DIODES INCORPORATED

MMDT4401

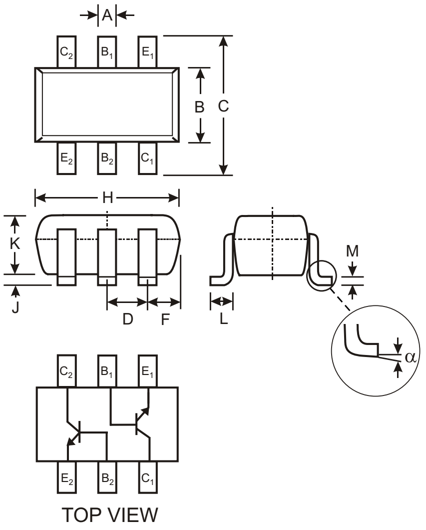
DUAL NPN SMALL SIGNAL SURFACE MOUNT TRANSISTOR

Features

- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching
- Ultra-Small Surface Mount Package

Mechanical Data

- Case: SOT-363, Molded Plastic
- Case material - UL Flammability Rating Classification 94V-0
- Moisture sensitivity: Level 1 per J-STD-020A
- Terminals: Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Marking (See Page 2): K2X
- Ordering & Date Code Information: See Page 2
- Weight: 0.006 grams (approx.)



SOT-363		
Dim	**Min**	**Max**
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 Nominal	
F	0.30	0.40
H	1.80	2.20
J	—	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.25
α	0°	8°
All Dimensions in mm		

Maximum Ratings

@ $T_A = 25°C$ unless otherwise specified

Characteristic	Symbol	MMDT4401	Unit
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6.0	V
Collector Current - Continuous (Note 1)	I_C	600	mA
Power Dissipation (Note 1, 2)	P_d	200	mW
Thermal Resistance, Junction to Ambient (Note 1)	$R_{\theta JA}$	625	K/W
Operating and Storage and Temperature Range	T_j, T_{STG}	-55 to +150	°C

Notes:
1. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.
2. Maximum combined dissipation.

Electrical Characteristics @ $T_A = 25°C$ unless otherwise specified

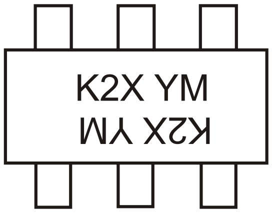
Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 3)					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60	—	V	$I_C = 100\mu A$, $I_E = 0$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40	—	V	$I_C = 1.0mA$, $I_B = 0$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6.0	—	V	$I_E = 100\mu A$, $I_C = 0$
Collector Cutoff Current	I_{CEX}	—	100	nA	$V_{CE} = 35V$, $V_{EB(OFF)} = 0.4V$
Base Cutoff Current	I_{BL}	—	100	nA	$V_{CE} = 35V$, $V_{EB(OFF)} = 0.4V$
ON CHARACTERISTICS (Note 3)					
DC Current Gain	h_{FE}	20 40 80 100 40	— — — 300 —	—	$I_C = 100\mu A$, $V_{CE} = 1.0V$ $I_C = 1.0mA$, $V_{CE} = 1.0V$ $I_C = 10mA$, $V_{CE} = 1.0V$ $I_C = 150mA$, $V_{CE} = 1.0V$ $I_C = 500mA$, $V_{CE} = 2.0V$
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	0.40 0.75	V	$I_C = 150mA$, $I_B = 15mA$ $I_C = 500mA$, $I_B = 50mA$
Base- Emitter Saturation Voltage	$V_{BE(SAT)}$	0.75 —	0.95 1.2	V	$I_C = 150mA$, $I_B = 15mA$ $I_C = 500mA$, $I_B = 50mA$
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{cb}	—	6.5	pF	$V_{CB} = 5.0V$, f = 1.0MHz, $I_E = 0$
Input Capacitance	C_{eb}	—	30	pF	$V_{EB} = 0.5V$, f = 1.0MHz, $I_C = 0$
Input Impedance	h_{ie}	1.0	15	kΩ	$V_{CE} = 10V$, $I_C = 1.0mA$, f = 1.0kHz
Voltage Feedback Ratio	h_{re}	0.1	8.0	$\times 10^{-4}$	
Small Signal Current Gain	h_{fe}	40	500	—	
Output Admittance	h_{oe}	1.0	30	µS	
Current Gain-Bandwidth Product	f_T	250	—	MHz	$V_{CE} = 10V$, $I_C = 20mA$, f = 100MHz
SWITCHING CHARACTERISTICS					
Delay Time	t_d	—	15	ns	$V_{CC} = 30V$, $I_C = 150mA$, $V_{BE(off)} = 2.0V$, $I_{B1} = 15mA$
Rise Time	t_r	—	20	ns	
Storage Time	t_s	—	225	ns	$V_{CC} = 30V$, $I_C = 150mA$, $I_{B1} = I_{B2} = 15mA$
Fall Time	t_f	—	30	ns	

Ordering Information (Note 4)

Device	Packaging	Shipping
MMDT4401-7	SOT-363	3000/Tape & Reel

Notes: 3. Short duration pulse test used to minimize self-heating effect.
4. For Packaging Details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

Marking Information



K2X = Product Type Marking Code
YM = Date Code Marking
Y = Year ex: N = 2002
M = Month ex: 9 = September

Date Code Key

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Code	J	K	L	M	N	P	R	S	T	U	V	W

Month	Jan	Feb	March	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

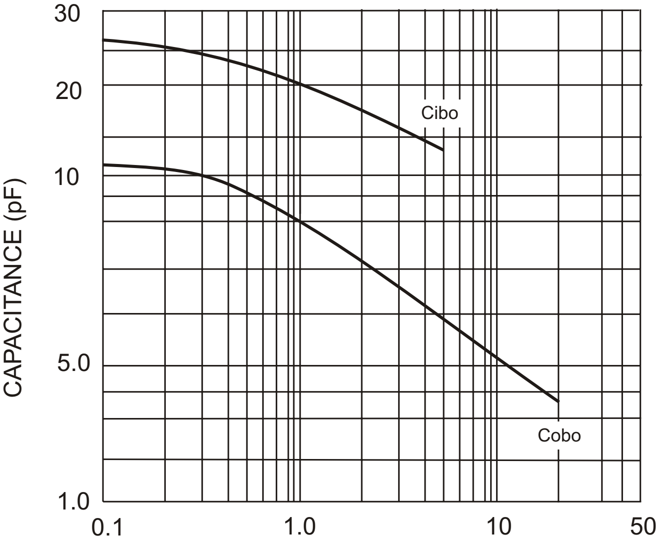


Fig. 1 Typical Capacitance

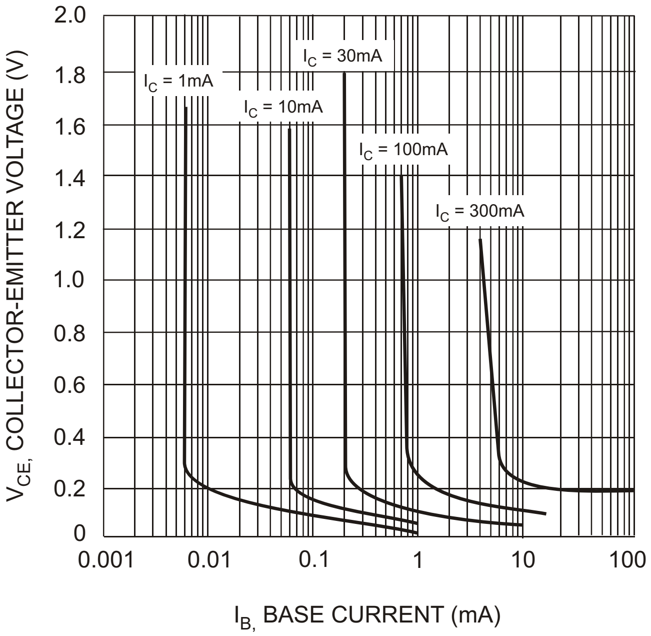


Fig. 2 Typical Collector Saturation Region