Low Power Low Offset Voltage Single Comparator

General Description

The SWCM331 consists of a single precision voltage comparator with a typical input offset voltage of 1.0mV and high gain. It is specifically designed to operate from a single power supply over wide range of voltage. Operation from split power supply is also possible and the low power supply current drain is independent of the megnitude of the power supply voltage. The SWCM331 is available in SOT-23-5 package.

Features

- Wide Supply Voltage Range:
  Single Supply: 2.0V to 36V
  Dual Supplies: ±1.0V to ±18V
- Low Supply Current at Vcc=5V: 0.4mA
- Low Input Bias Current: 25nA (Typical)
- Low Input Offset Current: ±5.0nA (Typical)
- Low Input Offset Voltage: 1.0mV (Typical)
- Input Common Mode Voltage Range Includes Ground
- Differential Input Voltage Range Equals to the Power Supply Voltage
- Low Output Saturation Voltage:200mV at 4mA
- Open Collector Output

Applications

- Battery Charger
- Cordless Telephone
- Switching Power Supply
- DC-DC Module
- PC Motherboard
- Communication Equipment

Packages:

- SOT-23-5

SOT-23-5

Figure 1. Package Type of SWCM331

Pin Configuration

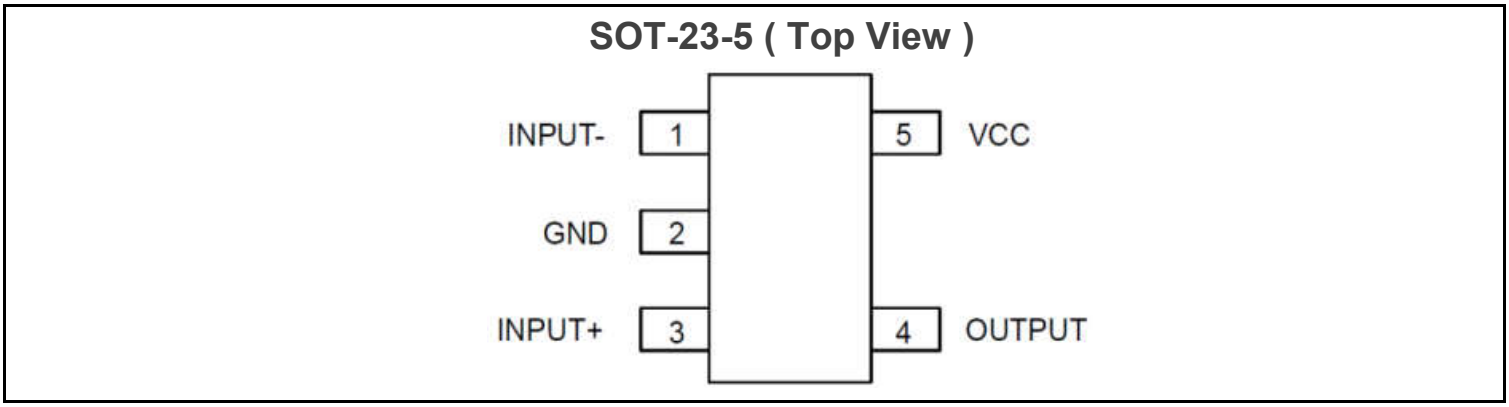
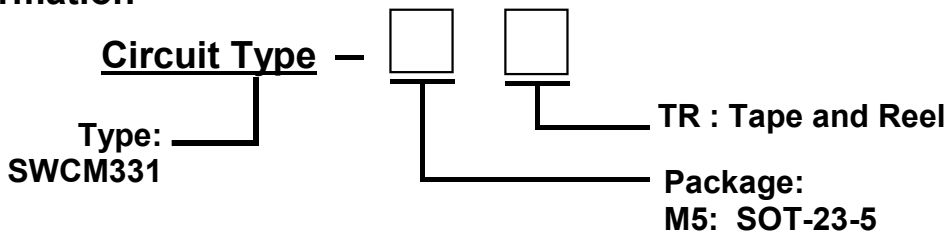


Figure 2. Pin Configuration of SWCM331 (Top View)

Pin Function Table

SOT-23-5	Name	Function
1	Input -	Inverting Inputs
2	GND	Negative Power Supply
3	Input +	Non-inverting Inputs
4	Output	Outputs
5	VCC	Positive Power Supply

Ordering Information



Ordering Code note b

Part Number	Marking ID	Temperature Range	Package	Package Type
SWCM331-M5TR	GEAXX	-40'C to +85'C	SOT-23-5	3000pcs/TR

note a. marking information: XX, the 1ST X is date code-Year(A=2010, B=2011,...)

Functional Block Diagram

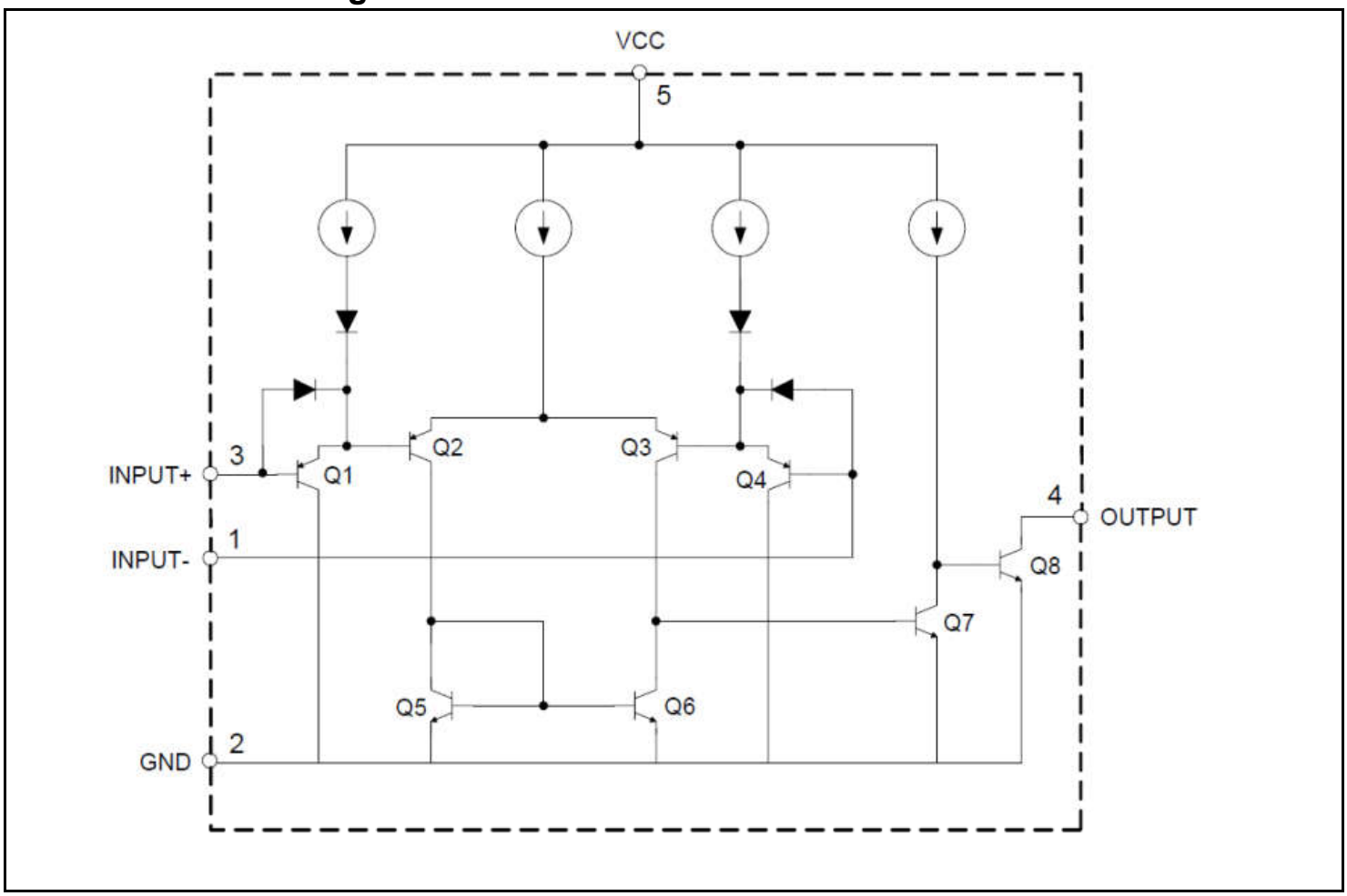


Figure 3. Functional Block Diagram of SWCM331

Typical Application Circuit

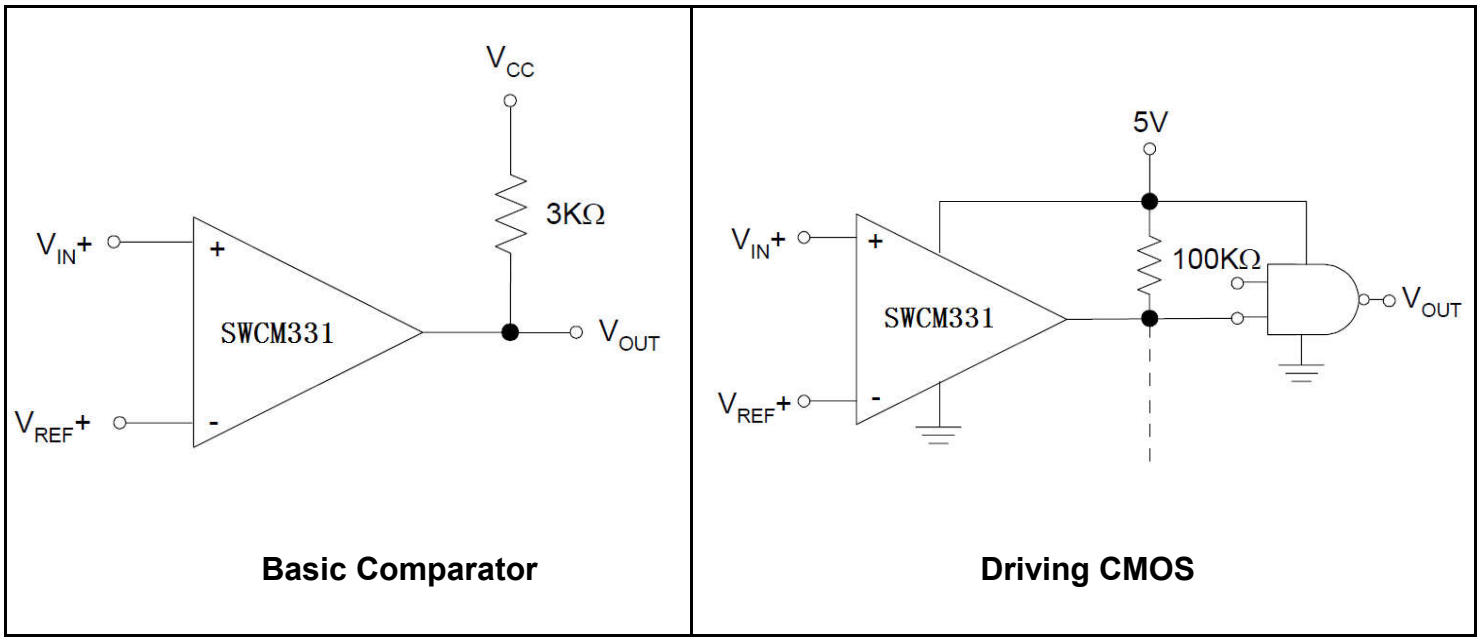
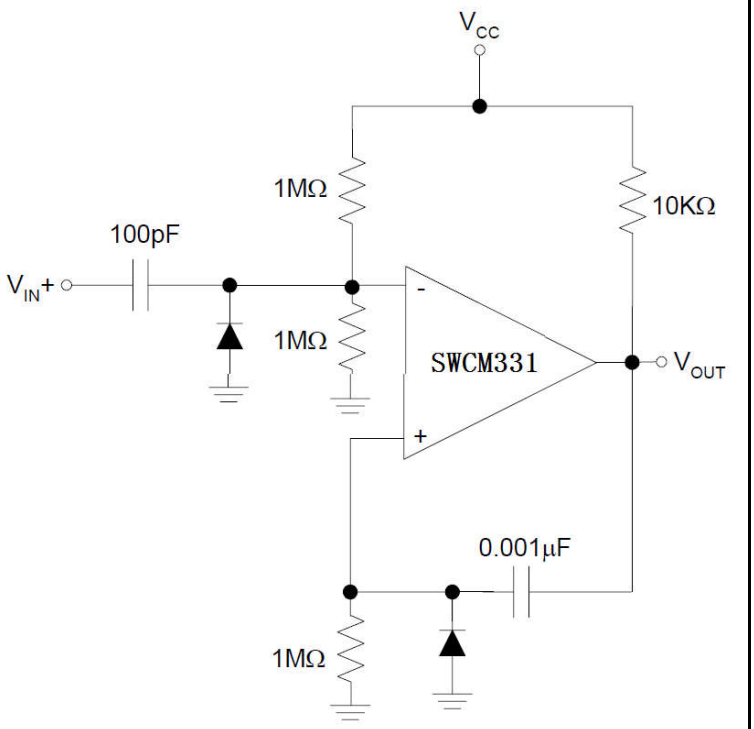
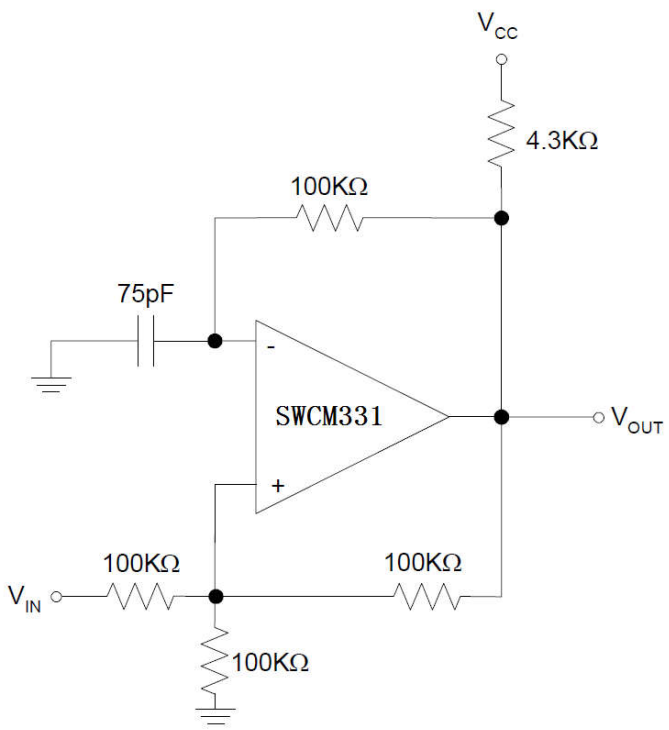


Figure 4-1. Typical Application Circuit of SWCM331

Typical Application Circuit (Con.)



One Shot Multivibrator



Squarewave Oscillator

Figure 4-2. Functional Block Diagram of SWCM331

Absolute Maximum Ratings Note 1

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	40	V
Input Voltage	V_{IN}	-0.3 to 40	V
Difference Input Voltage	V_{ID}	40	V
Input Current (V_{IN}<-0.3V)	I_{IN}	50	mA
Output Short-Circuit to Ground	-	Continuous	-
Power Dissipation @T_A=+25'C	P_D	620	mW
Storage Temperature Range	T_{STG}	-65 to 120	'C
Operating Junction Temperature	T_J	+150	'C
Lead Temperature (Soldering, 10s)	T_{LEAD}	+260	'C

Note 1: Stresses above those listed under"Maximum Ratings" may cause permanent damage to the device.This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	2	36	V
Operating Temperature Range	T_A	-40	+85	'C

Electrical Characteristics:

(Limits in standard typeface are for T_A=25 `C, bold tyeface applies over TA=-40'C to +85'C[note2] VCC=5V, GND=0V, unless otherwise noted.)

Parameter	Symbol	Conditions	Min	Type	Max	Unit
Input Offset Voltage	V_{OS}	V_O=1.4V, R_S=0Ω, V_{CC} from 5V to 30V	-	1.0	5.0	mV
			-	-	7	
Input Bias Current	I_{BC}	I_{IN}+ or I_{IN}- with output in linear Range, V_{CM}=0V	-	25	250	nA
			-	-	400	
Input Offset Current	I_{IO}	I_{IN}+ - I_{IN}-, V_{CM} = 0V	-	5.0	50	nA
			-	-	200	
Input Common Mode Voltage Range[note3]	V_{CM}	V_{CC}=30V	0	-	V_{CC}-1.5	V
Supply Current	I_{CC}	V_{CC}=5V, R_L = ∞	-	0.4	1.0	mA
			-	-	2.0	
		V_{CC}=30V, R_L = ∞	-	0.5	1.7	
			-	-	3.0	
Voltage Gain	G_V	R_L>=15KΩ, V_{CC}=15V, V_{OUT}=1V to 11V	50	200	-	V/mV
Large Signal Response Time	Tr	V_{IN}=TTL Logic Swing, V_{REF}=1.4V, V_{RL}=5V, R_L=5.1KΩ	-	200	-	ns
Response Time	T_{RS}	R_L=5.1KΩ	-	1.3	-	us
Output Sink Current	I_{SINK}	V_{IN}- =1V, V_{IN}+=0, V_{OUT}=1.5V	6.0	16	-	mA
Output Leakage Current	$I_{Leakage}$	V_{IN}- =0V, V_{IN}+=1V, V_{OUT}=5V	-	0.1	-	nA
		V_{IN}- =0V, V_{IN}+=1V, V_{OUT}=30V	-	-	1.0	uA
Saturation Voltage	V_{SAT}	V_{IN}- =1V, V_{IN}+=0, I_{SINK}<=4mA	-	200	400	mV
			-	-	500	
Thermal Resistance (Junction to Case)	θ_{JC}		-	42	-	'C/W
Thermal Resistance (Junction to Ambient)	θ_{JA}		-	135	-	'C/W

note 2. Limites over the full temperature are guaranteed by design, but not tested in production.

3. The input common-mode voltage of either input signal should not be allowed to go negatively by more than 0.3V (at +25'C). The upper end of the common-mode voltage range is V_{CC}-1.5V (at +25'C), but either or both inputs can go to +36V without damages, independent of the magnitude of the V_{CC}.

Typical Performance Characteristics (Unless Otherwise Specified.)

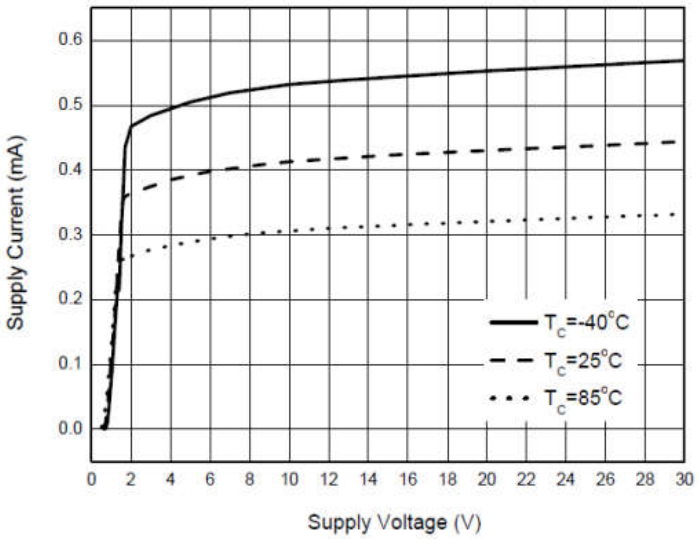


Figure. 5 Supply Current vs. Supply Voltage

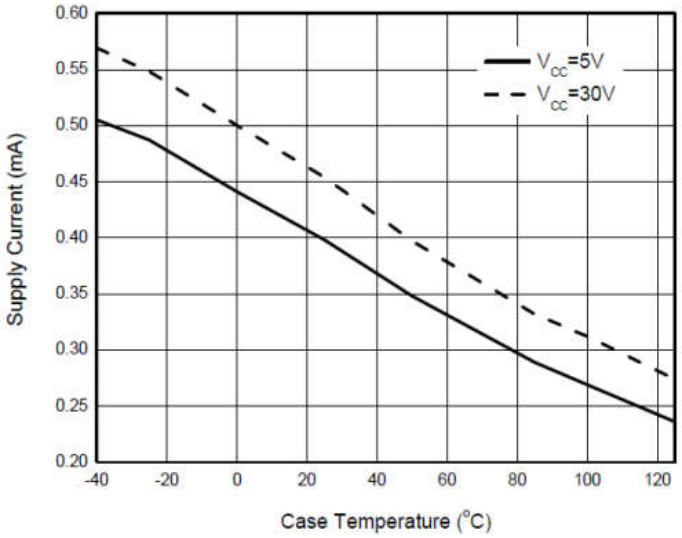


Figure. 6 Supply Current vs. Case Temperature

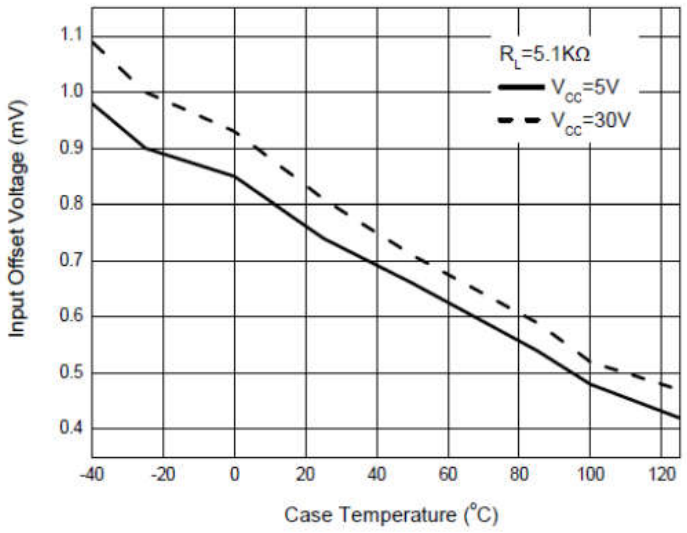


Figure.7 Input Offset Voltage vs. Case Temperature

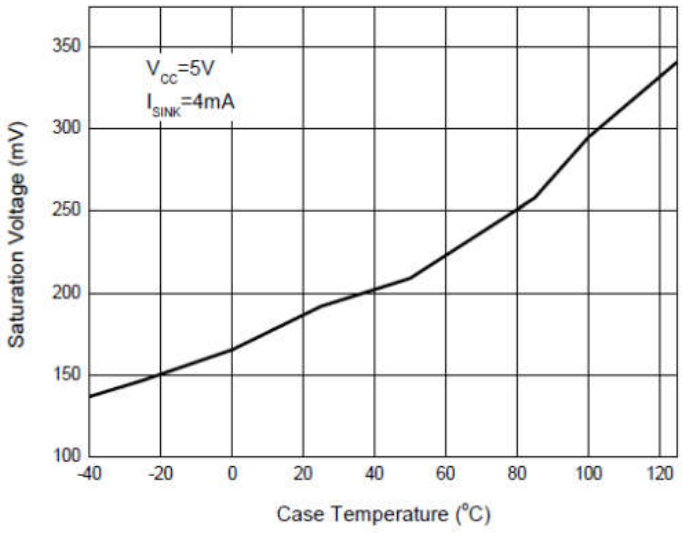


Figure. 8 Saturation Voltage vs. Case Temperature

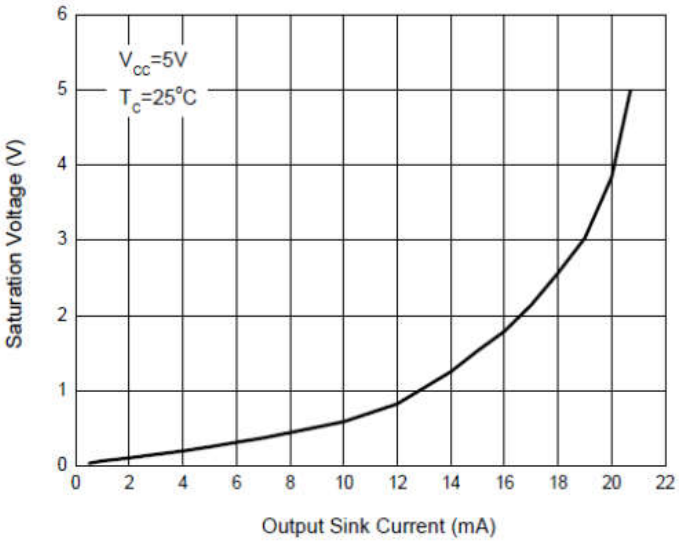


Figure. 9 Saturation Voltage vs. Output Sink Current

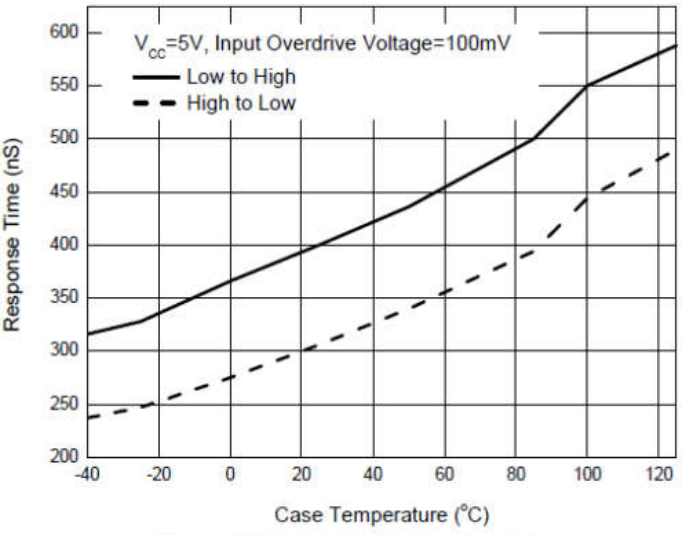


Figure. 10 Response Time vs. Case Temperature

Typical Performance Characteristics (Unless Otherwise Specified.)

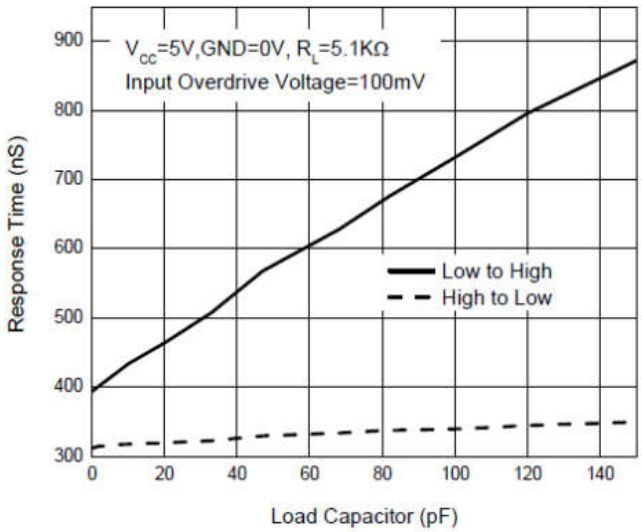


Figure. 11 Response Time vs. Load Capacitor

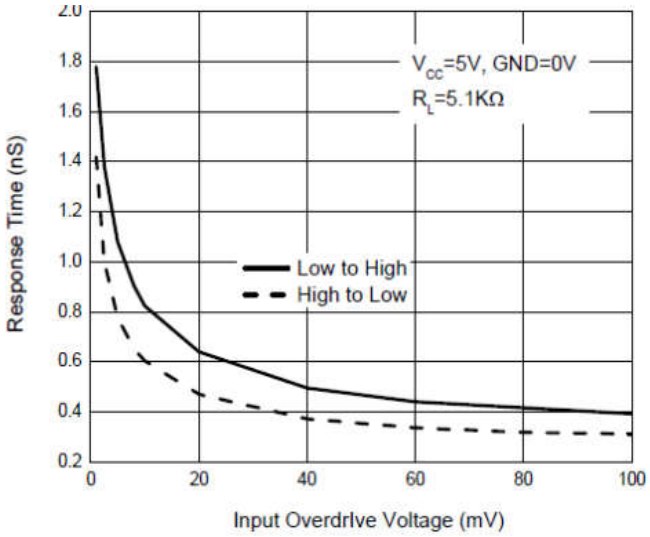


Figure. 12 Response Time vs. Input Overdrive Voltage

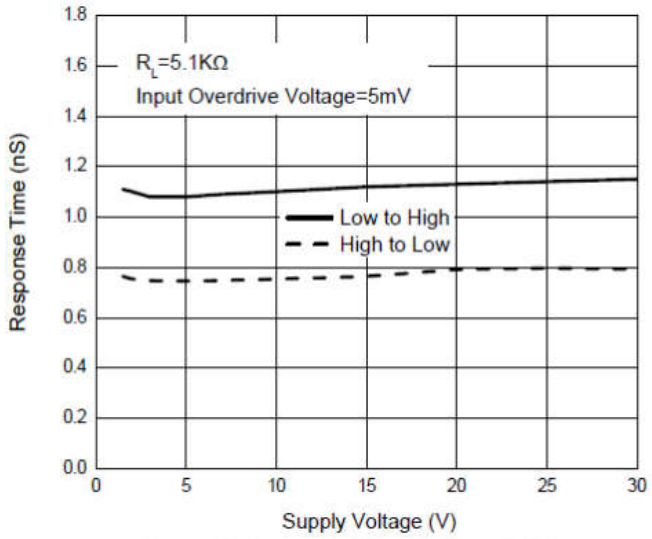


Figure. 13 Response Time vs. Supply Voltage

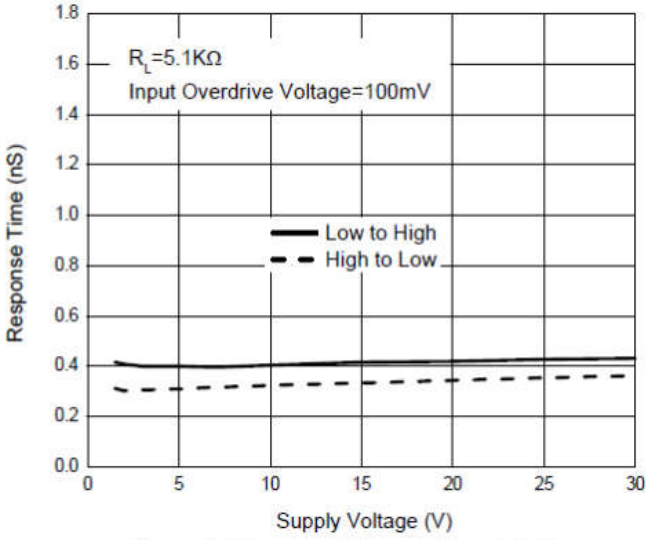


Figure. 14 Response Time vs. Supply Voltage

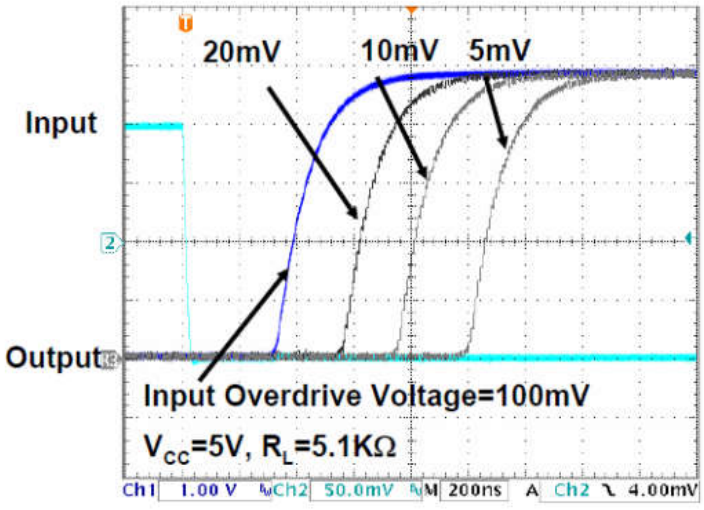


Figure. 15 Response Time for Positive Transition

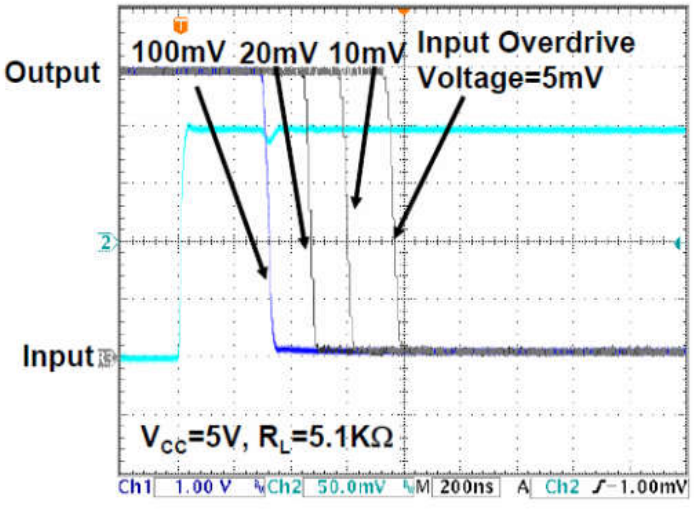


Figure. 16 Response Time for Negative Transition

Typical Performance Characteristics (Unless Otherwise Specified.)

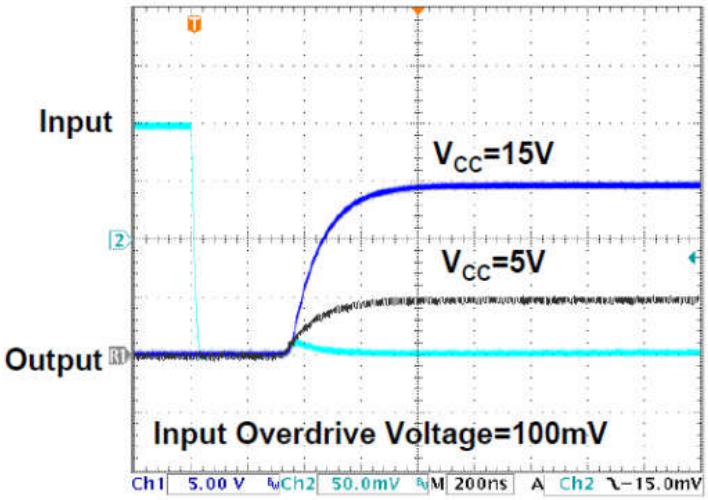


Figure. 17 Response Time for Positive Transition

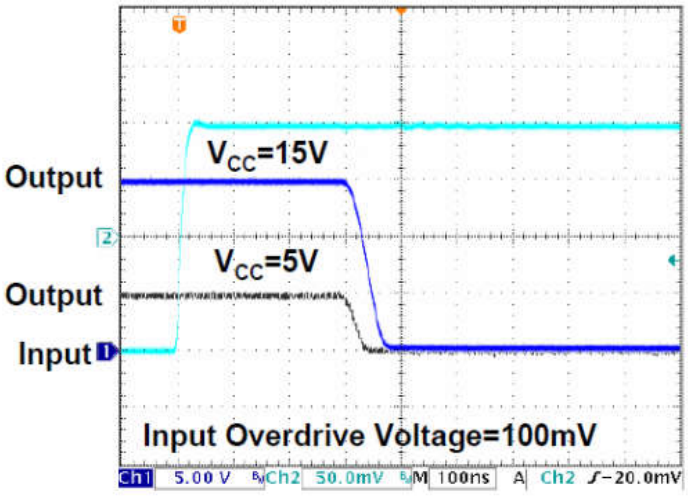


Figure. 18 Response Time for Negative Transition

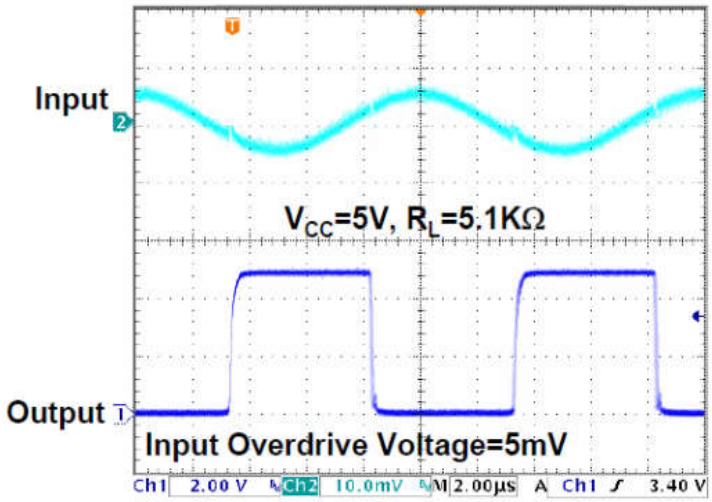


Figure. 19 100kHz Response

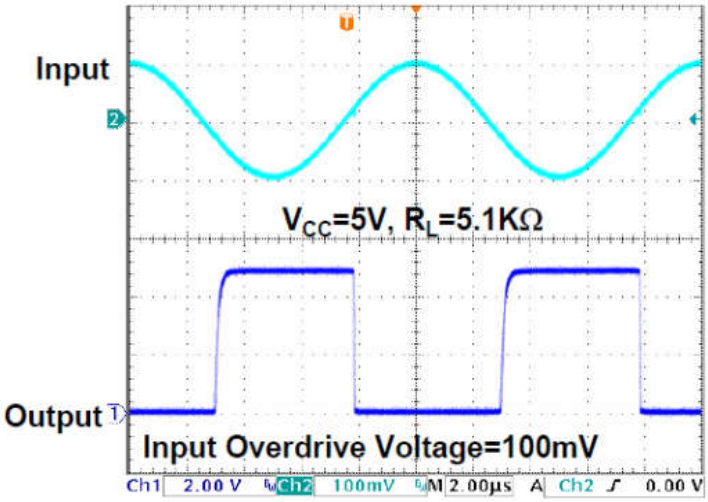


Figure. 20 100kHz Response

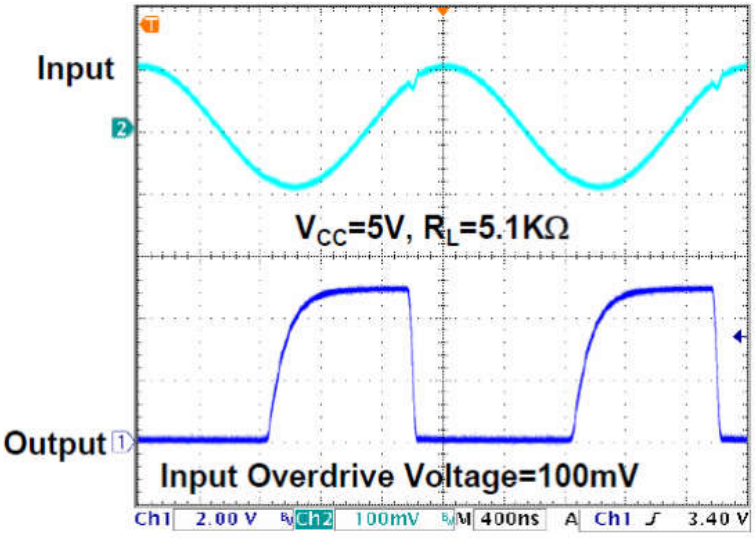
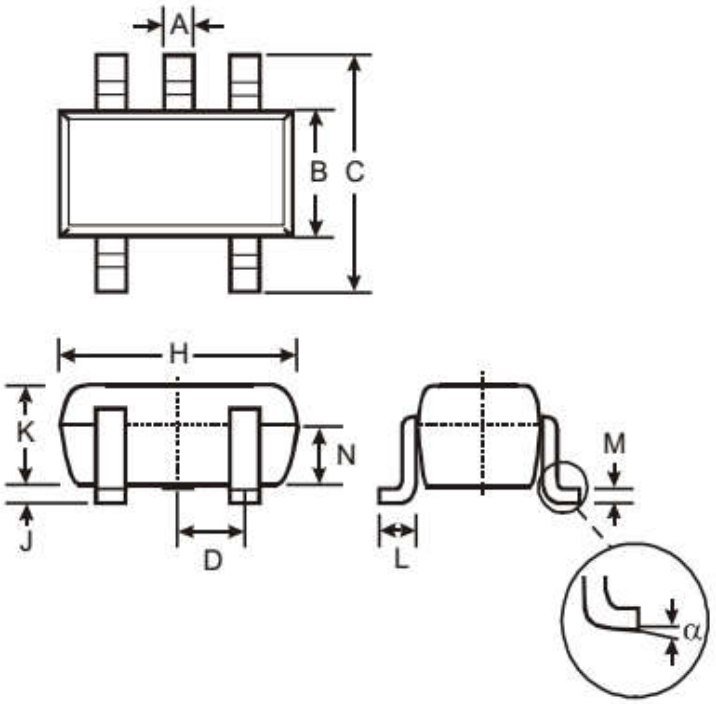


Figure. 21 500kHz Response

Mechanical Dimensions

PKG: SOT-23-5 (M5)

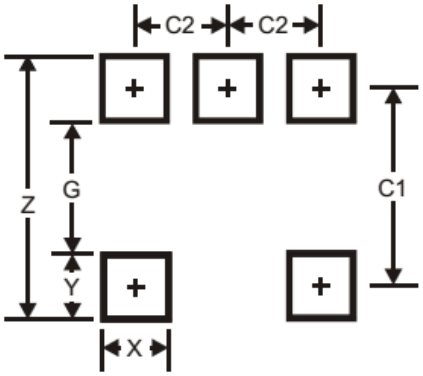
Unit: mm



SOT-23-5			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			

Suggested Pad Layout

Unit: mm



Dimensions	Value
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95