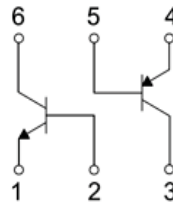


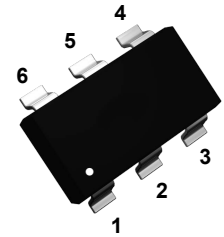
**Complementary NPN+PNP Transistor**

**Features**

- Complementary pair
- One 3904-Type NPN
- One 3906-Type PNP
- Epitaxial planar die construction
- Ideal for low power amplification and switching



Schematic Diagram



SOT-363

1. Emitter 1
2. Base 1
3. Collector 2
4. Emitter 2
5. Base 2
6. Collector 1

**NPN Absolute Maximum Ratings**

( $T_A=25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Base Voltage	$V_{CB0}$	60	V
Collector-Emitter Voltage	$V_{CE0}$	40	V
Emitter-Base Voltage	$V_{EB0}$	5	V
Collector Current	$I_c$	0.2	A
Collector Power Dissipation	$P_c$	0.2	W
Thermal Resistance From Junction to Ambient	$R_{\theta JA}$	625	$^\circ\text{C/W}$
Junction Temperature	$T_J$	-55 to +150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

**PNP Absolute Maximum Ratings**

( $T_A=25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Base Voltage	$V_{CB0}$	-40	V
Collector-Emitter Voltage	$V_{CE0}$	-40	V
Emitter-Base Voltage	$V_{EB0}$	-5	V
Collector Current	$I_c$	-0.2	A
Collector Power Dissipation	$P_c$	0.2	W
Thermal Resistance From Junction to Ambient	$R_{\theta JA}$	625	$^\circ\text{C/W}$
Junction Temperature	$T_J$	-55 to +150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

**Complementary NPN+PNP Transistor**

**NPN Electrical Characteristics** ( $T_A=25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=10\mu\text{A}, I_E=0$	60	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=1\text{mA}, I_B=0$	40	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=10\mu\text{A}, I_C=0$	5	-	-	V
Collector Cut-Off Current	$I_{CBO}$	$V_{CB}=30\text{V}, I_E=0$	-	-	50	nA
Collector Cut-Off Current	$I_{CEO}$	$V_{CE}=30\text{V}, I_B=0$	-	-	500	nA
Emitter-Base Cutoff Current	$I_{EBO}$	$V_{EB}=5\text{V}, I_C=0$	-	-	50	nA
DC Current Gain	$h_{FE}$	$V_{CE}=1\text{V}, I_C=0.1\text{mA}$	40	-	-	-
		$V_{CE}=1\text{V}, I_C=1\text{mA}$	70	-	-	
		$V_{CE}=1\text{V}, I_C=10\text{mA}$	100	-	300	
		$V_{CE}=1\text{V}, I_C=50\text{mA}$	60	-	-	
		$V_{CE}=1\text{V}, I_C=100\text{mA}$	30	-	-	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=10\text{mA}, I_B=1\text{mA}$	-	-	0.2	V
		$I_C=50\text{mA}, I_B=5\text{mA}$	-	-	0.3	
Base-Emitter Voltage	$V_{BE(sat)}$	$I_C=10\text{mA}, I_B=1\text{mA}$	0.65	-	0.85	V
		$I_C=50\text{mA}, I_B=5\text{mA}$	-	-	0.95	
Transition Frequency	$f_T$	$V_{CE}=20\text{V}, I_C=20\text{mA}, F=100\text{MHz}$	300	-	-	MHz
Output Capacitance	$C_{ob}$	$V_{CB}=5\text{V}, I_E=0, F=1\text{MHz}$	-	-	4	pF
Noise Figure	$N_F$	$V_{CE}=5\text{V}, I_C=0.1\text{mA}, F=1\text{KHz}, R_g=1\text{K}\Omega, F=200\text{Hz}$	-	-	5	dB
Delay Time	$t_d$	$V_{CC}=3\text{V}, V_{BE}=0.5\text{V}, I_C=10\text{mA}, I_{B1}=-I_{B2}=1\text{mA}$	-	-	35	nS
Rise Time	$t_r$		-	-	35	nS
Storage Time	$t_s$	$V_{CC}=3\text{V}, I_C=10\text{mA}, I_{B1}=-I_{B2}=1\text{mA}$	-	-	200	nS
Fall Time	$t_f$		-	-	50	nS

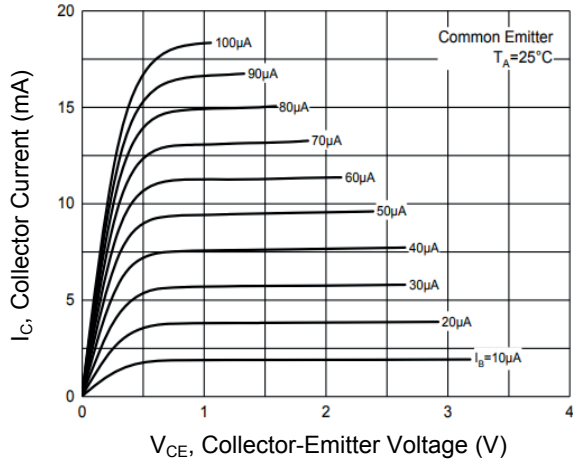
**Complementary NPN+PNP Transistor**

**PNP Electrical Characteristics** ( $T_A=25^\circ\text{C}$  unless otherwise noted)

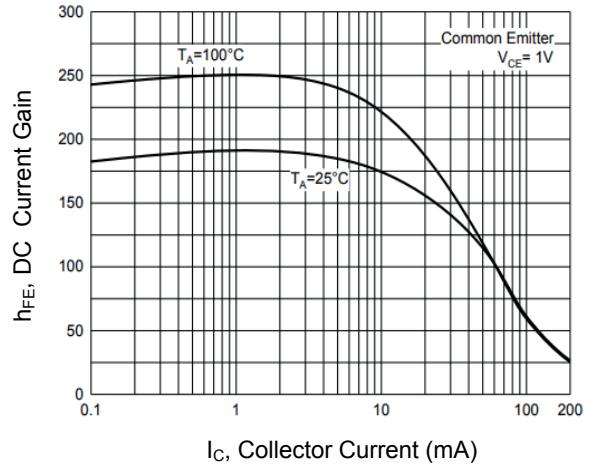
Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=-10\mu\text{A}, I_E=0$	-40	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=-1\text{mA}, I_B=0$	-40	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=-10\mu\text{A}, I_C=0$	-5	-	-	V
Collector Cut-Off Current	$I_{CBO}$	$V_{CB}=-30\text{V}, I_E=0$	-	-	-50	nA
Emitter-Base Cutoff Current	$I_{EBO}$	$V_{EB}=-5\text{V}, I_C=0$	-	-	-50	nA
DC Current Gain	$h_{FE}$	$V_{CE}=-1\text{V}, I_C=-0.1\text{mA}$	60	-	-	-
		$V_{CE}=-1\text{V}, I_C=-1\text{mA}$	80	-	-	
		$V_{CE}=-1\text{V}, I_C=-10\text{mA}$	100	-	300	
		$V_{CE}=-1\text{V}, I_C=-50\text{mA}$	60	-	-	
		$V_{CE}=-1\text{V}, I_C=-100\text{mA}$	30	-	-	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=-10\text{mA}, I_B=-1\text{mA}$	-	-	-0.25	V
		$I_C=-50\text{mA}, I_B=-5\text{mA}$	-	-	-0.4	V
Base-Emitter Voltage	$V_{BE(sat)}$	$I_C=-10\text{mA}, I_B=-1\text{mA}$	-0.65	-	-0.85	V
		$I_C=-50\text{mA}, I_B=-5\text{mA}$	-	-	-0.95	V
Transition Frequency	$f_T$	$V_{CE}=-20\text{V}, I_C=-10\text{mA}, F=100\text{MHz}$	250	-	-	MHz
Noise Figure	$N_F$	$V_{CE}=-5\text{V}, I_C=-0.1\text{mA}, F=1\text{kHz}, R_g=1\text{K}\Omega,$	-	-	4	dB
Delay Time	$t_d$	$V_{CC}=-3\text{V}, V_{BE}=-0.5\text{V}, I_C=-10\text{mA},$	-	-	35	nS
Rise Time	$t_r$	$I_{B1}=-I_{B2}=-1\text{mA}$	-	-	35	nS
Storage Time	$t_s$	$V_{CC}=-3\text{V}, I_C=-10\text{mA},$	-	-	225	nS
Fall Time	$t_f$	$I_{B1}=-I_{B2}=-1\text{mA}$	-	-	75	nS

**Complementary NPN+PNP Transistor**

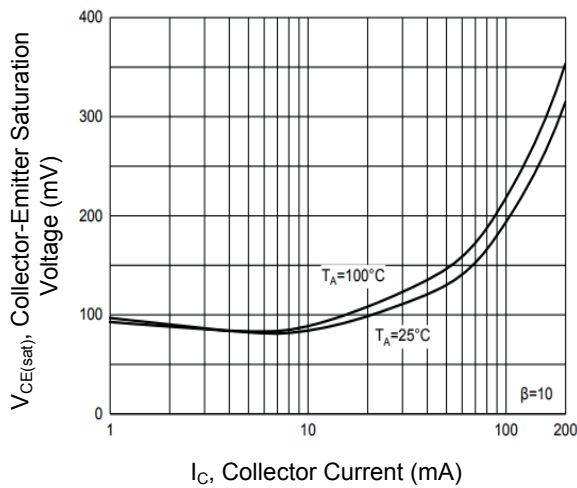
**NPN Typical Characteristic Curves**



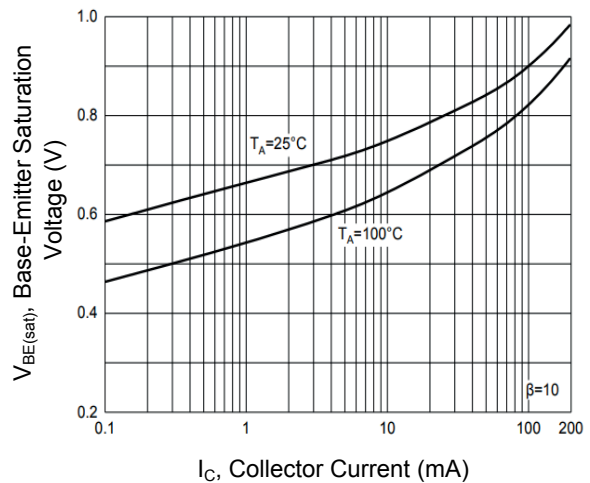
**Figure 1. Static Characteristics**



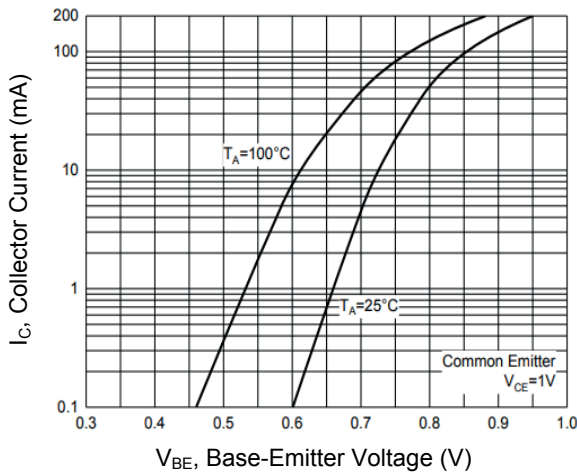
**Figure 2. DC Current Gain Characteristics**



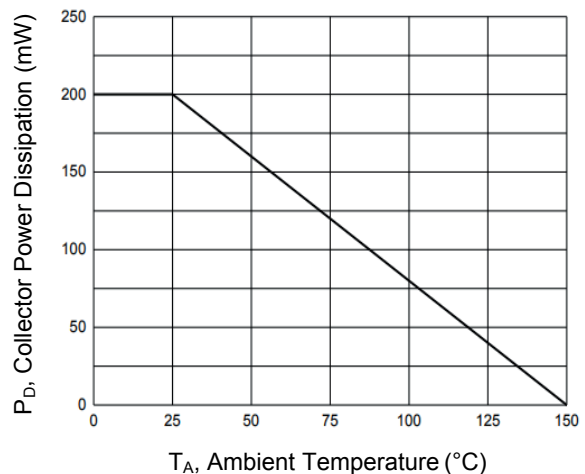
**Figure 3. Collector-Emmitter Saturation Voltage Characteristics**



**Figure 4. Base-Emmitter Saturation Voltage Characteristics**



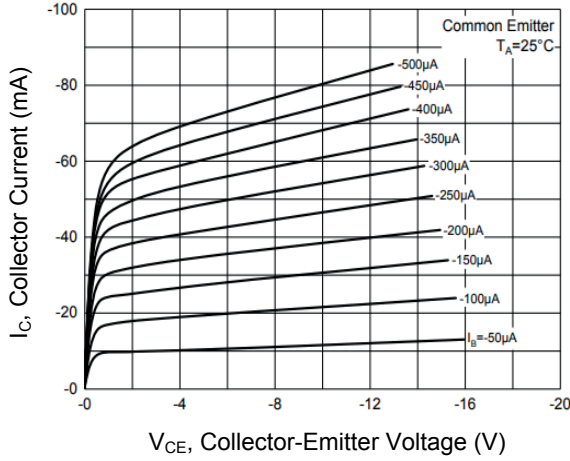
**Figure 5. Base-Emmitter Voltage Characteristics**



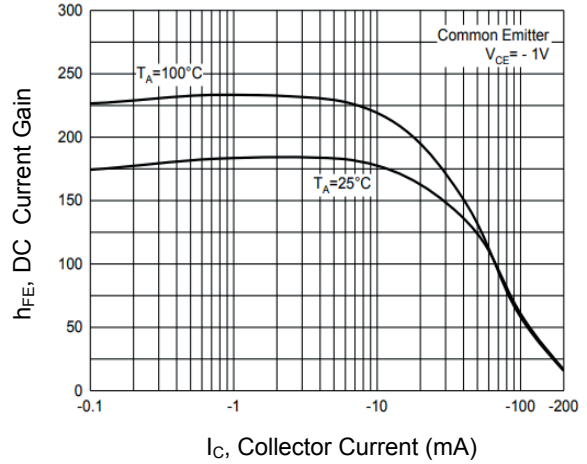
**Figure 6. Collector Power Derating Curve**

**Complementary NPN+PNP Transistor**

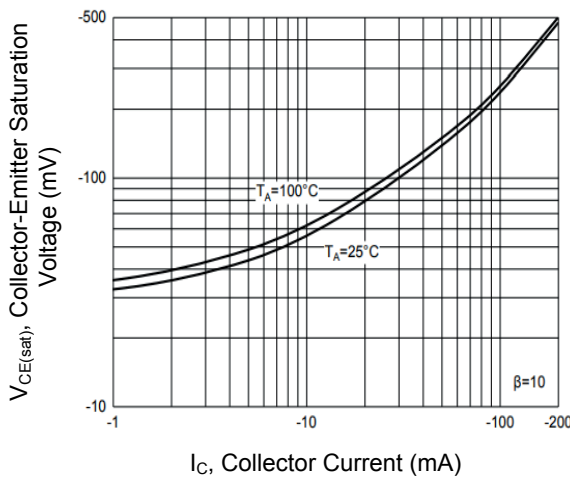
**PNP Typical Characteristic Curves**



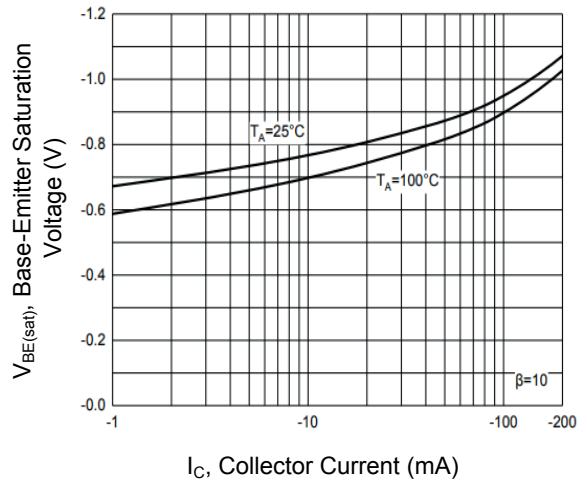
**Figure 7. Static Characteristics**



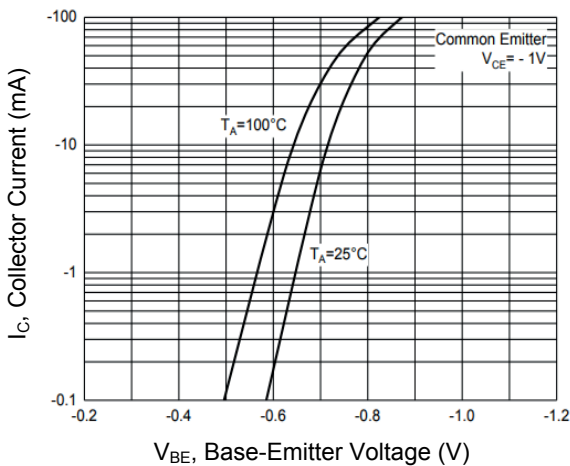
**Figure 8. DC Current Gain Characteristics**



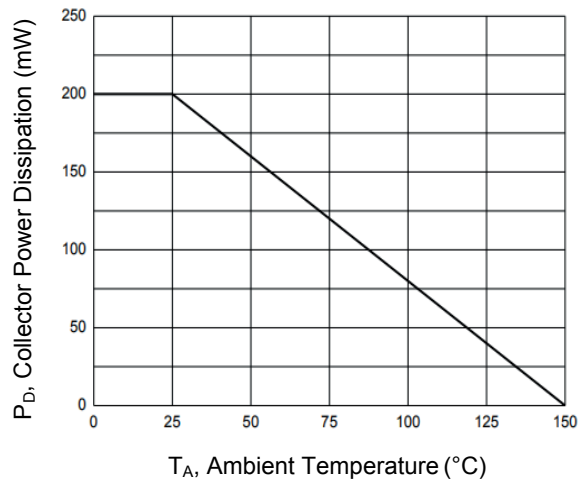
**Figure 9. Collector-Emitter Saturation Voltage Characteristics**



**Figure 10. Base-Emitter Saturation Voltage Characteristics**



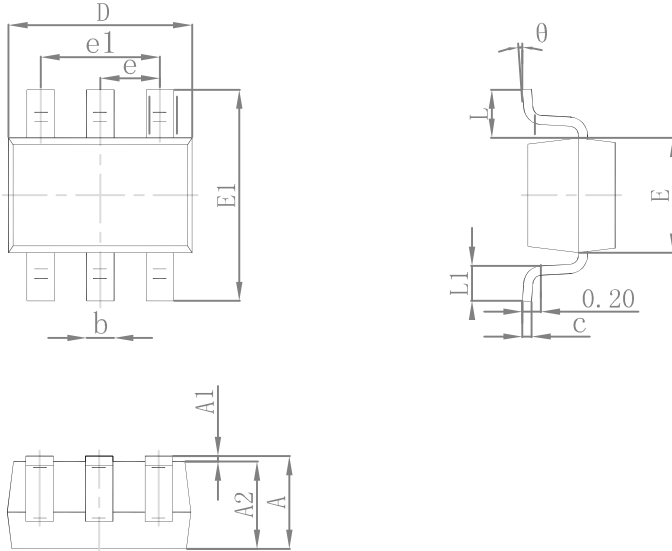
**Figure 11. Base-Emitter Voltage Characteristics**



**Figure 12. Collector Power Derating Curve**

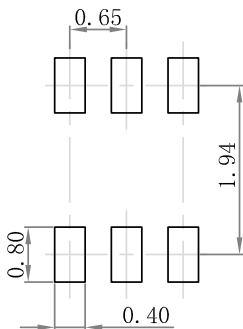
**Complementary NPN+PNP Transistor**

**Package Outline Dimensions (SOT-363)**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650 TYP		0.026 TYP	
e1	1.200	1.400	0.047	0.055
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

**Recommended Pad Layout**



Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.

**Ordering Information**

Device	Package	Marking	Quantity	HSF Status
MMDT3946	SOT-363	K46	3,000pcs / Reel	RoHS Compliant

For more information, please contact us at: [inquiry@goodarksemi.com](mailto:inquiry@goodarksemi.com)