GAMMA MICROELECTRONICS

GM5510

STANDARD VOLTAGE DETECTORS

Description

The GM5510 series are highly precise, and low power consumption voltage detectors. Detect voltage is extremely accurate with minimal temperature drift. Both CMOS and N channel open drain output configurations are available.

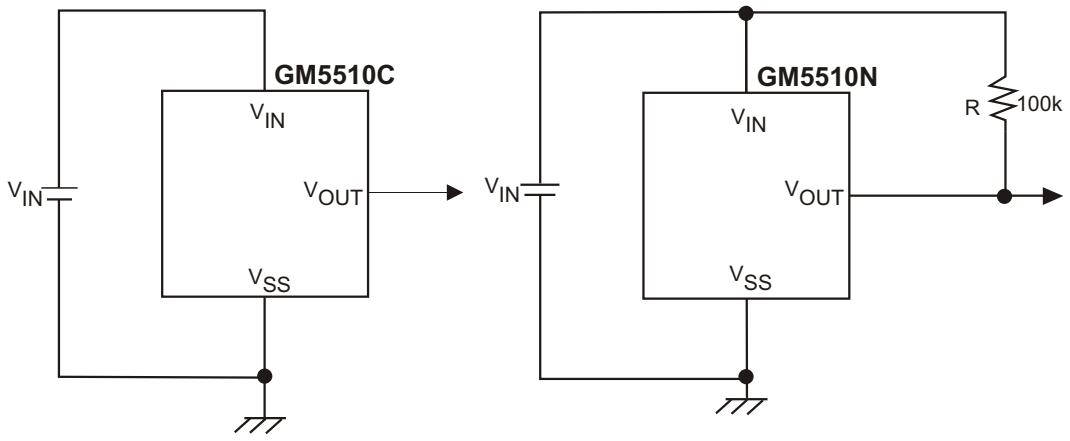
Features

- **Highly accurate: ± 2%**
- **Low power consumption: TYP 0.7μA [V_{IN} = 1.5V]**
- **Detect voltage range: 1.6V to 6.0V in 0.1V increments**
- **Operating voltage range: 0.7 to 10.0V**
- **Detect voltage temperature characteristic: TYP ± 100 ppm/ °C**
- **Output Configuration: CMOS or N channel open drain**

Application

Computers
Controllers
Intelligent Instruments
Critical μP and uC Power Monitoring
Portable/ Battery- Powered Equipment
Automotive

TYPICAL APPLICATION CIRCUITS

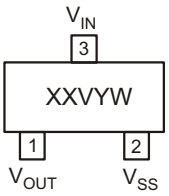


CMOS Output

N-ch Open Drain Output

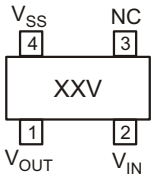
◆ MARKING INFORMATION & PIN CONFIGURATIONS (TOP VIEW)

SOT-23

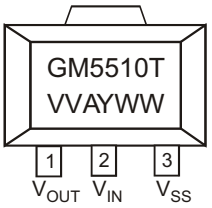


XX = Device Code (GA= GM5510N, GB= GM5510C)
V = Detect Voltage (Refer to "Voltage Suffix")
Y = Year
WW = Weekly

SOT-343 (SSOT-24)



SOT-89



T = Output Config. (C = CMOS, N = N ch. Open Drain)
V V = Detect Voltage (27=2.7V, 30 = 3.0V)
A = Assembly Location
Y = Year
WW = Weekly

◆ ORDERING INFORMATION

Ordering Number	Output Config.	Detect Voltage	Voltage Suffix: V	Package	Shipping
GM5510C-1.8ST23R	CMOS	1.8V	C	SOT-23	3,000 Units/ Tape & Reel
GM5510C-2.0ST23R	CMOS	2.0V	E	SOT-23	3,000 Units/ Tape & Reel
GM5510C-2.7ST23R	CMOS	2.7V	K	SOT-23	3,000 Units/ Tape & Reel
GM5510C-2.9ST23R	CMOS	2.9V	M	SOT-23	3,000 Units/ Tape & Reel
GM5510C-3.0ST23R	CMOS	3.0V	N	SOT-23	3,000 Units/ Tape & Reel
GM5510C-3.3ST23R	CMOS	3.3V	Q	SOT-23	3,000 Units/ Tape & Reel
GM5510C-3.6ST23R	CMOS	3.6V	T	SOT-23	3,000 Units/ Tape & Reel
GM5510C-4.0ST23R	CMOS	4.0V	X	SOT-23	3,000 Units/ Tape & Reel
GM5510C-4.1ST23R	CMOS	4.1V	Y	SOT-23	3,000 Units/ Tape & Reel
GM5510C-4.2ST23R	CMOS	4.2V	Z	SOT-23	3,000 Units/ Tape & Reel
GM5510C-1.8ST34R	CMOS	1.8V	C	SOT-343	3,000 Units/ Tape & Reel
GM5510C-2.0ST34R	CMOS	2.0V	E	SOT-343	3,000 Units/ Tape & Reel
GM5510C-2.7ST34R	CMOS	2.7V	K	SOT-343	3,000 Units/ Tape & Reel
GM5510C-2.9ST34R	CMOS	2.9V	M	SOT-343	3,000 Units/ Tape & Reel
GM5510C-3.0ST34R	CMOS	3.0V	N	SOT-343	3,000 Units/ Tape & Reel
GM5510C-3.3ST34R	CMOS	3.3V	Q	SOT-343	3,000 Units/ Tape & Reel
GM5510C-3.6ST34R	CMOS	3.6V	T	SOT-343	3,000 Units/ Tape & Reel
GM5510C-4.0ST34R	CMOS	4.0V	X	SOT-343	3,000 Units/ Tape & Reel
GM5510C-4.1ST34R	CMOS	4.1V	Y	SOT-343	3,000 Units/ Tape & Reel
GM5510C-4.2ST34R	CMOS	4.2V	Z	SOT-343	3,000 Units/ Tape & Reel
GM5510C-1.8ST89R	CMOS	1.8V		SOT-89	1,000 Units/ Tape & Reel
GM5510C-2.0ST89R	CMOS	2.0V		SOT-89	1,000 Units/ Tape & Reel
GM5510C-2.7ST89R	CMOS	2.7V		SOT-89	1,000 Units/ Tape & Reel
GM5510C-2.9ST89R	CMOS	2.9V		SOT-89	1,000 Units/ Tape & Reel
GM5510C-3.0ST89R	CMOS	3.0V		SOT-89	1,000 Units/ Tape & Reel
GM5510C-3.3ST89R	CMOS	3.3V		SOT-89	1,000 Units/ Tape & Reel
GM5510C-3.6ST89R	CMOS	3.6V		SOT-89	1,000 Units/ Tape & Reel
GM5510C-4.0ST89R	CMOS	4.0V		SOT-89	1,000 Units/ Tape & Reel
GM5510C-4.1ST89R	CMOS	4.1V		SOT-89	1,000 Units/ Tape & Reel
GM5510C-4.2ST89R	CMOS	4.2V		SOT-89	1,000 Units/ Tape & Reel

* For detail Ordering Number identification, please see last page.

◆ ORDERING INFORMATION

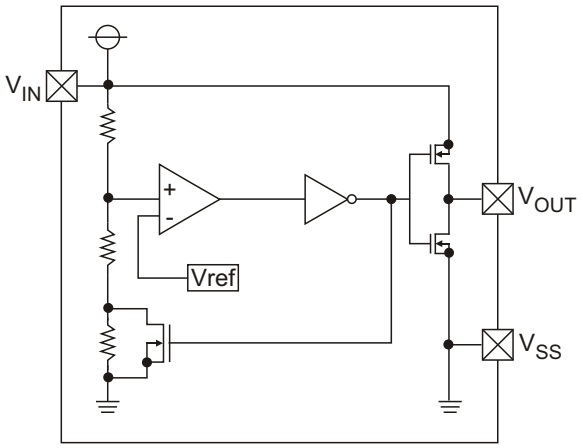
Ordering Number	Output Config.	Detect Voltage	Voltage Suffix: V	Package	Shipping
GM5510N-1.8ST23R	N-ch Open Drain	1.8V	C	SOT-23	3,000 Units/ Tape & Reel
GM5510N-2.0ST23R	N-ch Open Drain	2.0V	E	SOT-23	3,000 Units/ Tape & Reel
GM5510N-2.7ST23R	N-ch Open Drain	2.7V	K	SOT-23	3,000 Units/ Tape & Reel
GM5510N-2.9ST23R	N-ch Open Drain	2.9V	M	SOT-23	3,000 Units/ Tape & Reel
GM5510N-3.0ST23R	N-ch Open Drain	3.0V	N	SOT-23	3,000 Units/ Tape & Reel
GM5510N-3.3ST23R	N-ch Open Drain	3.3V	Q	SOT-23	3,000 Units/ Tape & Reel
GM5510N-3.6ST23R	N-ch Open Drain	3.6V	T	SOT-23	3,000 Units/ Tape & Reel
GM5510N-4.0ST23R	N-ch Open Drain	4.0V	X	SOT-23	3,000 Units/ Tape & Reel
GM5510N-4.1ST23R	N-ch Open Drain	4.1V	Y	SOT-23	3,000 Units/ Tape & Reel
GM5510N-4.2ST23R	N-ch Open Drain	4.2V	Z	SOT-23	3,000 Units/ Tape & Reel
GM5510N-1.8ST34R	N-ch Open Drain	1.8V	C	SOT-343	3,000 Units/ Tape & Reel
GM5510N-2.0ST34R	N-ch Open Drain	2.0V	E	SOT-343	3,000 Units/ Tape & Reel
GM5510N-2.7ST34R	N-ch Open Drain	2.7V	K	SOT-343	3,000 Units/ Tape & Reel
GM5510N-2.9ST34R	N-ch Open Drain	2.9V	M	SOT-343	3,000 Units/ Tape & Reel
GM5510N-3.0ST34R	N-ch Open Drain	3.0V	N	SOT-343	3,000 Units/ Tape & Reel
GM5510N-3.3ST34R	N-ch Open Drain	3.3V	Q	SOT-343	3,000 Units/ Tape & Reel
GM5510N-3.6ST34R	N-ch Open Drain	3.6V	T	SOT-343	3,000 Units/ Tape & Reel
GM5510N-4.0ST34R	N-ch Open Drain	4.0V	X	SOT-343	3,000 Units/ Tape & Reel
GM5510N-4.1ST34R	N-ch Open Drain	4.1V	Y	SOT-343	3,000 Units/ Tape & Reel
GM5510N-4.2ST34R	N-ch Open Drain	4.2V	Z	SOT-343	3,000 Units/ Tape & Reel
GM5510N-1.8ST89R	N-ch Open Drain	1.8V		SOT-89	1,000 Units/ Tape & Reel
GM5510N-2.0ST89R	N-ch Open Drain	2.0V		SOT-89	1,000 Units/ Tape & Reel
GM5510N-2.7ST89R	N-ch Open Drain	2.7V		SOT-89	1,000 Units/ Tape & Reel
GM5510N-2.9ST89R	N-ch Open Drain	2.9V		SOT-89	1,000 Units/ Tape & Reel
GM5510N-3.0ST89R	N-ch Open Drain	3.0V		SOT-89	1,000 Units/ Tape & Reel
GM5510N-3.3ST89R	N-ch Open Drain	3.3V		SOT-89	1,000 Units/ Tape & Reel
GM5510N-3.6ST89R	N-ch Open Drain	3.6V		SOT-89	1,000 Units/ Tape & Reel
GM5510N-4.0ST89R	N-ch Open Drain	4.0V		SOT-89	1,000 Units/ Tape & Reel
GM5510N-4.1ST89R	N-ch Open Drain	4.1V		SOT-89	1,000 Units/ Tape & Reel
GM5510N-4.2ST89R	N-ch Open Drain	4.2V		SOT-89	1,000 Units/ Tape & Reel

◆ ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

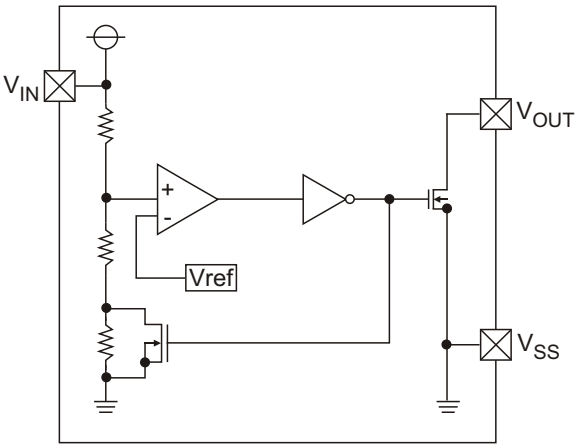
PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V_{IN}	12	V
Output Current		I_{OUT}	50	mA
Output Voltage	CMOS Nch open drain	V_{OUT}	V_{SS} - 0.3 to V_{IN} + 0.3 V_{SS} - 0.3 to 12	V
Power Dissipation	SOT-23 SOT-89	P_D	150 500	mW
Operating Ambient Temperature		Topr	-40 to + 85	°C
Storage Temperature		Tstg	-40 to +125	°C

◆ BLOCK DIAGRAM

(1) CMOS Output



(2) Nch Open Drain Output



◆ ELECTRICAL CHARACTERISTICS [V_{DF} (T) = 1.6 to 6.0V ± 2%]

T_A = 25°C

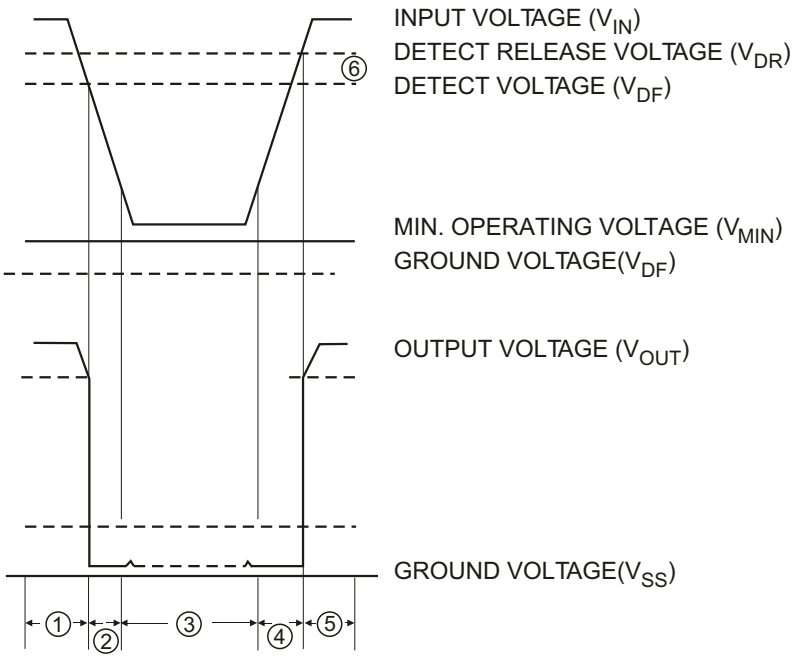
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	CIRCUIT
Detect Voltage	V_{DF}		V_{DF} X 0.98	V_{DF}	V_{DF} X 1.02	V	1
Hysteresis Range	V_{HYS}		V_{DF} X 0.02	V_{DF} X 0.05	V_{DF} X 0.08	V	1
Supply Current	I_{SS}	V_{IN} = 1.5V		0.7	2.3	μA	2
		V_{IN} = 2.0V		0.8	2.7		
		V_{IN} = 3.0V		0.9	3.0		
		V_{IN} = 4.0V		1.0	3.2		
		V_{IN} = 5.0V		1.1	3.6		
Operating Voltage	V_{IN}	V_{DF}(T) = 1.6V to 6.0V	0.7		10.0	V	1
Output Current	I_{OUT}	Nch V_{DS} = 0.5V				mA	3
		V_{IN} = 1.0V	1.0	2.2			
		V_{IN} = 2.0V	3.0	7.7			
		V_{IN} = 3.0V	5.0	10.1			
		V_{IN} = 4.0V	6.0	11.5			
		V_{IN} = 5.0V	7.0	13.0			
		Pch V_{DS} = 2.1V		-10.0	-2.0		4
		V_{IN} = 8.0V (with CMOS output)					
Temperature Characteristics	$\frac{V_{DF}}{Topr - V_{DF}}$	-40°C ≤ Topr ≤ 85°C		± 100		ppm/ °C	-
Delay Time (V_{DR} V_{OUT} inversion)	t_{DLY}				0.2	mS	5

Note:
V_{DF} (T): Established Detect Voltage Value
Release Voltage: $V_{DR} = V_{DF} + V_{HYS}$

◆ Function Description (CMOS output)

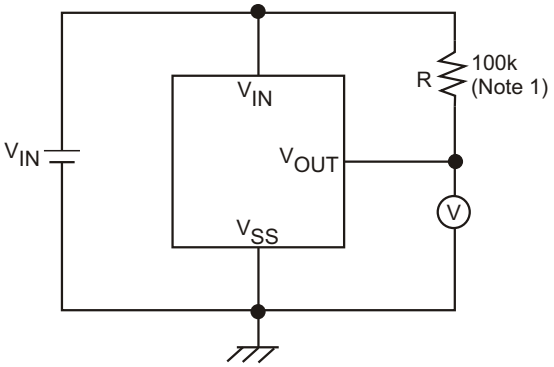
① When input voltage (V_{IN}) rises above detect voltage (V_{DF}), output voltage (V_{OUT}) will be equal to V_{IN}.
(A condition of high impedance exists with Nch open drain output configurations.)
② When input voltage (V_{IN}) falls below detect voltage (V_{DF}), output voltage (V_{OUT}) will be equal to the ground voltage (V_{SS}) level.
③ When input voltage (V_{IN})falls to a level below that of the minimum operating voltage (V_{MIN}), output will become unstable. In this condition, V_{IN} will equal to the pulled-up output (should output be pulled-up).
④ When input voltage (V_{IN}) rises above the ground voltage (V_{SS}) level, output will be unstable at levels below the minimum operating voltage (V_{MIN}). Between the V_{MIN} and detect release voltage (V_{DR}) levels, the ground voltage (V_{SS})level will be maintained.
⑤ When input voltage (V_{IN}) rises above detect release voltage (V_{DR}), output voltage (V_{OUT}) will be equal to V_{IN}.
(A condition of high impedance exists with Nch open drain output configurations).
⑥ The difference between V_{DR} and V_{DF} represents the hysteresis range.

◆ Timing Chart

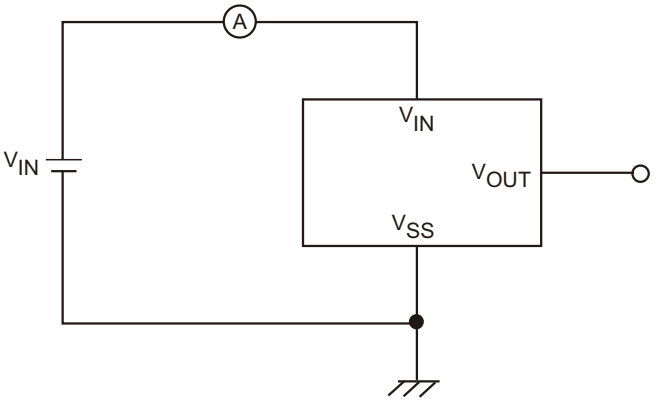


◆ Measuring Circuits

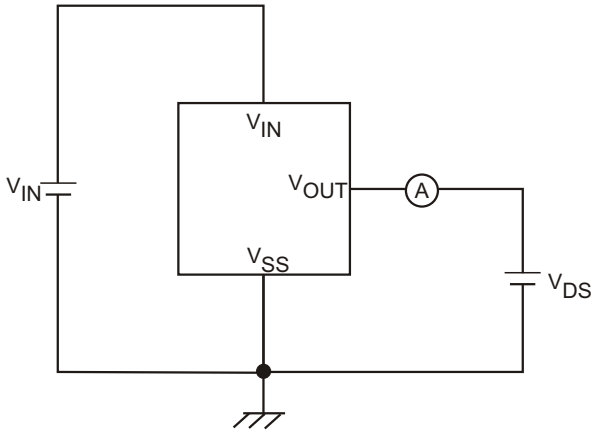
Circuit 1



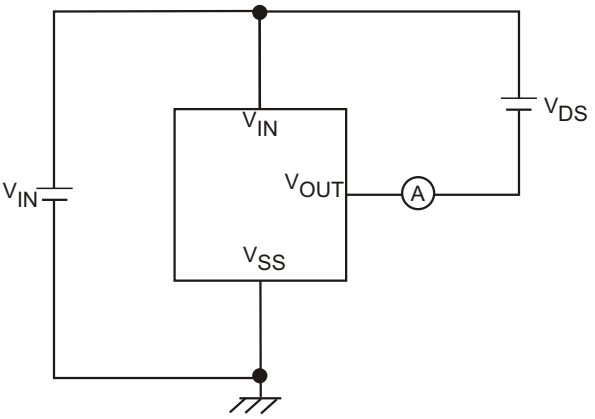
Circuit 2



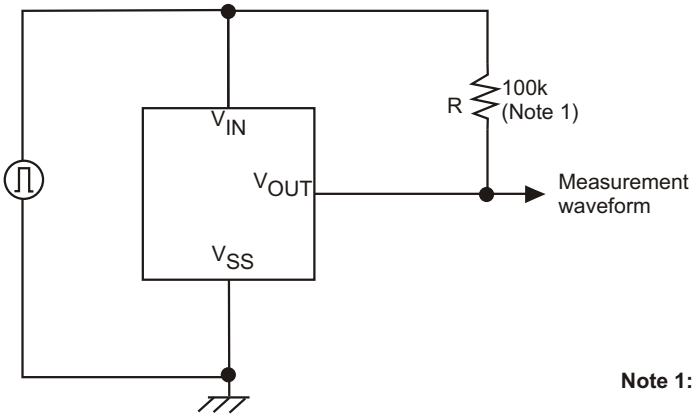
Circuit 3



Circuit 4



Circuit 5



Note 1: Not necessary with CMOS output products.

◆ Notes on Use

1. When a resistor is connected between the V_{IN} pin and the input with CMOS output configurations, oscillation may occur as a result of voltage drops at R_{IN} if load current (I_{OUT}) exists.
   (Refer to N.B 1- (1) below)
2. When a resistor is connected between the V_{IN} pin and the input with CMOS output configurations, irrespective of Nch output configurations, oscillation may occur as a result of through current at the time of voltage release even if load current (I_{OUT}) does not exist.
   (Refer to N.B 1- (2) below)
3. With a resistor connected between the V_{IN} pin and the input, detect and release voltage will rise as a result of the IC's supply current flowing through the V_{IN} pin.
4. In order to stabilise the IC's operations, please ensure that V_{IN} pin's input frequency's rise and fall times are more than several μ sec/ V.

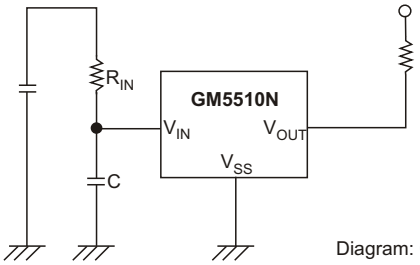


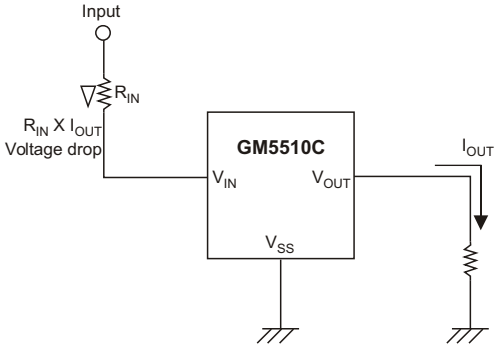
Diagram: Circuit using an input resistor

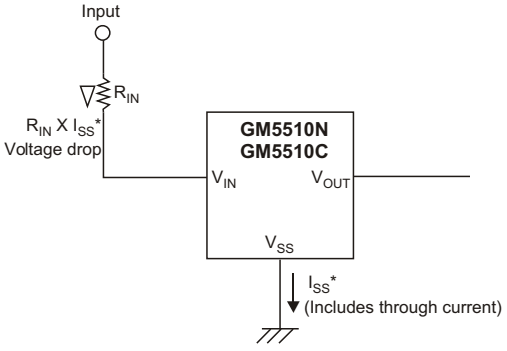
◆ N. B.

1. Oscillation

(1) Output current oscillation with the CMOS output configuration
When the voltage applied at IN rises, release operations commence and the detector's output voltage increases. Load current (I_{OUT}) will flow at R_L. Because a voltage drop (R_{IN} x I_{OUT}) is produced at the R_{IN} resistor, located between the input (I_N) and the V_{IN} pin, the load current will flow via the IC's V_{IN} pin. The voltage drop will also lead to a fall in the voltage level at the V_{IN} pin. When the V_{IN} pin voltage level falls below the detect voltage level, detect operations will commence. Following detect operations, load current flow will cease and since voltage drop at R_{IN} will disappear, the voltage level at the V_{IN} pin will rise and release operations will begin over again.
Oscillation may occur with this "release" repetition.
Further, this condition will also appear via means of a similar mechanism during detect operations.

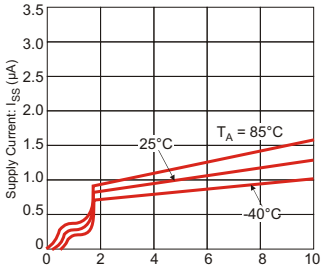
(2) Oscillation as a result of through current
Since the GM5510 series are CMOS IC's, through current will flow when the IC's internal circuit switching operates (during release and detect operations). Consequently, oscillation is liable to occur as a result of drops in voltage at the through current's resistor (R_{IN}) during release voltage operations. (Refer to diagram2)
Since hysteresis exists during detect operations, oscillation is unlikely to occur.



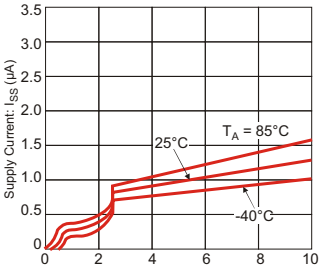


◆ TYPICAL PERFORMANCE CHARACTERISTICS

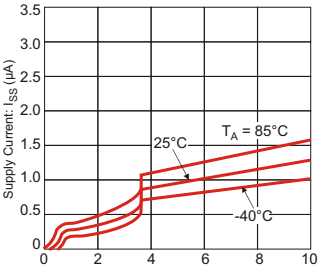
(1) Supply Current vs. Input voltage



GM5510C-18(1.8V)

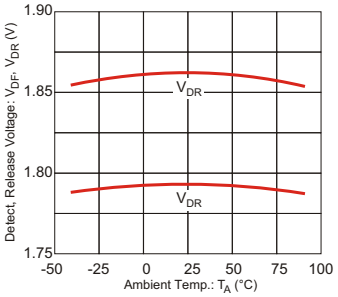


GM5510C-27(2.7V)

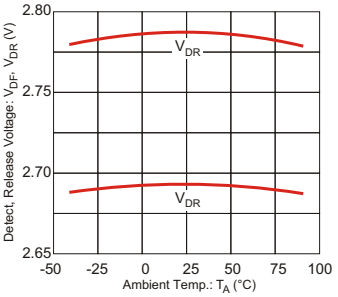


GM5510C-36(3.6V)

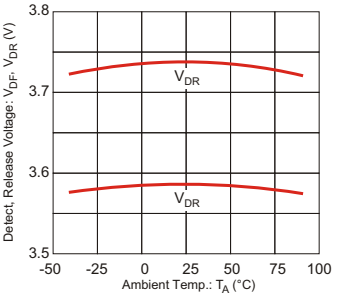
(2) Detect, Release Voltage vs. Ambient Temperature



GM5510C-18(1.8V)

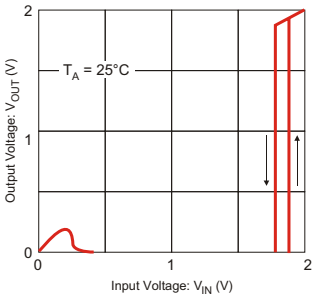


GM5510C-27(2.7V)

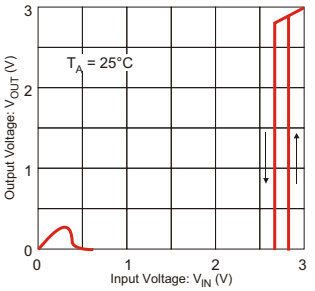


GM5510C-36(3.6V)

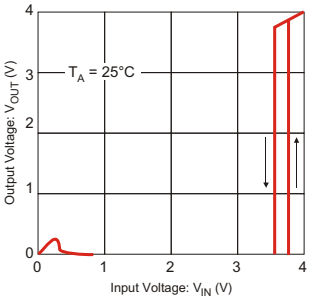
(3) Output Voltage vs. Input Voltage



GM5510C-18(1.8V)

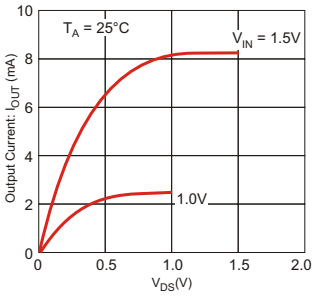


GM5510C-27(2.7V)

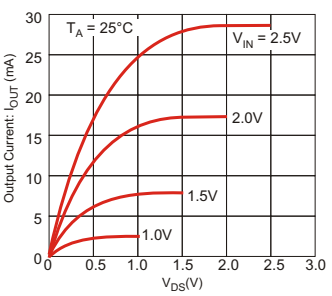


GM5510C-36(3.6V)

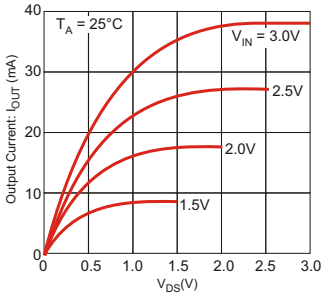
(4) N-ch Driver Output current vs. V_{DS}



GM5510C-18(1.8V)



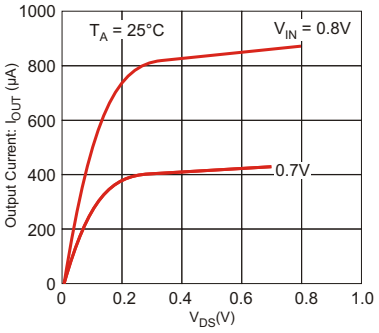
GM5510C-27(2.7V)



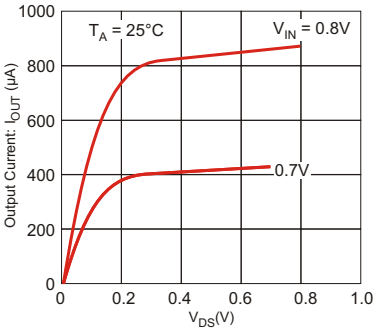
GM5510C-36(3.6V)

◆ TYPICAL PERFORMANCE CHARACTERISTICS

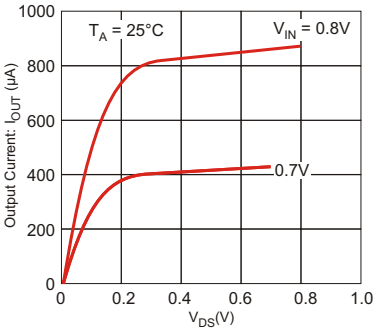
(4) N-ch Driver Output current vs. V_{DS}



GM5510C-18(1.8V)

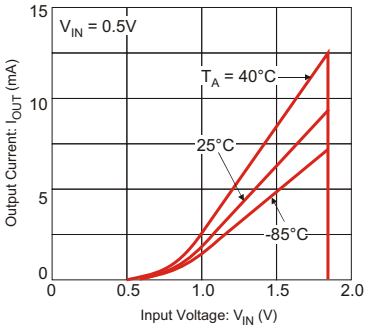


GM5510C-27(2.7V)

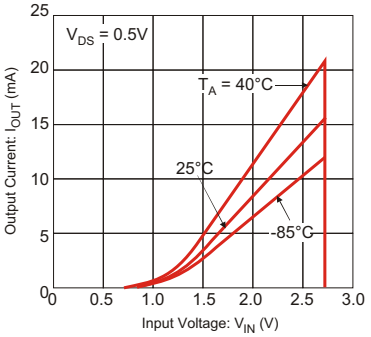


GM5510C-36(3.6V)

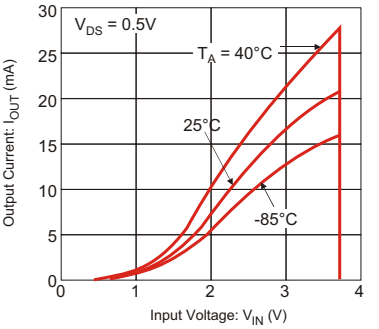
(6) N-ch DRIVER OUTPUT CURRENT VS. INPUT VOLTAGE



GM5510C-18(1.8V)

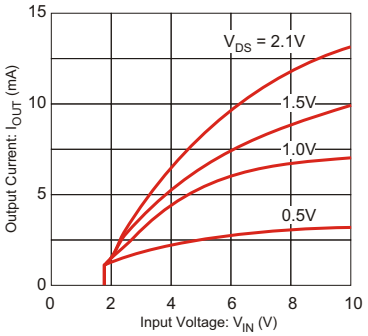


GM5510C-27(2.7V)

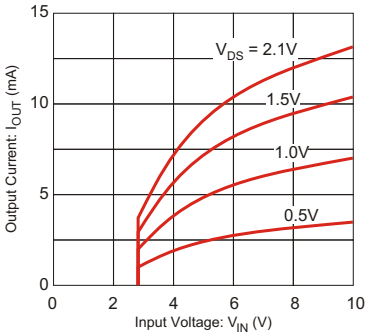


GM5510C-36(3.6V)

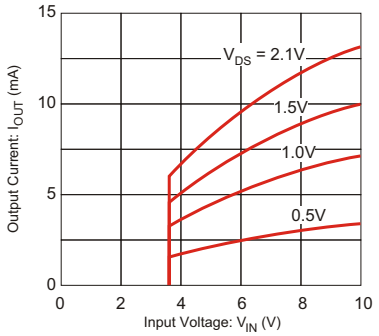
(7) P-ch DRIVER OUTPUT CURRENT VS. INPUT VOLTAGE



GM5510C-18(1.8V)

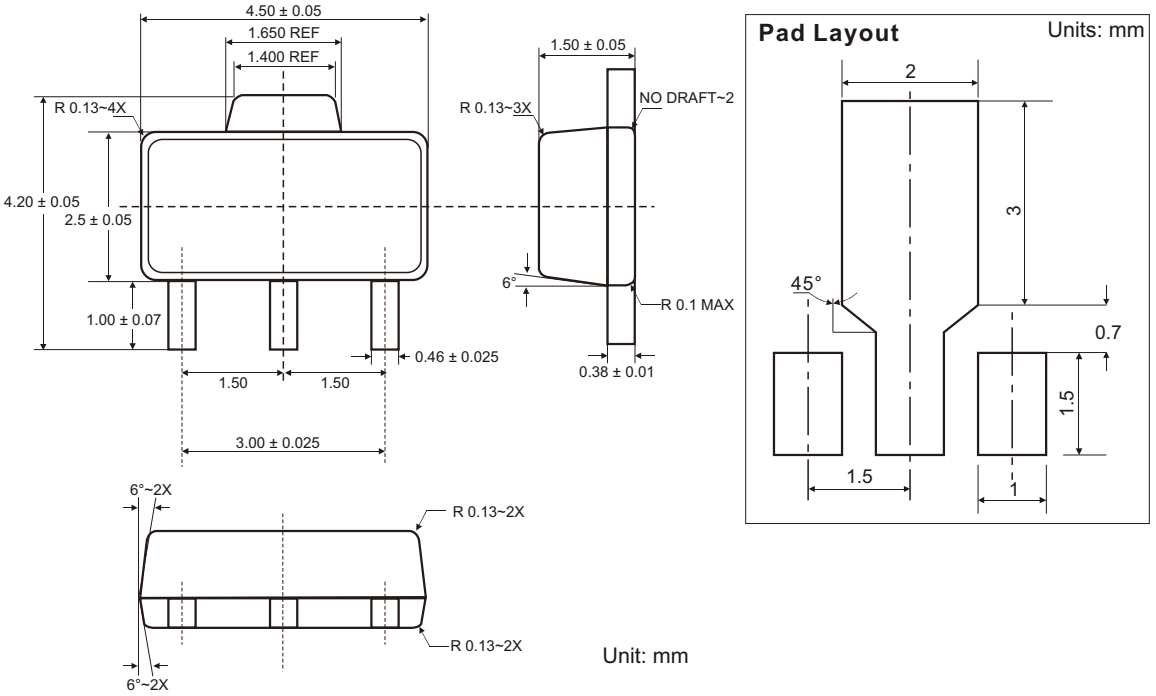


GM5510C-27(2.7V)



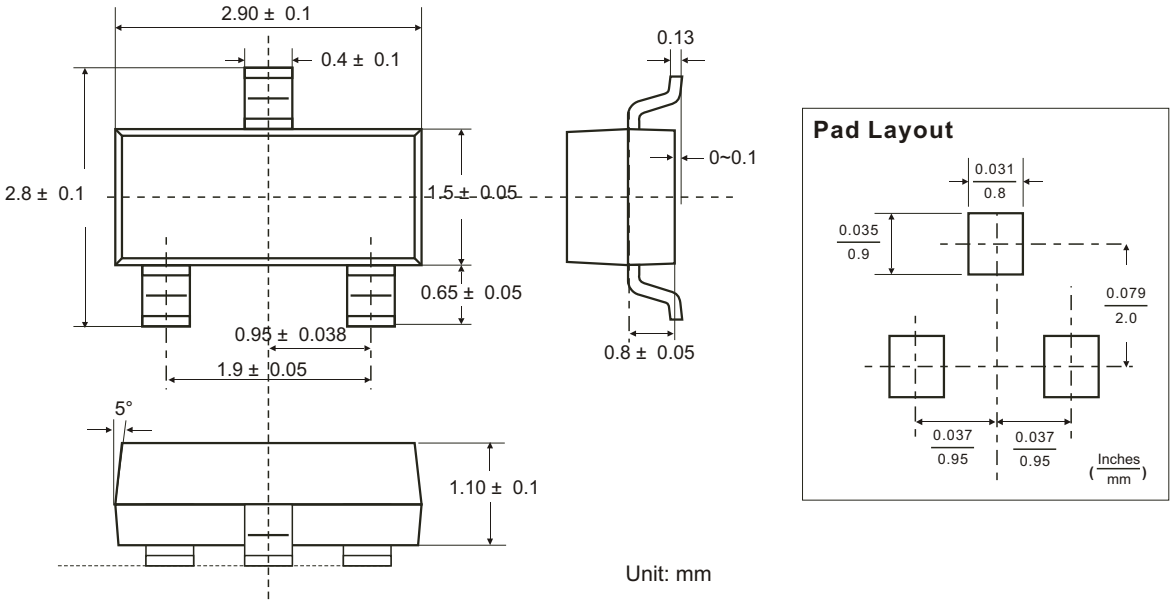
GM5510C-36(3.6V)

◆ SOT-89 PACKAGE OUTLINE DIMENSIONS



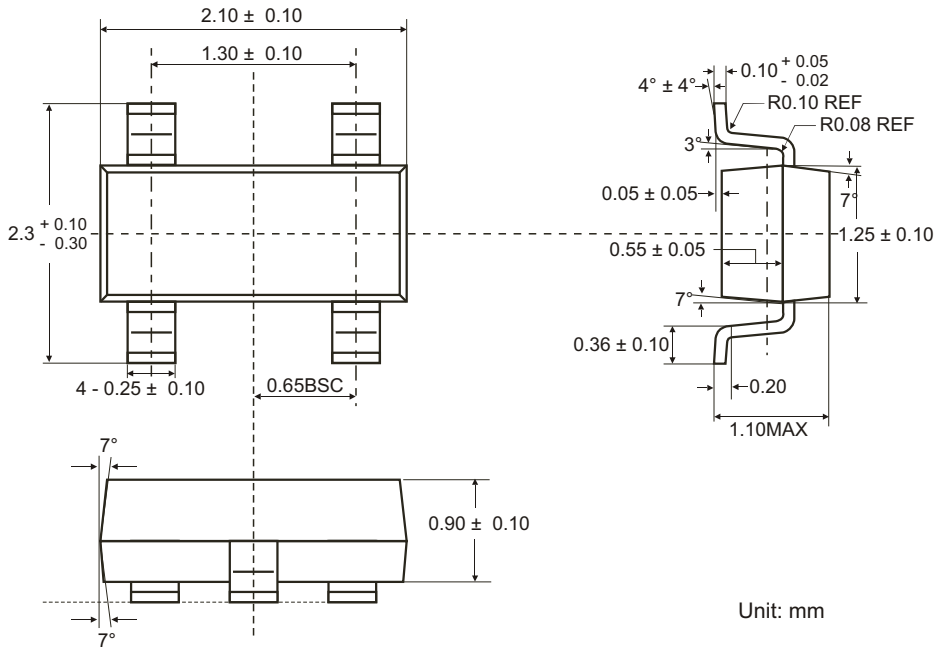
Unit: mm

◆ SOT-23 PACKAGE OUTLINE DIMENSIONS



Unit: mm

◆ SOT-343 (SSOT-24) PACKAGE OUTLINE DIMENSIONS



◆ ORDERING NUMBER

GM 5510 C / 5510 N 1.8 ST23 R

- GM — Gamma Micro.
- 5510 C / 5510 N — Circuit Type
  - C: CMOS
  - N: N-ch Open Drain
- 1.8 — Output Voltage
  - 1.0: 1.0V, 1.8: 1.8V
  - 2.0: 2.0V, 2.7: 2.7V
  - 3.0: 3.0V, 3.6: 3.6V
  - 4.0: 4.0V, 4.1: 4.1V
  - 4.2: 4.2V
- ST23 — Package
  - ST23: SOT-23
  - ST89: SOT-89
  - ST34: SOT-343
- R — Shipping
  - R: Tape & Reel