MMDT3946

COMPLEMENTARY NPN / PNP GENERAL PURPOSE SWITCHING TRANSISTOR

VOLTAGE	40 Volts	POWER	200 mWatts

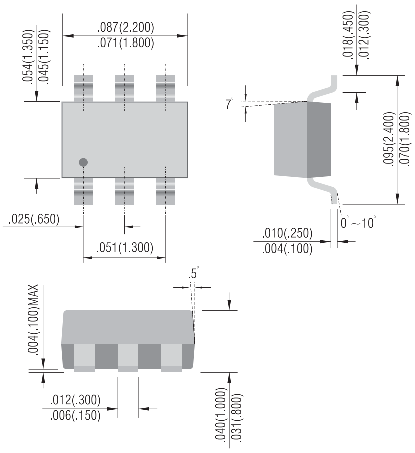
FEATURES

- Epitaxial silicon, planar design
- Collector-emitter voltage VCE = 40V
- Collector current IC = 200mA
- In compliance with EU RoHS 2002/95/EC directives
- Transition Frequency > 300MHz f_T@IC=10mA,V_{CE}=20V, f=100MHz

MECHANICAL DATA

- Case: SOT-363, Plastic
- Terminals: Solderable per MIL-STD-750, Method 2026
- Approx. Weight: 0.006 gram
- Marking: S3A

SOT-363 Unit: inch (mm)



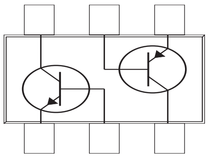


Fig.55

ABSOLUTE RATINGS

ABSOLUTE RATING		NPN 3904 Section	PNP 3906 Section	-
PARAMETER	Symbol	Value	Value	Units
Collector - Emitter Voltage	V_{CEO}	40	-40	V
Collector - Base Voltage	V_{CBO}	60	-40	V
Emitter - Base Voltage	V_{EBO}	6.0	-5.0	V
Collector Current - Continuous	I_C	200	-200	mA

THERMAL CHARACTERISTICS

PARAMETER	Symbol	Value	Units
Max Power Dissipation (Note 1)	P_{TOT}	200	mW
Thermal Resistance , Junction to Ambient	$R_{\theta JA}$	625	°C/W
Junction Temperature	T_J	-55 to 150	°C
Storage Temperature	T_{STG}	-55 to 150	°C

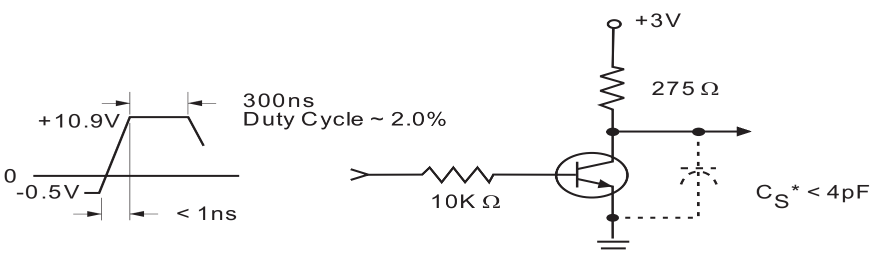
Note 1: Transistor mounted on FR-5 board 1.0 x 0.75 x 0.062 in.

ELECTRICAL CHARACTERISTICS NPN SECTION

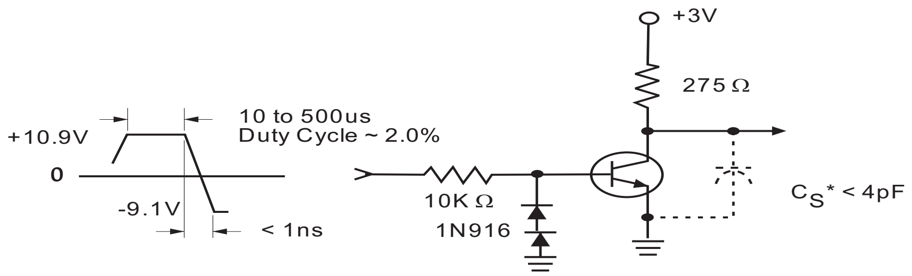
PARAMETER	Symbol	Test Condition	MIN.	TYP.	MAX.	Units
Collector - Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C=1.0mA, I_B=0	40	-	-	V
Collector - Base Breakdown Voltage	$V_{(BR)CBO}$	I_C=10uA, I_E=0	60	-	-	V
Emitter - Base Breakdown Voltage	$V_{(BR)EBO}$	I_E=10uA, I_C=0	6.0	-	-	V
Base Cutoff Current	I_{BI}	V_{CE}=30V, V_{EB}=3.0V	-	-	50	nA
Collector Cutoff Current	I_{CEX}	V_{CE}=30V, V_{EB}=3.0V	-	-	50	nA
DC Current Gain (Note 2)	h_{FE}	I_C=0.1mA, V_{CE}=1.0V I_C=1.0mA, V_{CE}=1.0V I_C=10mA, V_{CE}=1.0V I_C=50mA, V_{CE}=1.0V I_C=100mA, V_{CE}=1.0V	40 70 100 60 30	- - - - -	- - 300 - -	-
Collector - Emitter Saturation Voltage (Note 2)	$V_{CE(SAT)}$	I_C=10mA, I_B=1.0mA I_C=50mA, I_B=5.0mA	-	-	0.2 0.3	V
Base - Emitter Saturation Voltage (Note 2)	$V_{BE(SAT)}$	I_C=10mA, I_B=1.0mA I_C=50mA, I_B=5.0mA	0.65 -	- -	0.85 0.95	V
Collector - Base Capacitance	C_{CBO}	V_{CB}=5V, I_E=0, f=1MHz	-	-	4.0	pF
Emitter - Base Capacitance	C_{EBO}	V_{CB}=0.5V, I_C=0, f=1MHz	-	-	8.0	pF
Delay Time	td	V_{CC}=3V,V_{BE}=-0.5V, I_C=10mA,I_B=1.0mA	-	-	35	ns
Rise Time	tr	V_{CC}=3V,V_{BE}=-0.5V, I_C=10mA,I_B=1.0mA	-	-	35	ns
Storage Time	ts	V_{CC}=3V,I_C=10mA I_B1=I_B2=1.0mA	-	-	200	ns
Fall Time	tf	V_{CC}=3V,I_C=10mA I_B1=I_B2=1.0mA	-	-	50	ns

Note 2: Pulse Test: Pulse Width ≤ 300 us, Duty Cycle ≤ 2.0%.

SWITCHING TIME EQUIVALENT TEST CIRCUITS



Delay and Rise Time Equivalent Test Circuit

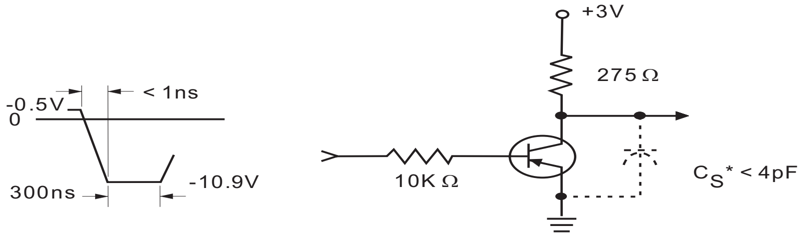


Storage and Fall Time Equivalent Test Circuit

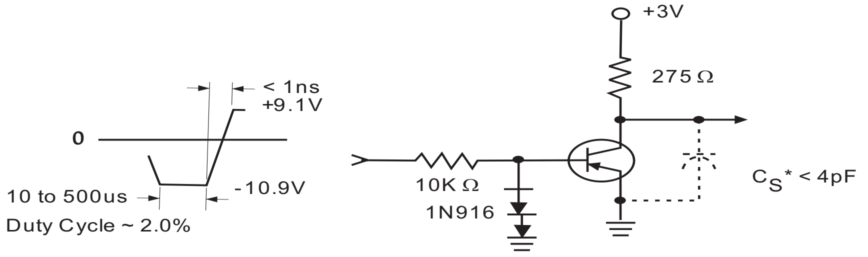
ELECTRICAL CHARACTERISTICS PNP SECTION

PARAMETER	Symbol	Test Condition	MIN.	TYP.	MAX.	Units
Collector - Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C=-1.0mA, I_B=0	-40	-	-	V
Collector - Base Breakdown Voltage	$V_{(BR)CBO}$	I_C=-10uA, I_E=0	-40	-	-	V
Emitter - Base Breakdown Voltage	$V_{(BR)EBO}$	I_E=-10uA, I_C=0	-5.0	-	-	V
Base Cutoff Current	I_{BI}	V_{CE}=-30V, V_{EB}=-3.0V	-	-	-50	nA
Collector Cutoff Current	I_{CEX}	V_{CE}=-30V, V_{EB}=-3.0V	-	-	-50	nA
DC Current Gain (Note 2)	h_{FE}	I_C=-0.1mA, V_{CE}=-1.0V I_C=-1.0mA, V_{CE}=-1.0V I_C=-10mA, V_{CE}=-1.0V I_C=-50mA, V_{CE}=-1.0V I_C=-100mA, V_{CE}=-1.0V	60 80 100 60 30	- - - - -	- - 300 - -	-
Collector - Emitter Saturation Voltage (Note 2)	$V_{CE(SAT)}$	I_C=-10mA, I_B=-1.0mA I_C=-50mA, I_B=-5.0mA	-	-	-0.25 -0.4	V
Base - Emitter Saturation Voltage (Note 2)	$V_{BE(SAT)}$	I_C=-10mA, I_B=-1.0mA I_C=-50mA, I_B=-5.0mA	-0.65 -	- -	-0.85 -0.95	V
Collector - Base Capacitance	C_{CBO}	V_{CB}=-5V, I_E=0, f=1MHz	-	-	4.0	pF
Emitter - Base Capacitance	C_{EBO}	V_{CB}=-0.5V, I_C=0, f=1MHz	-	-	10	pF
Delay Time	td	V_{CC}=-3V,V_{BE}=-0.5V, I_C=-10mA,I_B=-1.0mA	-	-	35	ns
Rise Time	tr	V_{CC}=-3V,V_{BE}=-0.5V, I_C=-10mA,I_B=-1.0mA	-	-	35	ns
Storage Time	ts	V_{CC}=-3V,I_C=-10mA I_B1=I_B2=-1.0mA	-	-	225	ns
Fall Time	tf	V_{CC}=-3V,I_C=-10mA I_B1=I_B2=1.0mA	-	-	75	ns

SWITCHING TIME EQUIVALENT TEST CIRCUITS



Delay and Rise Time Equivalent Test Circuit



Storage and Fall Time Equivalent Test Circuit

ELECTRICAL CHARACTERISTICS CURVE NPN SECTION

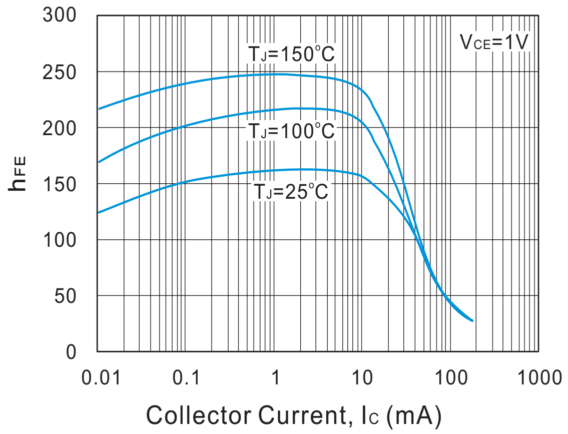


Fig. 1. Typical hFE vs. Collector Current

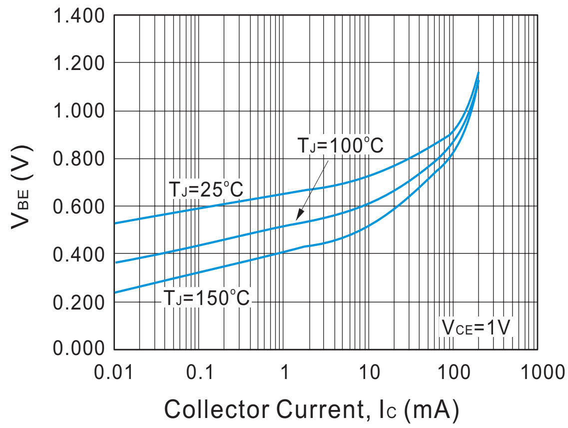


Fig. 2. Typical VBE vs. Collector Current

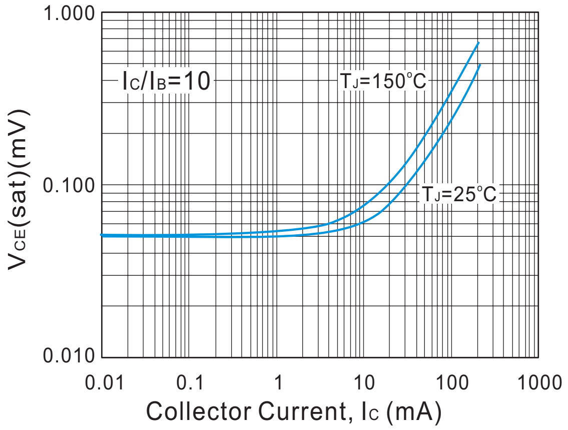


Fig. 3. Typical $V_{CE(sat)}$ vs. Collector Current

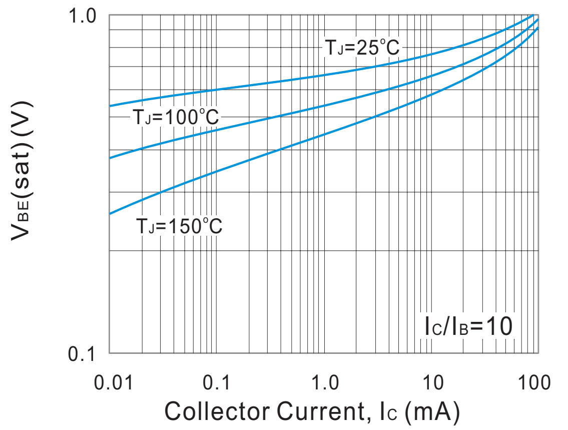


Fig. 4. Typical $V_{BE(sat)}$ vs Collector Current

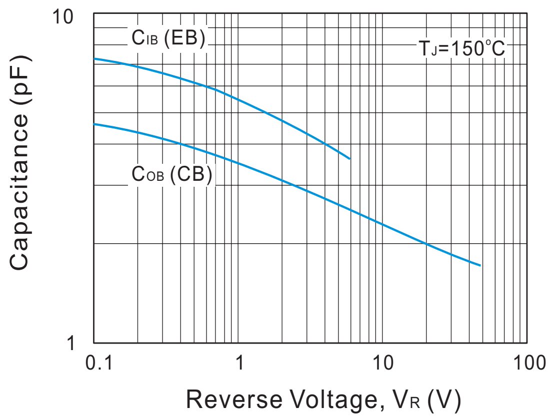


Fig. 5. Typical Capacitances vs. Reverse Voltage

ELECTRICAL CHARACTERISTICS CURVE PNP SECTION

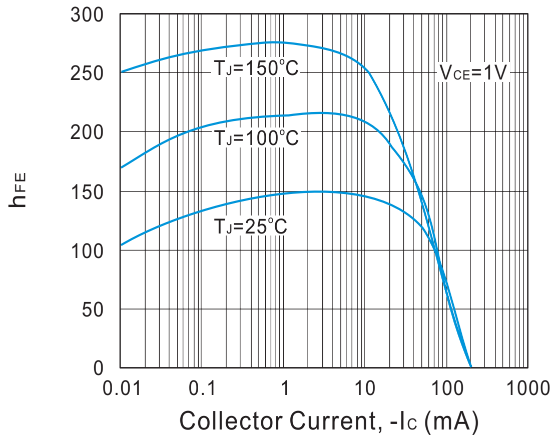


Fig. 1. Typical h_{FE} vs Collector Current

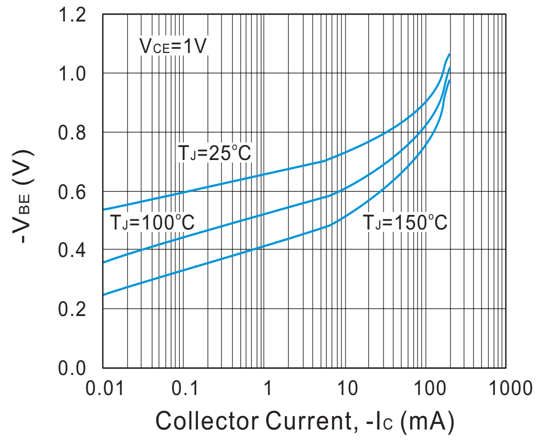


Fig. 2. Typical V_{BE} vs Collector Current

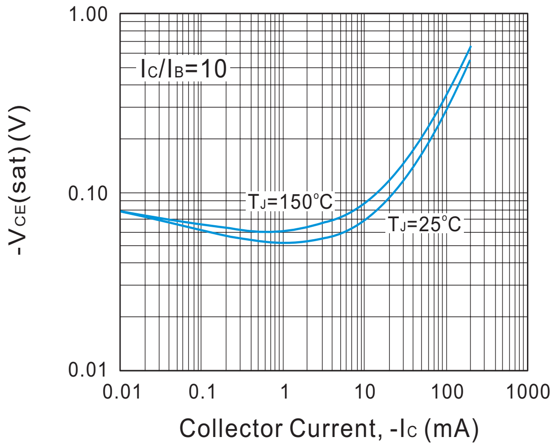


Fig. 3. Typical $V_{CE\,(sat)}$ vs Collector Current

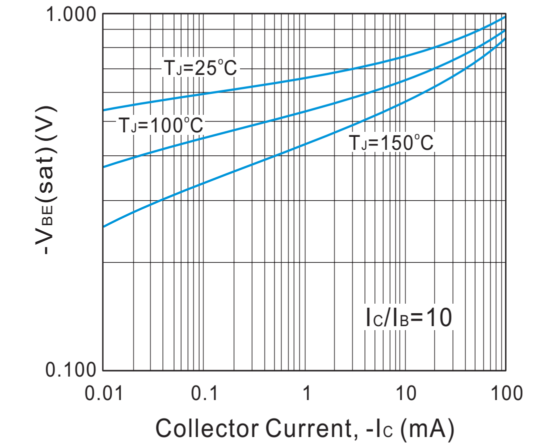


Fig. 4. Typical $V_{BE\,(sat)}$ vs Collector Current

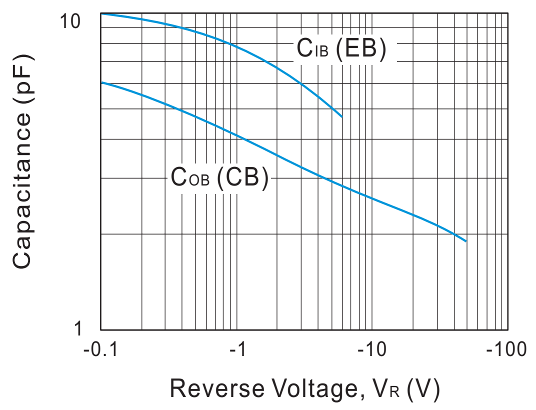
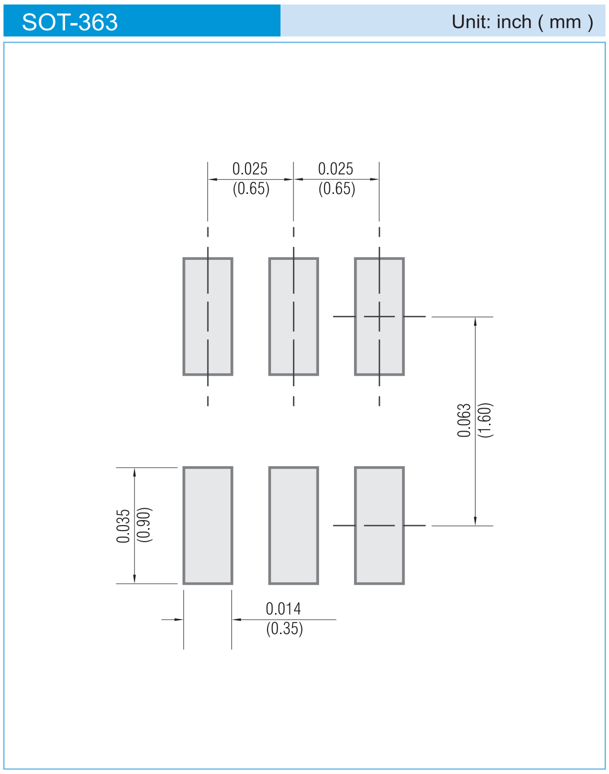


Fig. 5. Typical Capacitances vs Reverse Voltage

MOUNTING PAD LAYOUT



ORDER INFORMATION

- Packing information

  T/R - 10K per 13" plastic Reel

  T/R - 3K per 7” plastic Reel