

SOT-363 Plastic-Encapsulate Transistors

MMDT3904DW DUAL TRANSISTOR (NPN+NPN)

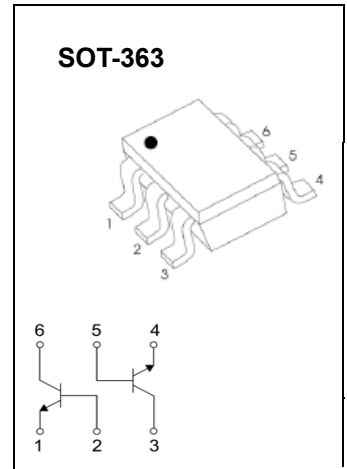
FEATURES

- Epitaxial planar die construction
- Ideal for low power amplification and switching

MARKING:K6N

MAXIMUM RATINGS ($T_a=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage	60	V
V_{CEO}	Collector-Emitter Voltage	40	V
V_{EBO}	Emitter-Base Voltage	5	V
I_C	Collector Current -Continuous	0.2	A
P_C	Collector Power Dissipation	0.2	W
T_J	Junction Temperature	150	$^\circ\text{C}$
T_{stg}	Storage Temperature	-55-150	$^\circ\text{C}$



ELECTRICAL CHARACTERISTICS ($T_a=25^\circ\text{C}$ unless otherwise specified)

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}	$V_{CB}=30\text{V}, I_E=0$			0.05	μA
Emitter cut-off current	I_{EBO}	$V_{EB}=5\text{V}, I_C=0$			0.05	μA
Collector cut-off current	I_{CEX}	$V_{CE}=30\text{V}, V_{BE(off)}=3\text{V}$			0.05	μA
DC current gain	$h_{FE(1)}$	$V_{CE}=1\text{V}, I_C=0.1\text{mA}$	40			
	$h_{FE(2)}$	$V_{CE}=1\text{V}, I_C=1\text{mA}$	70			
	$h_{FE(3)}$	$V_{CE}=1\text{V}, I_C=10\text{mA}$	100		300	
	$h_{FE(4)}$	$V_{CE}=1\text{V}, I_C=50\text{mA}$	60			
	$h_{FE(5)}$	$V_{CE}=1\text{V}, I_C=100\text{mA}$	30			
Collector-emitter saturation voltage	$V_{CE(sat)1}$	$I_C=10\text{mA}, I_B=1\text{mA}$			0.2	V
	$V_{CE(sat)2}$	$I_C=50\text{mA}, I_B=5\text{mA}$			0.3	V
Base-emitter saturation voltage	$V_{BE(sat)1}$	$I_C=10\text{mA}, I_B=1\text{mA}$	0.65		0.85	V
	$V_{BE(sat)2}$	$I_C=50\text{mA}, I_B=5\text{mA}$			0.95	V
Transition frequency	f_T	$V_{CE}=20\text{V}, I_C=10\text{mA}, f=100\text{MHz}$	300			MHz
Collector output capacitance	C_{ob}	$V_{CB}=5\text{V}, I_E=0, f=1\text{MHz}$			4	pF
Noise figure	NF	$V_{CE}=5\text{V}, I_C=0.1\text{mA}, f=1\text{kHz}, R_S=1\text{K}\Omega$			5	dB
Delay time	t_d	$V_{CC}=3\text{V}, V_{BE(off)}=-0.5\text{V}$			35	nS
Rise time	t_r	$I_C=10\text{mA}, I_{B1}=-I_{B2}=1\text{mA}$			35	nS
Storage time	t_s	$V_{CC}=3\text{V}, I_C=10\text{mA}$			200	nS
Fall time	t_f	$I_{B1}=-I_{B2}=1\text{mA}$			50	nS



TYPICAL TRANSIENT CHARACTERISTICS

— $T_J = 25^\circ\text{C}$
- - $T_J = 125^\circ\text{C}$

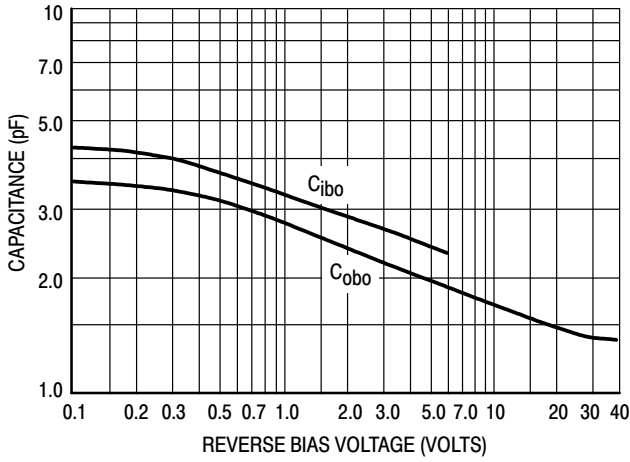


Figure 3. Capacitance

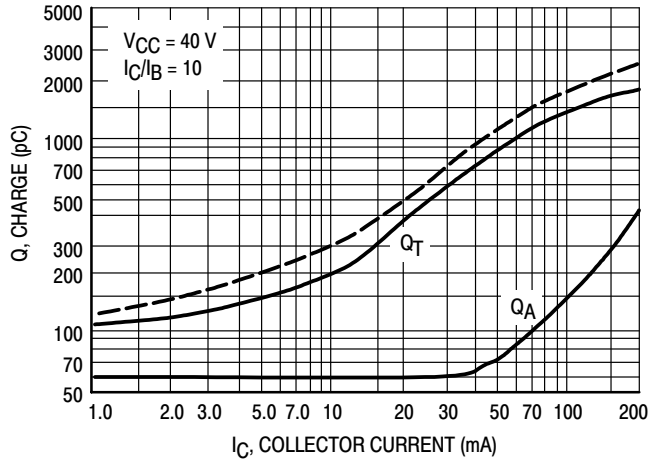


Figure 4. Charge Data

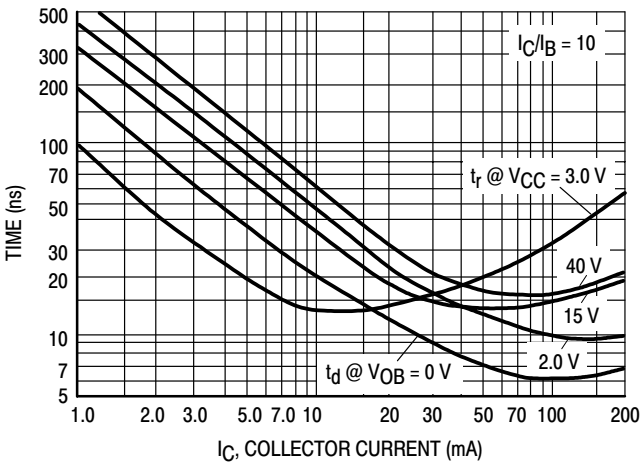


Figure 5. Turn-On Time

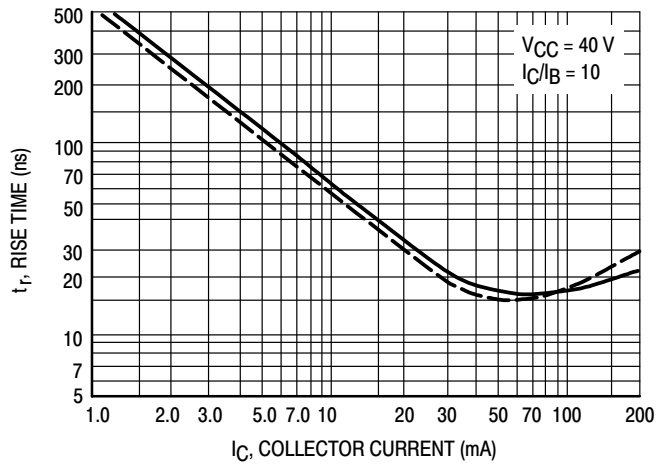


Figure 6. Rise Time

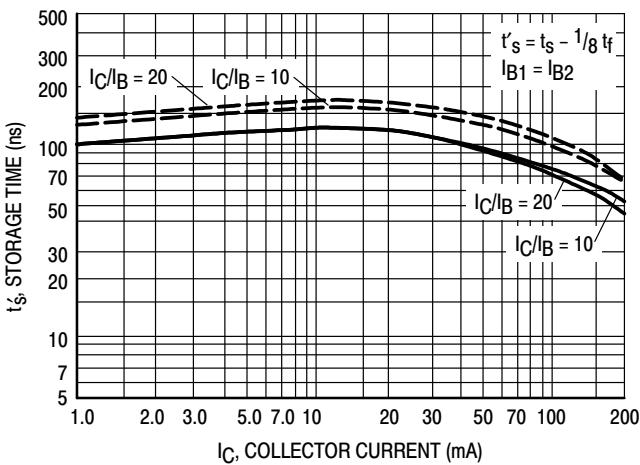


Figure 7. Storage Time

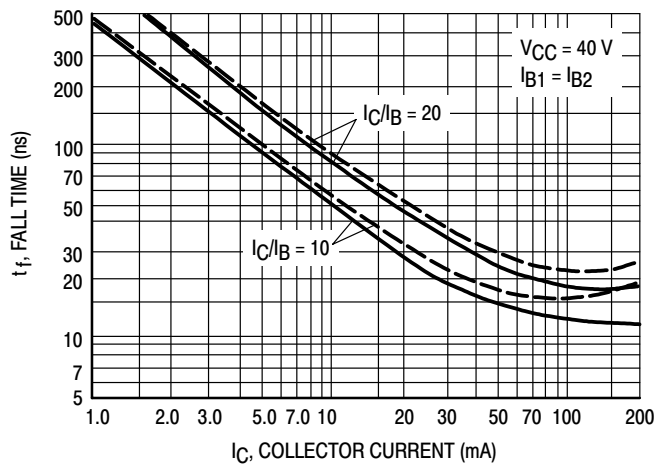


Figure 8. Fall Time



TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE VARIATIONS

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

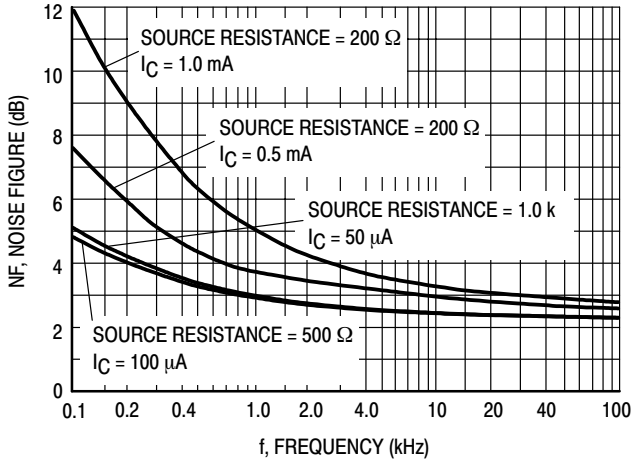


Figure 9. Noise Figure

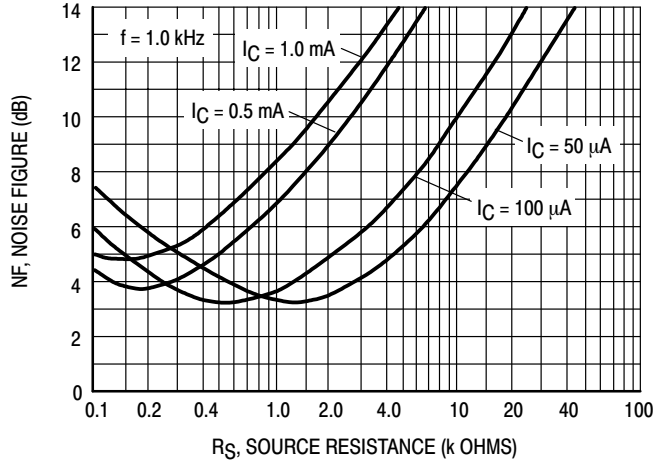


Figure 10. Noise Figure

h PARAMETERS

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

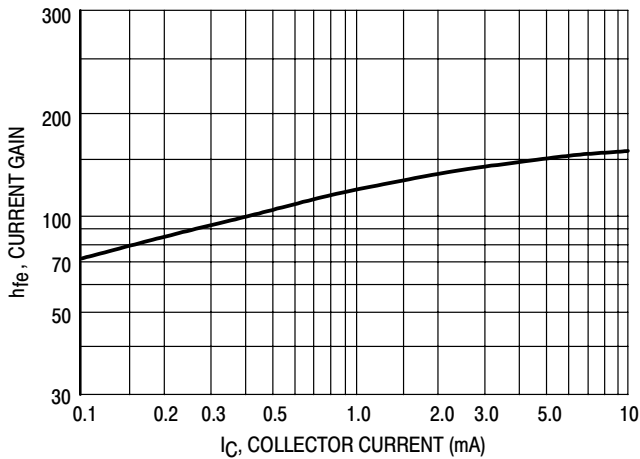


Figure 11. Current Gain

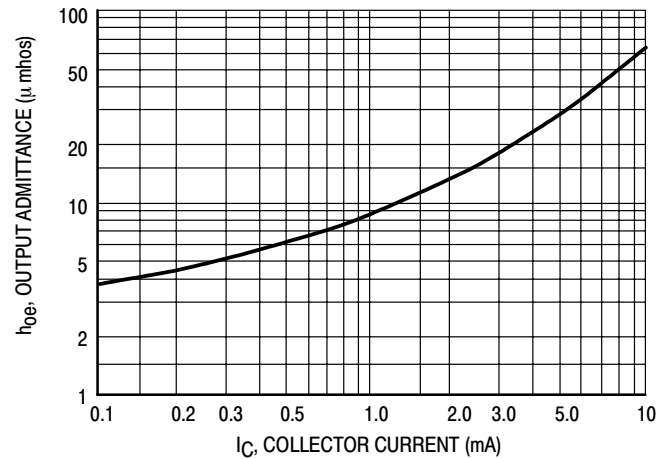


Figure 12. Output Admittance

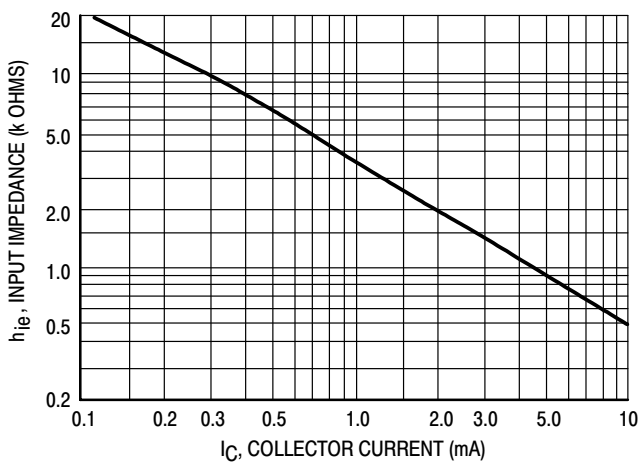


Figure 13. Input Impedance

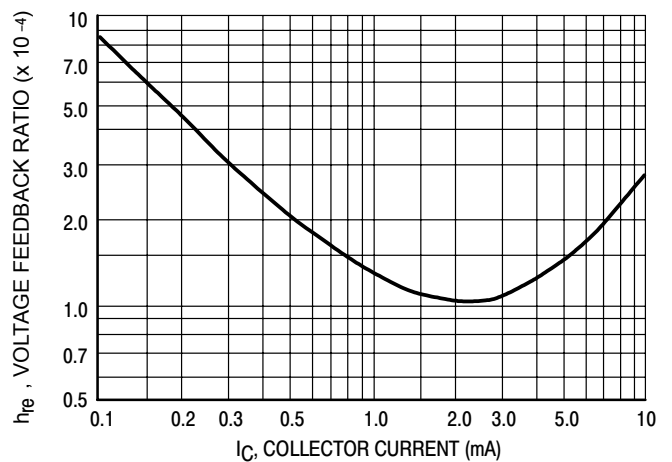


Figure 14. Voltage Feedback Ratio



TYPICAL STATIC CHARACTERISTICS

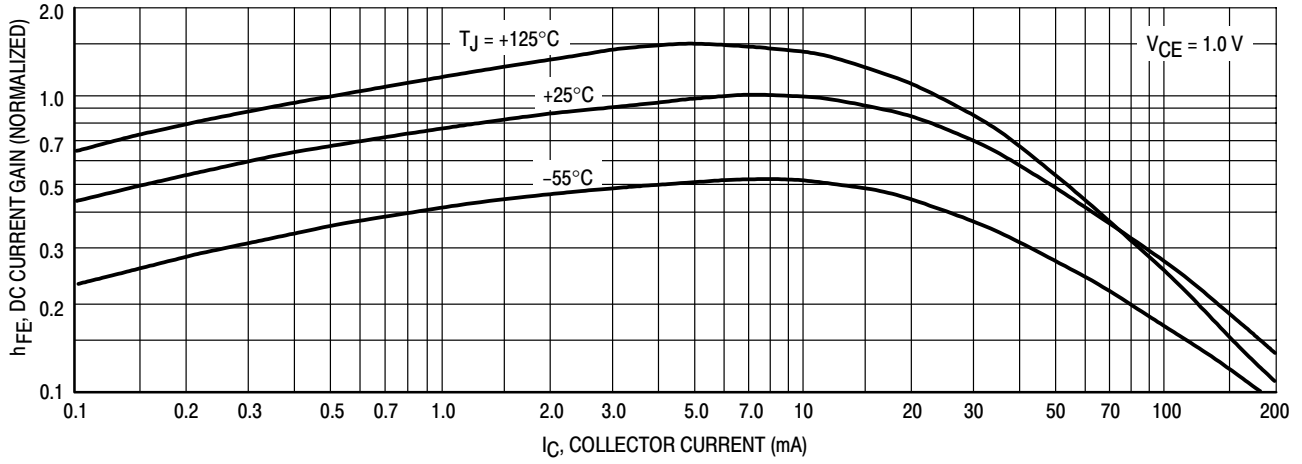


Figure 15. DC Current Gain

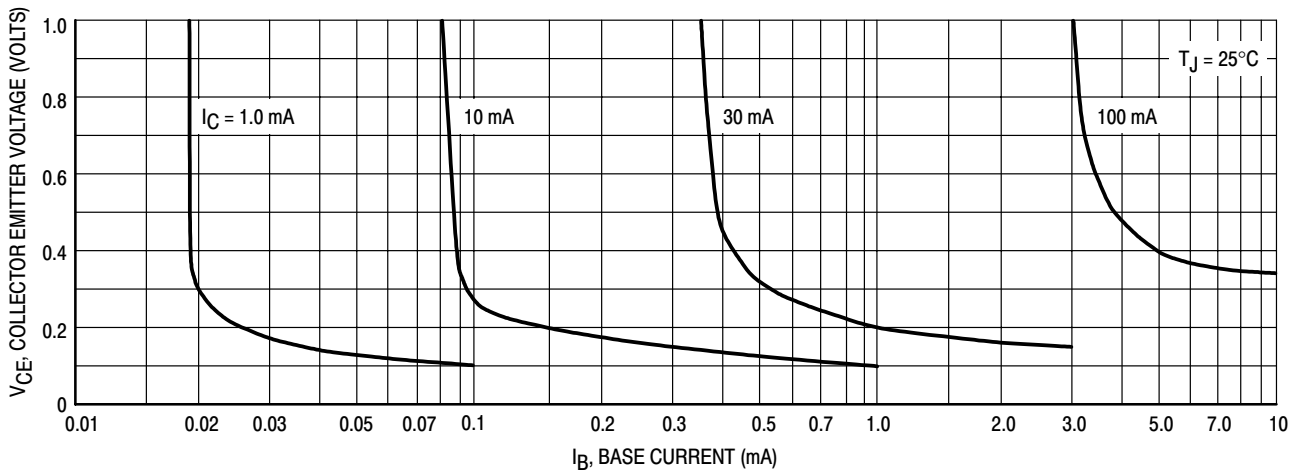


Figure 16. Collector Saturation Region

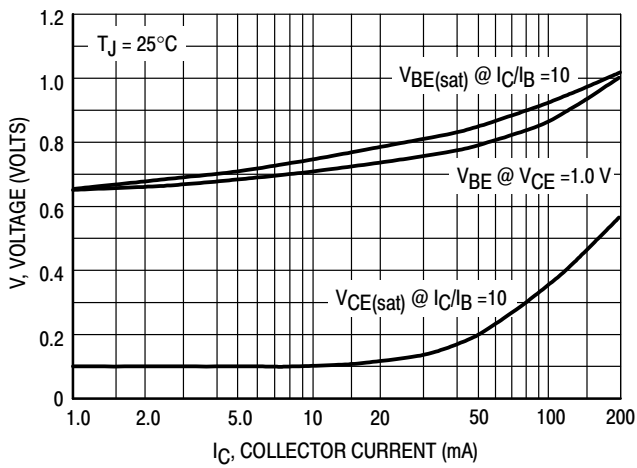


Figure 17. "ON" Voltages

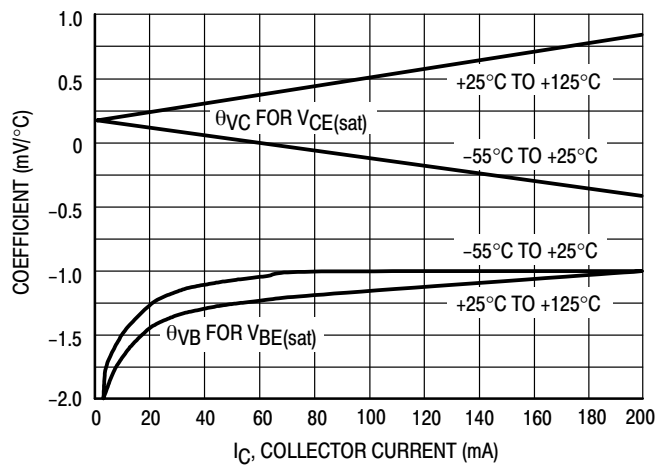
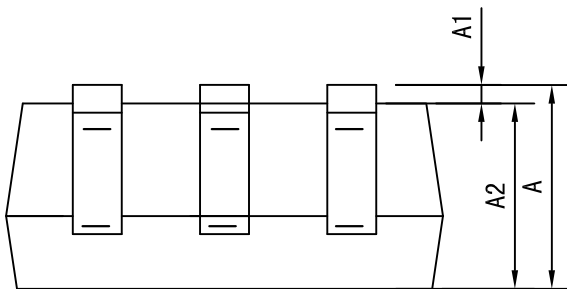
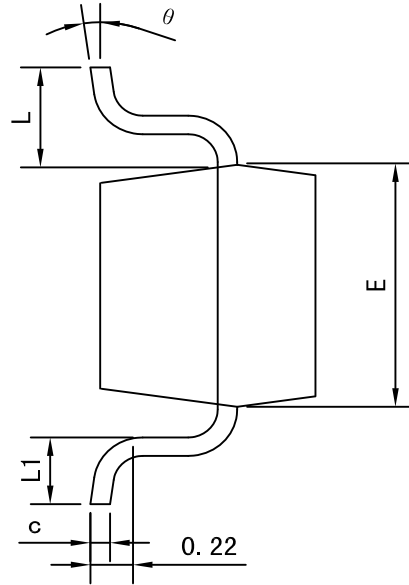
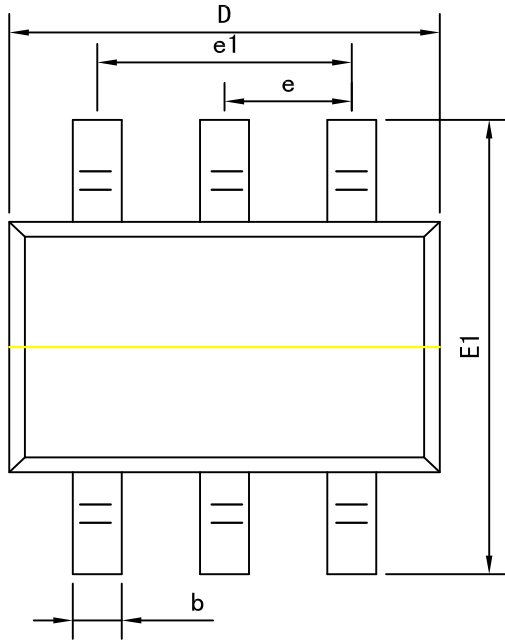


Figure 18. Temperature Coefficients



Package outline dimensions

SOT-363



Symbol	Dimension in Millimeters	
	Min	Max
A	0.900	1.100
A1	0.000	0.100
A2	0.900	1.000
b	0.150	0.350
c	0.080	0.150
D	2.000	2.200
E	1.150	1.350
E1	2.150	2.450
e	0.650 TYP	
e1	1.200	1.400
L	0.525 REF	
L1	0.260	0.460
θ	0°	8°