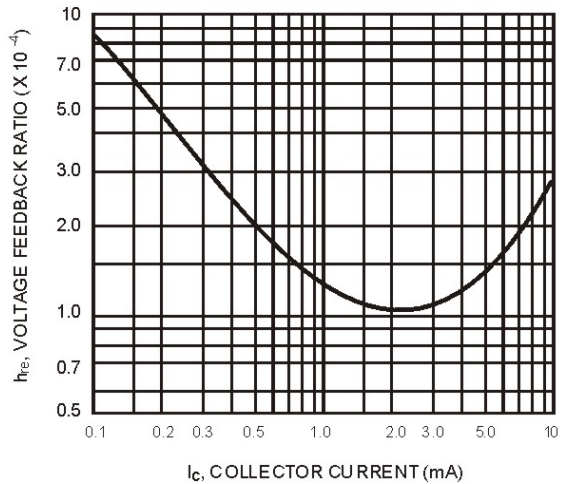


Figure 15. DC Current Gain

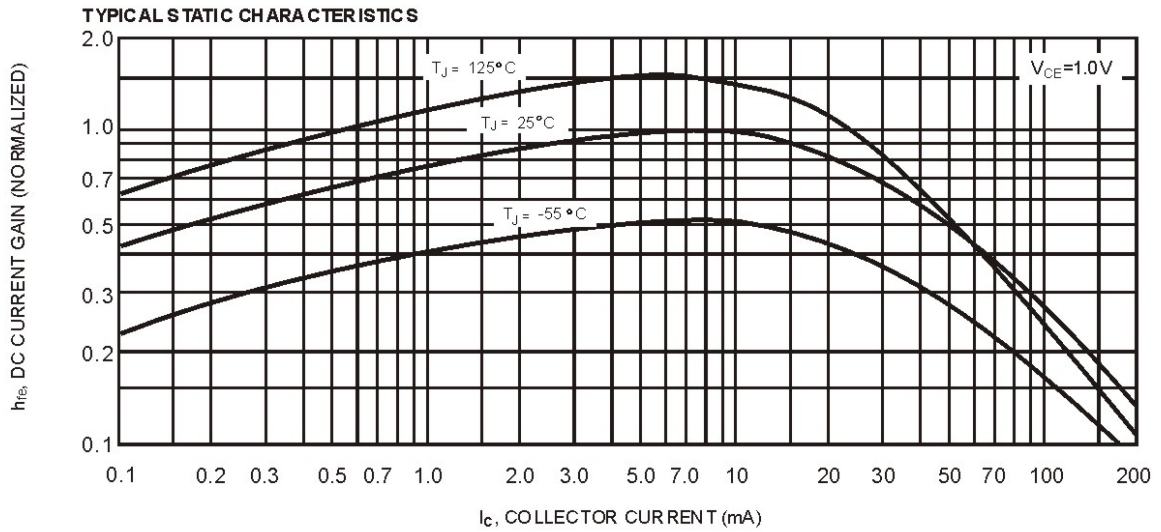


Figure 16. Collector Saturation Region

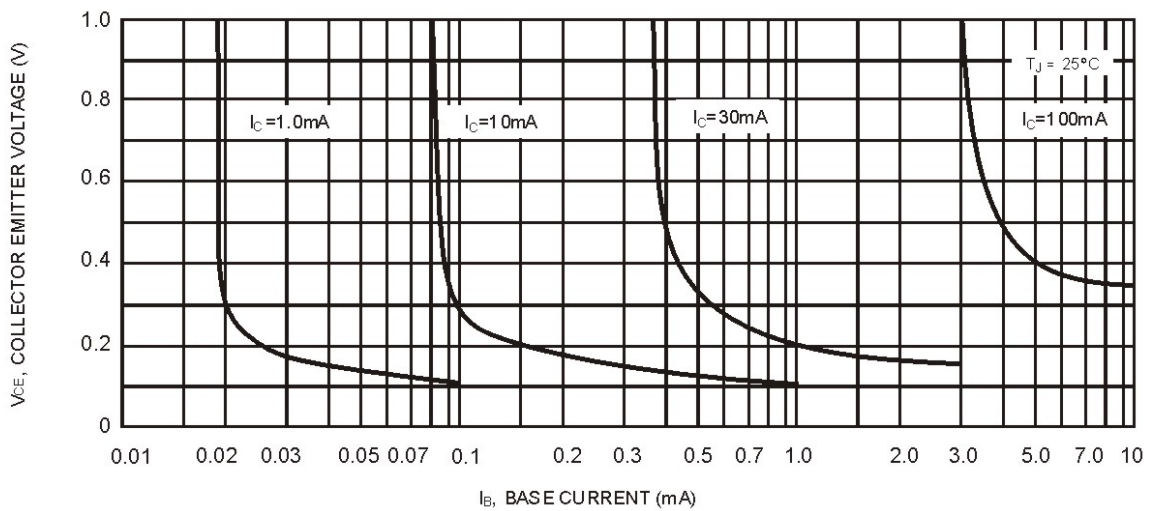


Figure 17. "On" Voltages

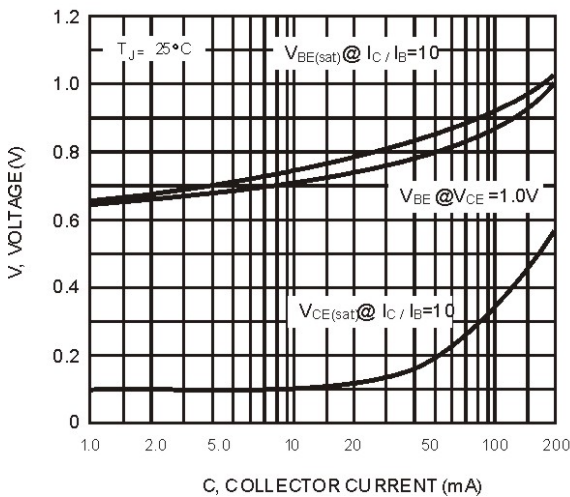
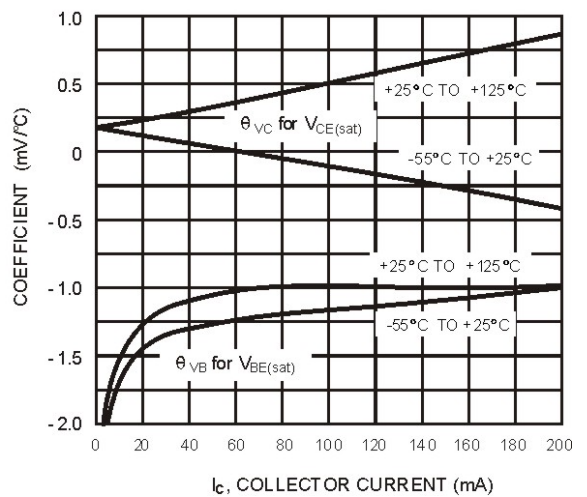


Figure 18. Temperature Coefficients

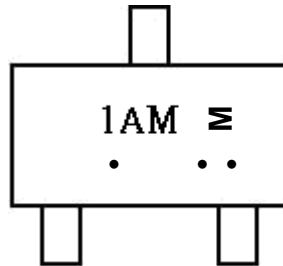


General Purpose Transistor (NPN)

Device name:METR3904

Package:SOT-23

Marking Code:



1AM: Device Marking Code

M: Date Code

MONTH CODE

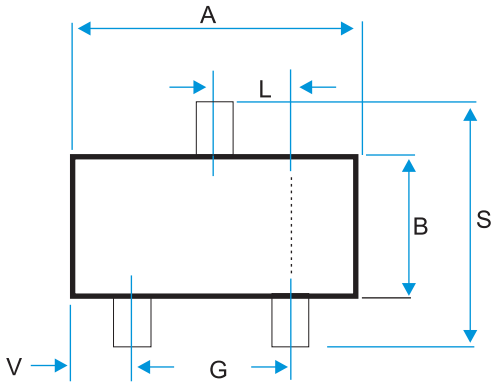
ODD YEARS(2007,2009)

Jan	1
Feb	2
Mar	3
Apr	4
May	5
Jun	6
Jul	7
Aug	8
Sep	9
Oct	T
Nov	V
Dec	C

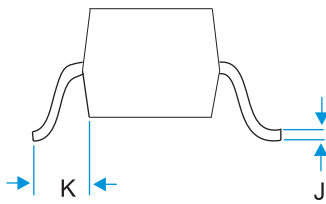
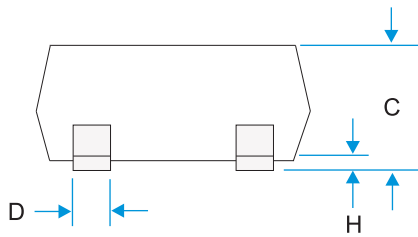
EVEN YEARS(2006,2008)

Jan	E
Feb	F
Mar	H
Apr	J
May	K
Jun	L
Jul	N
Aug	P
Sep	U
Oct	X
Nov	Y
Dec	Z

SOT-23 Package Outline



DIM	MILLIMETERS	
	MIN	MAX
A	2.80	3.1
B	1.20	1.7
C	0.89	1.3
D	0.37	0.50
G	1.78	2.04
H	0.013	0.15
J	0.085	0.2
K	0.35	0.7
L	0.89	1.02
S	2.10	3.0
V	0.45	0.60



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