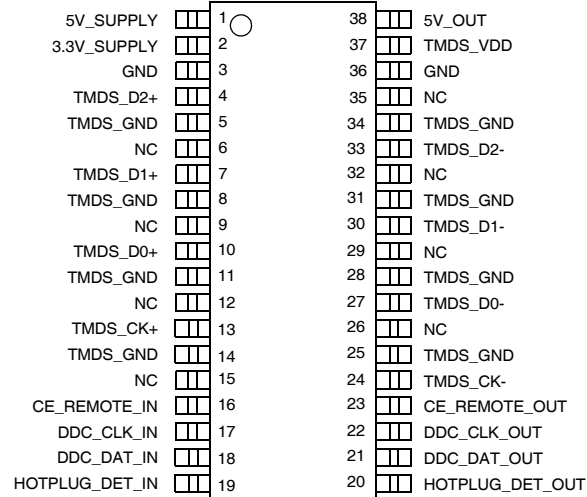




**PACKAGE / PINOUT DIAGRAM**

## TOP VIEW



38-PIN TSSOP PACKAGE

Note: This drawing is not to scale.

**PIN DESCRIPTIONS**

PINS	NAME	DESCRIPTION
37	TMDS_VDD	TMDS ESD diodes biased from 5V_SUPPLY through internal diode.
4	TMDS_D2+	TMDS 0.9pF ESD protection.
33	TMDS_D2-	TMDS 0.9pF ESD protection.
7	TMDS_D1+	TMDS 0.9pF ESD protection.
30	TMDS_D1-	TMDS 0.9pF ESD protection.
10	TMDS_D0+	TMDS 0.9pF ESD protection.
27	TMDS_D0-	TMDS 0.9pF ESD protection.
13	TMDS_CK+	TMDS 0.9pF ESD protection.
24	TMDS_CK-	TMDS 1pF ESD protection.
16	CE_REMOTE_IN	3.3V_SUPPLY referenced logic level in.
23	CE_REMOTE_OUT	5V_SUPPLY referenced logic level out plus 4pF ESD.
17	DDC_CLK_IN	3.3V_SUPPLY referenced logic level in.
22	DDC_CLK_OUT	5V_SUPPLY referenced logic level out plus 4pF ESD.
18	DDC_DAT_IN	3.3V_SUPPLY referenced logic level in.
21	DDC_DAT_OUT	5V_SUPPLY referenced logic level out plus 4pF ESD.
19	HOTPLUG_DET_IN	3.3V_SUPPLY referenced logic level in.
20	HOTPLUG_DET_OUT	5V_SUPPLY referenced logic level out plus 4pF ESD.
2	3.3V_SUPPLY	Bias for CE / DDC / HOTPLUG level shifters.
1	5V_SUPPLY	Current source for 5V_OUT.
38	5V_OUT	75mA minimum overcurrent protected 5V output.
3, 5, 8, 11, 14, 25, 28, 31, 34, 36	GND / TMDS_GND	GND reference.
6, 9, 12, 15, 26, 29, 32, 35	NC	No Connect.

## Ordering Information

PART NUMBERING INFORMATION					
Pins	Package	Standard Finish		Lead-free Finish	
		Ordering Part Number <sup>1</sup>	Part Marking	Ordering Part Number <sup>1</sup>	Part Marking
38	TSSOP-38	CM2020-00TS	CM2020-00TS	CM2020-00TR	CM2020-00TR

Note 1: Parts are shipped in Tape & Reel form unless otherwise specified.

## Specifications

ABSOLUTE MAXIMUM RATINGS		
PARAMETER	RATING	UNITS
$V_{CC5}, V_{CC3}$	6.0	V
ESD Clamp Diode Forward DC Current (Note 1)	8	mA
DC Voltage at any Channel Input	[GND - 0.5] to [VCC + 0.5]	V
Storage Temperature Range	-65 to +150	°C
Operating Temperature Range	-40 to +85	°C

Note 1: Only one diode conducting at a time.

STANDARD (RECOMMENDED) OPERATING CONDITIONS					
SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
5V_SUPPLY	Operating Supply Voltage		5	5.5	V
3.3V_SUPPLY	Bias Supply Voltage	1	3.3	5.5	V

**Specifications (cont'd)**

ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE 1)						
SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
$I_{CC5}$	Operating Supply Current	5V_SUPPLY = 5.0V	100	110	130	$\mu$ A
$I_{CC3}$	Bias Supply Current	3.3V_SUPPLY = 3.3V		1	5	$\mu$ A
$V_{DROP}$	5V_OUT Overcurrent Output Drop	5V_SUPPLY= 5.0V, $I_{OUT}=55$ mA		65	100	mV
$I_{SC}$	5V_OUT Short Circuit Current Limit	5V_SUPPLY= 5.0V, 5V_OUT = GND	90	135	175	mA
$I_{OFF}$	OFF state leakage current, level shifting NFET	3.3V_SUPPLY = 0V		0.1	5	$\mu$ A
$I_{BACKDRIVE}$	Current conducted from output pins to V_SUPPLY rails when powered down	5V_SUPPLY < $V_{CH\_OUT}$ ; Signal pins: TMDS_[2:0]+/-, TMDS_CK+/-, CE_REMOTE_OUT, DDC_DAT_OUT, DDC_CLK_OUT, HOTPLUG_DET_OUT, 5V_OUT Only		0.1	5	$\mu$ A
$V_{ON}$	VOLTAGE drop across level shifting NFET when ON	3.3V_SUPPLY = 2.5V, $V_S$ = GND, $I_{DS}$ = 3mA	75	95	140	mV
$V_F$	Diode Forward Voltage Top Diode Bottom Diode	$I_F$ = 8mA, $T_A$ = 25°C, Note 2	0.6 0.6	0.85 0.85	0.95 0.95	V V
$V_{ESD}$	ESD Withstand Voltage (IEC)	Pins 4, 7, 10, 13, 20, 21, 22, 23, 24, 27, 30, 33; Notes 2 and 3	$\pm$ 8			kV
$V_{ESD}$	ESD Withstand Voltage (HBM)	Pins 1, 2, 16, 17, 18, 19, 37, 38; Notes 2 and 4	$\pm$ 2			kV
$V_{CL}$	Channel Clamp Voltage @ 8kV HBM ESD Positive Transients Negative Transients	$T_A$ = 25°C, Notes 2 and 4		9.0 -9.0		V V
$R_{DYN}$	Dynamic Resistance Positive Transients Negative Transients	$I$ = 1A, $T_A$ = 25°C, Note 5		3.0 1.5		$\Omega$ $\Omega$
$I_{LEAK}$	TMDS Channel Leakage Current	$T_A$ = 25°C, Note 2		0.01	1	$\mu$ A
$C_{IN, TMDS}$	TMDS Channel Input Capacitance	5V_SUPPLY= 5.0V, Measured at 1MHz, $V_{BIAS}=2.5$ V, Note 2		0.9	1.2	pF
$\Delta C_{IN, TMDS}$	$C_{IN}$ Matching Capacitance	5V_SUPPLY= 5.0V, Measured at 1MHz, $V_{BIAS}=2.5$ V, Note 2, 6		0.05		pF
$C_{MUTUAL}$	Mutual Capacitance between signal pin and NC pin	5V_SUPPLY= 0V, Measured at 1MHz, $V_{BIAS}=2.5$ V, Note 2		0.07		pF

ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE 1)						
$C_{IN, DDC}$	Level Shifting Input Capacitance, Capacitance to GND	5V_SUPPLY= 0V, Measured at 100KHz, $V_{BIAS}=2.5V$ , Note 2		4	6	pF
$C_{IN, CEC}$	Level Shifting Input Capacitance, Capacitance to GND	5V_SUPPLY= 0V, Measured at 100KHz, $V_{BIAS}=2.5V$ , Note 2		4	6	pF
$C_{IN, HP}$	Level Shifting Input Capacitance, Capacitance to GND	5V_SUPPLY= 0V, Measured at 100KHz, $V_{BIAS}=2.5V$ , Note 2		4	6	pF

Note 1: Operating Characteristics are over Standard Operating Conditions unless otherwise specified.

Note 2: This parameter is guaranteed by design and verified by device characterization.

Note 3: Standard IEC 61000-4-2,  $C_{DISCHARGE}=150pF$ ,  $R_{DISCHARGE}=330\Omega$

Note 4: Human Body Model per MIL-STD-883, Method 3015,  $C_{DISCHARGE}=100pF$ ,  $R_{DISCHARGE}=1.5k\Omega$

Note 5: These measurements performed with no external capacitor on TMD5\_VDD.

Note 6: Intra-pair matching, each TMD5 pair (i.e. D+, D-)

**Performance Information**

Typical Filter Performance (T<sub>A</sub>=25°C, DC Bias=0V, 50 Ohm Environment)

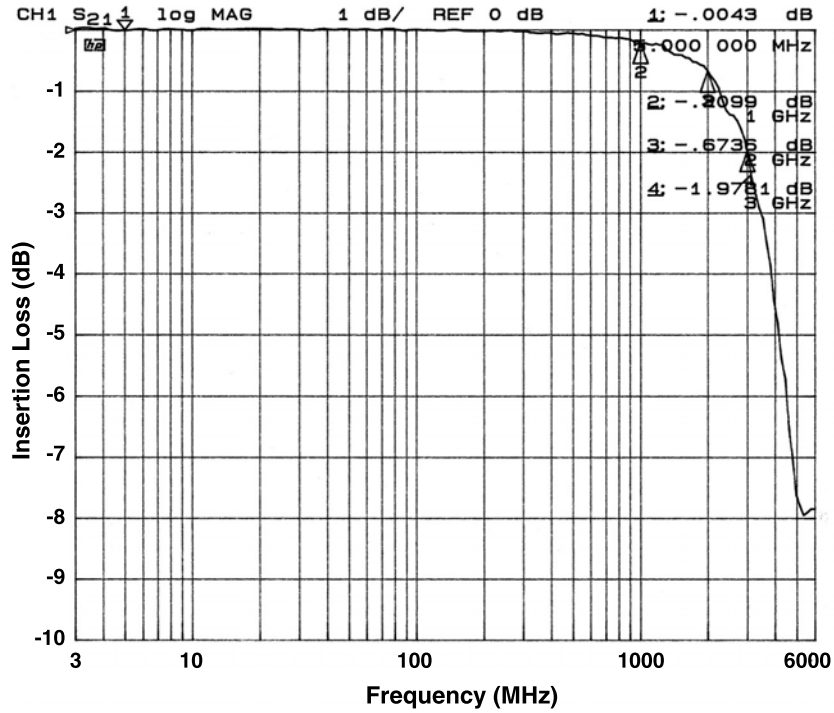
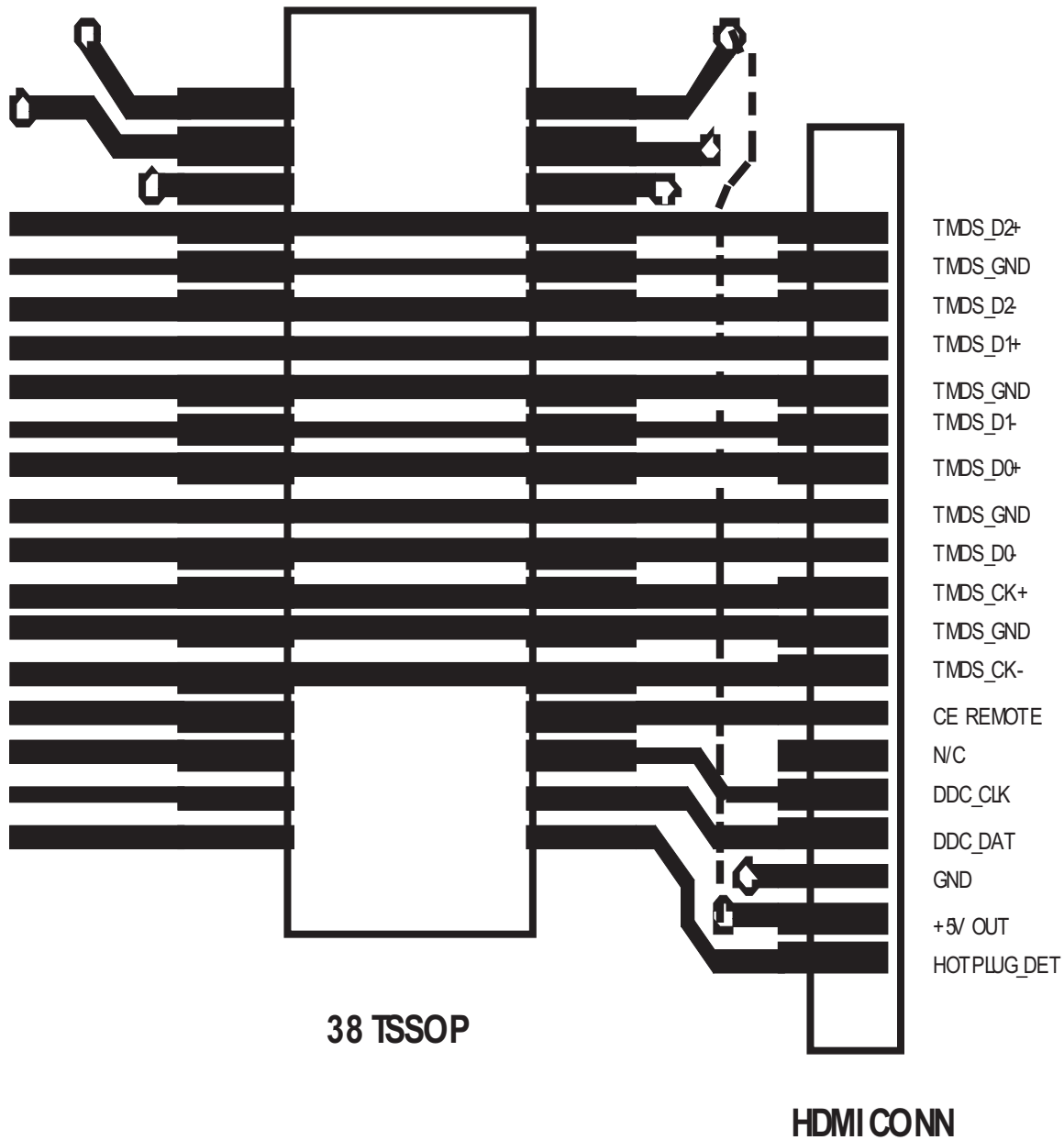


Figure 1. Insertion Loss vs. Frequency (TMDS\_D1- to GND)

**Application Information**



**Figure 2. Typical Application for CM2020**

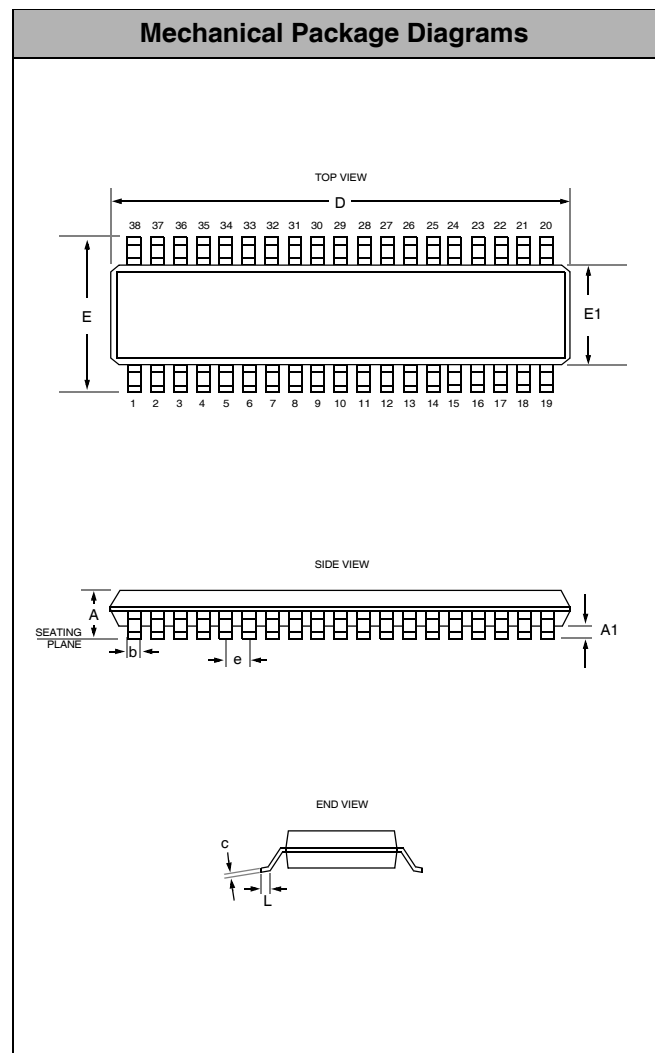
## Mechanical Details

### TSSOP-38 Mechanical Specifications

CM2020 devices are supplied in 38-pin TSSOP packages. Dimensions are presented below.

For complete information on the TSSOP-38, see the California Micro Devices TSSOP Package Information document.

PACKAGE DIMENSIONS				
Package	TSSOP			
JEDEC No.	MO-153 (Variation BD-1)			
Pins	38			
Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	—	1.20	—	0.047
A1	0.05	0.15	0.002	0.006
b	0.17	0.27	0.007	0.011
c	0.09	0.20	0.004	0.008
D	9.60	9.80	0.378	0.386
E	6.40 BSC		0.252 BSC	
E1	4.30	4.50	0.169	0.177
e	0.50 BSC		0.020 BSC	
L	0.45	0.75	0.018	0.030
# per tape and reel	2500 pieces			
Controlling dimension: millimeters				



Package Dimensions for TSSOP-38



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