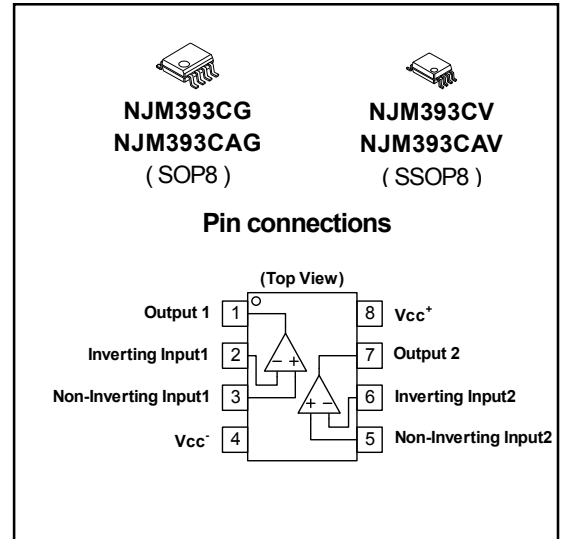


## Low power dual voltage comparator

### Features

- Wide single supply voltage range or dual supplies  
+2V to +36V or  $\pm 1V$  to  $\pm 18V$
- Very low supply current : 0.45mA typ. at  $V_{cc}^+ = 5V$
- Low input bias current: 20nA typ.
- Input common-mode voltage range includes ground
- Low output saturation voltage: 80mV typ. ( $I_{sink} = 4mA$ )
- Differential input voltage range equal to the supply voltage:  $\pm 36V$
- TTL, DTL, ECL, MOS, CMOS compatible outputs
- Internal ESD protection Human body model (HBM)  $\pm 2000V$  typ.
- Input Offset Voltage Grade

NJM393C( Normal-Grade)	NJM393CA(A-Grade )
5mV max. at $T_a = 25^\circ C$	2mV max. at $T_a = 25^\circ C$
9mV max. at $T_a = 0$ to $70^\circ C$	4mV max. at $T_a = 0$ to $70^\circ C$



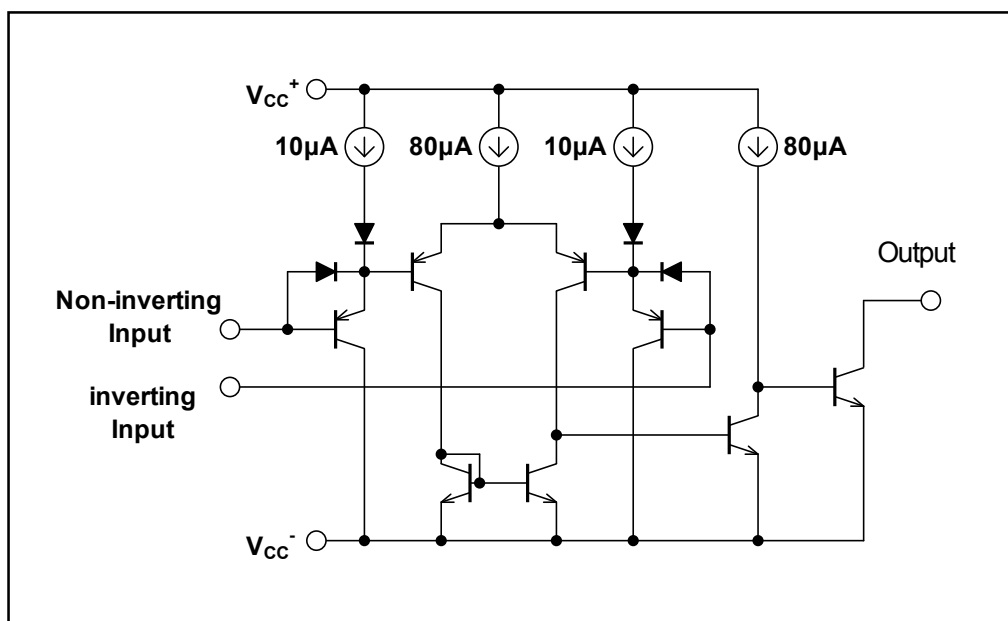
### Description

The NJM393C/NJM393CA consist of two independent low power voltage comparators designed specifically to operate from a single supply over a wide range of voltages. Operation from split power supplies is also possible.

These comparators also have a unique characteristic in that the input common-mode voltage range includes ground even though operated from a single power supply voltage.

## 1 Schematic diagram

Figure 1. Schematic diagram (1/2 NJM393C/NJM393CA)



# NJM393C/NJM393CA

## 2 Absolute maximum ratings and operating conditions

Table1. Absolute maximum ratings (T<sub>amb</sub>=25°C)

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply voltage(V <sub>CC</sub> <sup>+</sup> - V <sub>CC</sub> <sup>-</sup> )	36	V
V <sub>ID</sub>	Differential input voltage	±36	V
V <sub>IN</sub>	Input voltage <sup>(1)</sup>	V <sub>CC</sub> -0.3 to V <sub>CC</sub> +36	V
V <sub>O</sub>	Output Terminal Input Voltage <sup>(2)</sup>	V <sub>CC</sub> -0.3 to V <sub>CC</sub> +36	V
-	Output short-circuit to V <sub>CC</sub> <sup>-</sup> <sup>(3)</sup>	Infinite	-
T <sub>stg</sub>	Storage temperature range	-65 to +150	°C
T <sub>j</sub>	Maximum junction temperature	150	°C
P <sub>D</sub>	Power Dissipation	SOP8 : 690 <sup>(5)</sup> 1000 <sup>(6)</sup> SSOP8 : 430 <sup>(5)</sup> 540 <sup>(6)</sup>	mW
θ <sub>ja</sub>	thermal resistance junction to ambient <sup>(4)</sup>	SOP8 : 180 <sup>(5)</sup> 122 <sup>(6)</sup> SSOP8 : 290 <sup>(5)</sup> 230 <sup>(6)</sup>	°C/W
ψ <sub>jt</sub>	thermal resistance junction to top surface of IC package <sup>(4)</sup>	SOP8 : 49 <sup>(5)</sup> 43 <sup>(6)</sup> SSOP8 : 46 <sup>(5)</sup> 45 <sup>(6)</sup>	°C/W

1. Input voltage is the voltage should be allowed to apply to the input terminal independent of the magnitude of V<sub>CC</sub><sup>+</sup>.
2. Output voltage is the voltage should be allowed to apply to the output terminal independent of the magnitude of V<sub>CC</sub><sup>+</sup>.
3. Short-circuits from the output to V<sub>CC</sub><sup>+</sup> can cause excessive heating and potential destruction.
4. Short-circuit can cause excessive heating and destructive dissipation. Values are typical.
5. EIA/JEDEC STANDARD Test board (76.2 x 114.3 x 1.6mm, 2layers, FR-4) mounting
6. EIA/JEDEC STANDARD Test board (76.2 x 114.3 x 1.6mm, 4layers, FR-4) mounting

Table2. Operating conditions

T<sub>amb</sub>=25°C (unless otherwise specified)

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply voltage (V <sub>CC</sub> <sup>+</sup> - V <sub>CC</sub> <sup>-</sup> )	2 to 36	V
V <sub>icm</sub>	Common mode input voltage range (V <sub>CC</sub> <sup>+</sup> =30V) T <sub>amb</sub> = 25°C 0 °C ≤ T <sub>amb</sub> ≤ 70 °C <sup>(5)</sup>	0 to V <sub>CC</sub> <sup>+</sup> -1.5 0 to V <sub>CC</sub> <sup>+</sup> -2.0	V
T <sub>oper</sub>	Operating free-air temperature range	-40 to +85	°C

## 2 Electrical characteristics

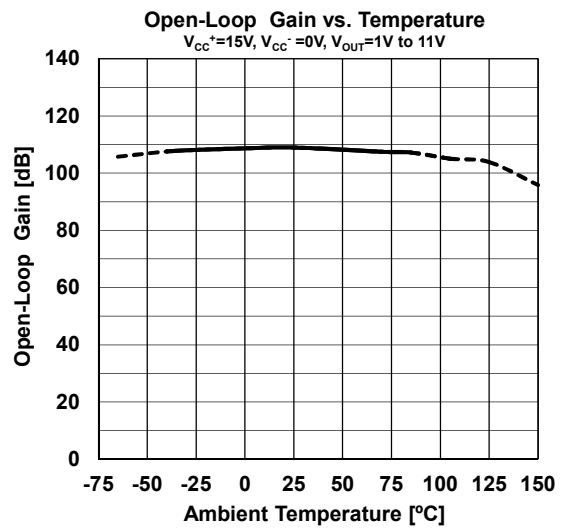
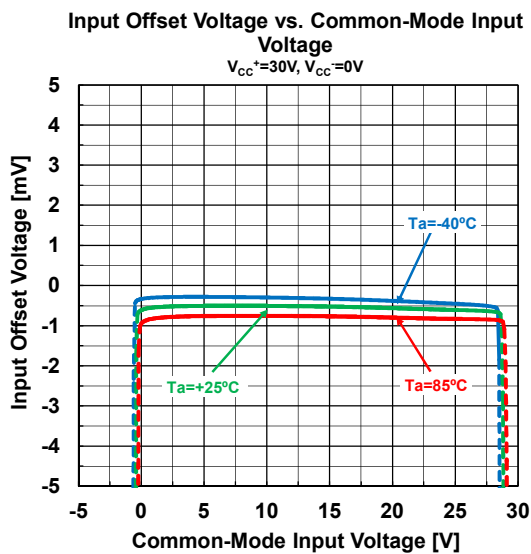
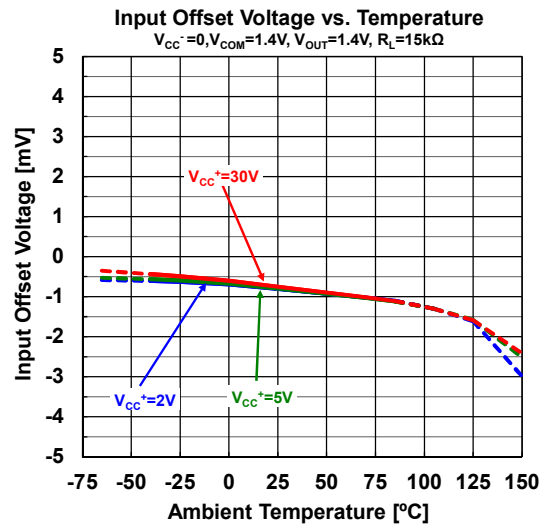
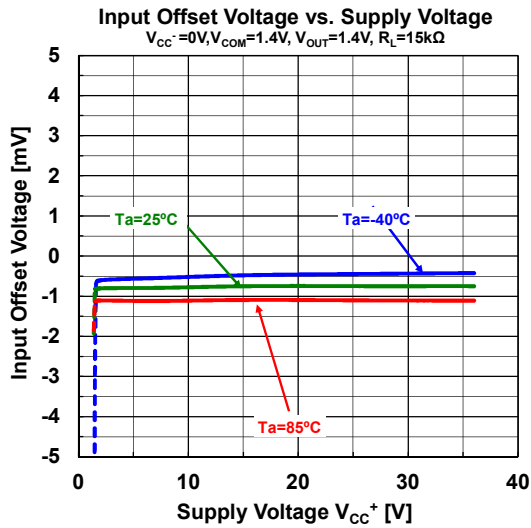
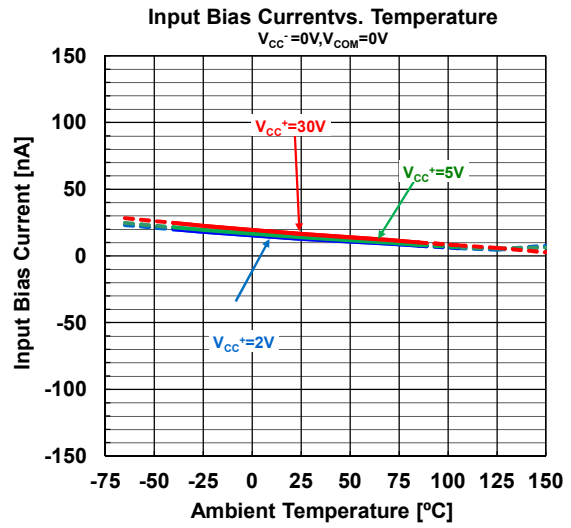
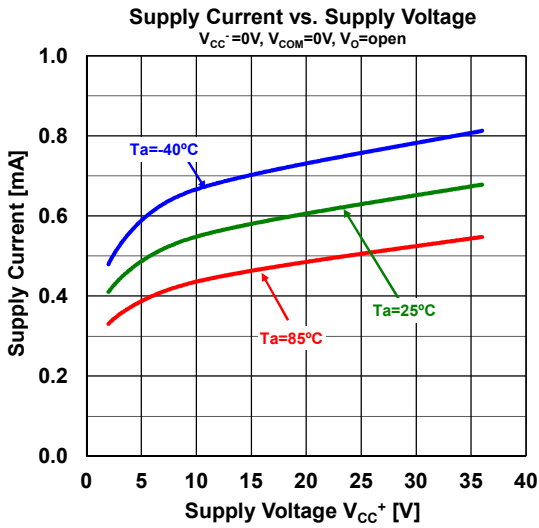
Table3.  $V_{CC}^+ = +5V, V_{CC}^- = 0V, T_{amb} = 25^\circ C$  (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{io}$	Input offset voltage <sup>(1)</sup> $T_{amb} = 25^\circ C$	-	0.5	5	mV
	NJM393CA	-	0.5	2	
	$0^\circ C \leq T_{amb} \leq 70^\circ C$ <sup>(5)</sup>	-	-	9	
	NJM393CA	-	-	4	
$I_{io}$	Input offset current $T_{amb} = 25^\circ C$	-	0.5	50	nA
	$0^\circ C \leq T_{amb} \leq 70^\circ C$ <sup>(5)</sup>	-	-	150	
$I_{ib}$	Input bias current <sup>(2)</sup> $T_{amb} = 25^\circ C$	-	20	250	nA
	$0^\circ C \leq T_{amb} \leq 70^\circ C$ <sup>(5)</sup>	-	-	400	
$A_{vd}$	Large signal voltage gain $V_{CC}^+ = 15V, R_L = 15k\Omega, V_o = 1V \text{ to } 11V$	50	200	-	V/mV
$I_{CC}$	Supply current (all comparators) $V_{CC}^+ = +5V, \text{ no load}$	-	0.45	1	mA
	$V_{CC}^+ = +30V, \text{ no load}$	-	0.6	2.5	
$V_{id}$	Differential input voltage <sup>(3)</sup>	-	-	$V_{CC}^+$	V
$V_{OL}$	Low level output voltage ( $V_{id} = -1V, I_{sink} = 4mA$ ) $T_{amb} = 25^\circ C$	-	80	400	mV
	$0^\circ C \leq T_{amb} \leq 70^\circ C$ <sup>(5)</sup>	-	-	700	
$I_{OH}$	High level output current ( $V_{CC}^+ = V_o = 30V, V_{id} = 1V$ ) $T_{amb} = 25^\circ C$	-	0.1	-	nA $\mu A$
	$0^\circ C \leq T_{amb} \leq 70^\circ C$ <sup>(5)</sup>	-	-	1	
$I_{sink}$	Output sink current, $V_{id} = 1V, V_o = 1.5V$	6	16	-	mA
$t_{re}$	Response Time <sup>(4)</sup> $R_L = 5.1k\Omega$ connected to $V_{CC}^+$	-	1.3	-	$\mu s$
$t_{rel}$	Large Signal Response Time $R_L = 5.1k\Omega$ connected to $V_{CC}^+$ $e_i = TTL, V_{(ref)} = +1.4V$	-	250	-	ns

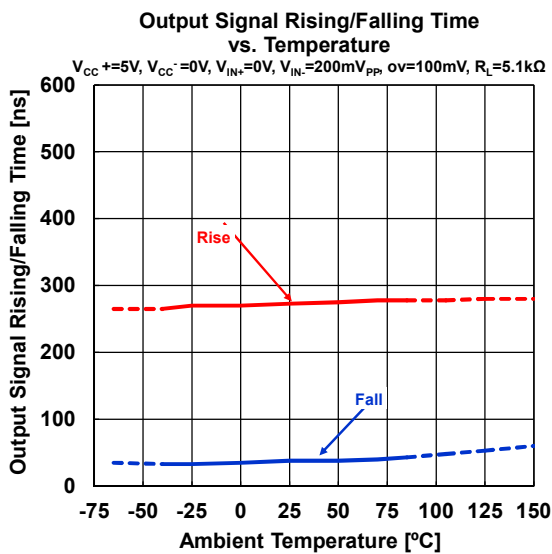
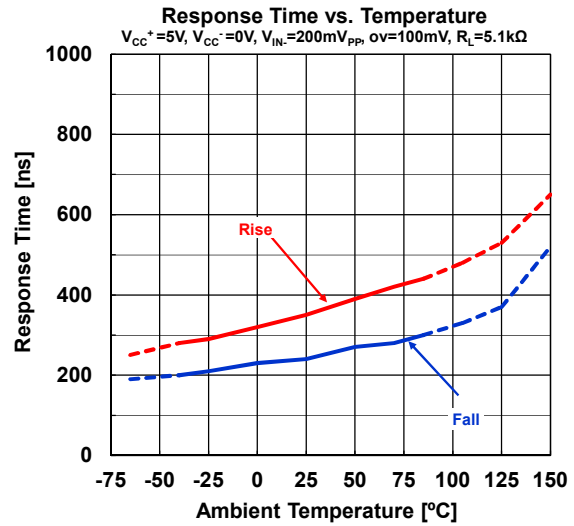
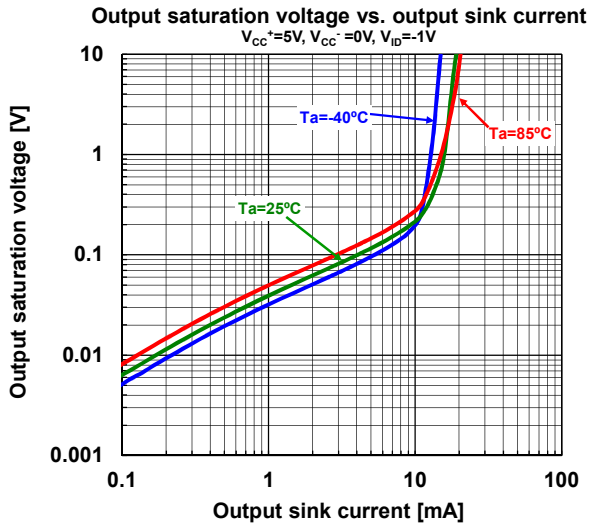
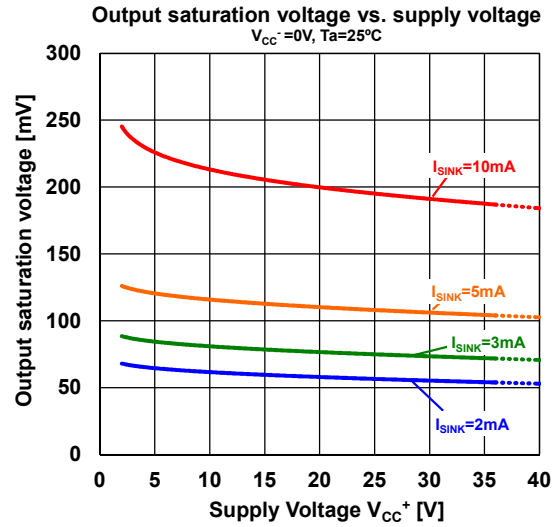
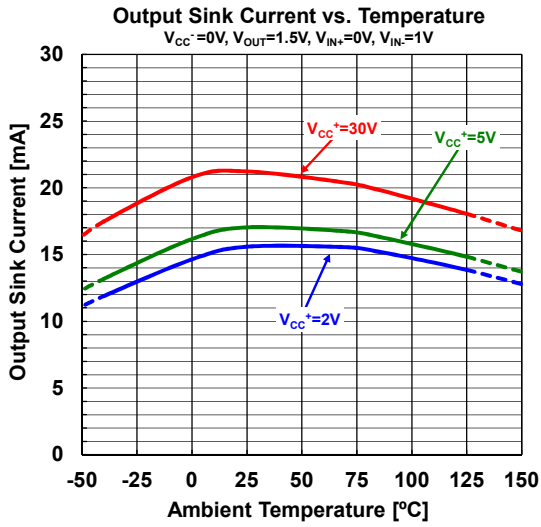
1. At output switch point,  $V_o = 1.4V, R_S = 0$  with  $V_{CC}^+$  from 5V to 30V, and over the full common-mode range (0V to  $V_{CC}^+ - 1.5V$ ).
2. The direction of the input current is out of the IC due to the PNP input stage.
3. Positive excursions of input voltage may exceed the power supply level. As long as the other voltage remains within the common-mode range, the comparator will provide a proper output state. The low input voltage must not be less than  $-0.3V$  (or  $0.3V$  below the negative power supply, if used).
4. The response time specified is for a 100mV input step with 5mV overdrive.
5. This parameter is not 100% test.

# NJM393C/NJM393CA

## TYPICAL CHARACTERISTICS

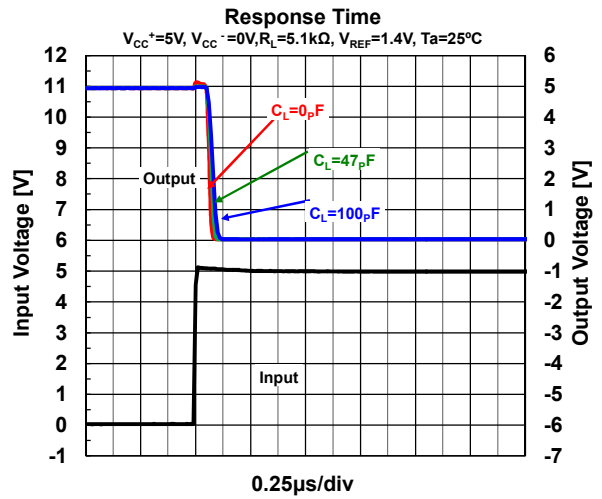
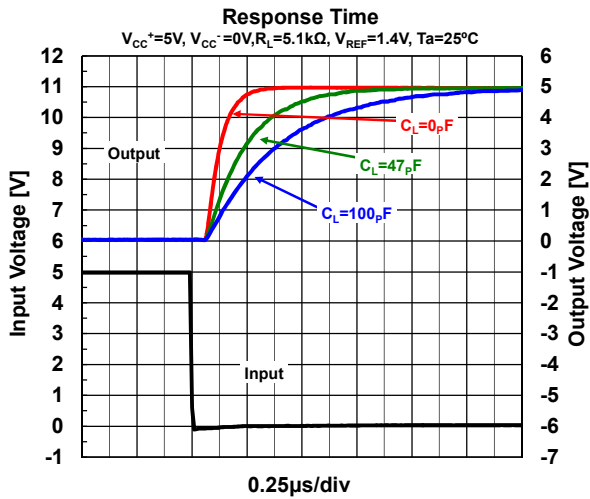
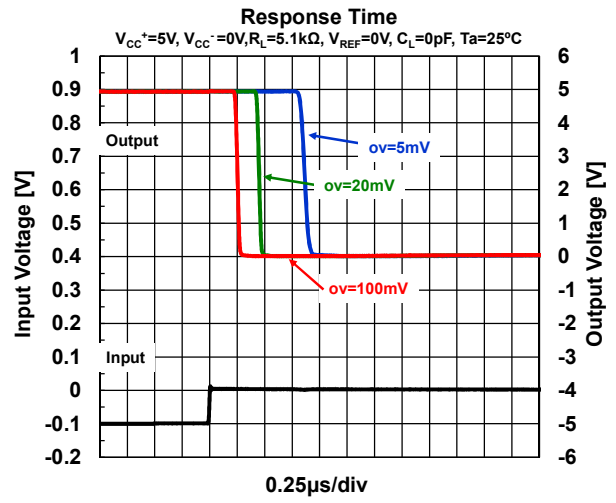
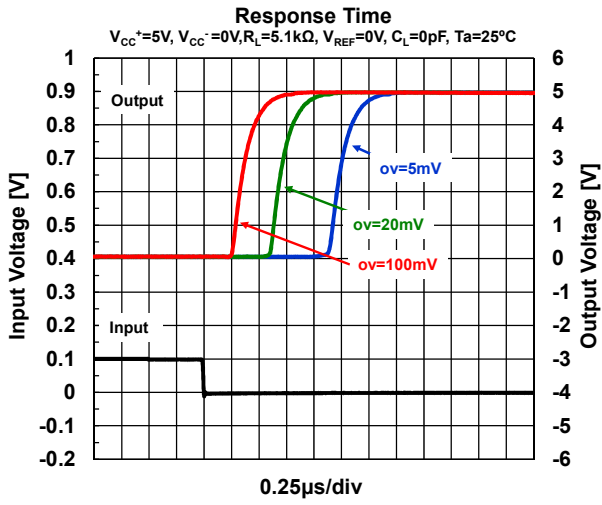


## ■ TYPICAL CHARACTERISTICS



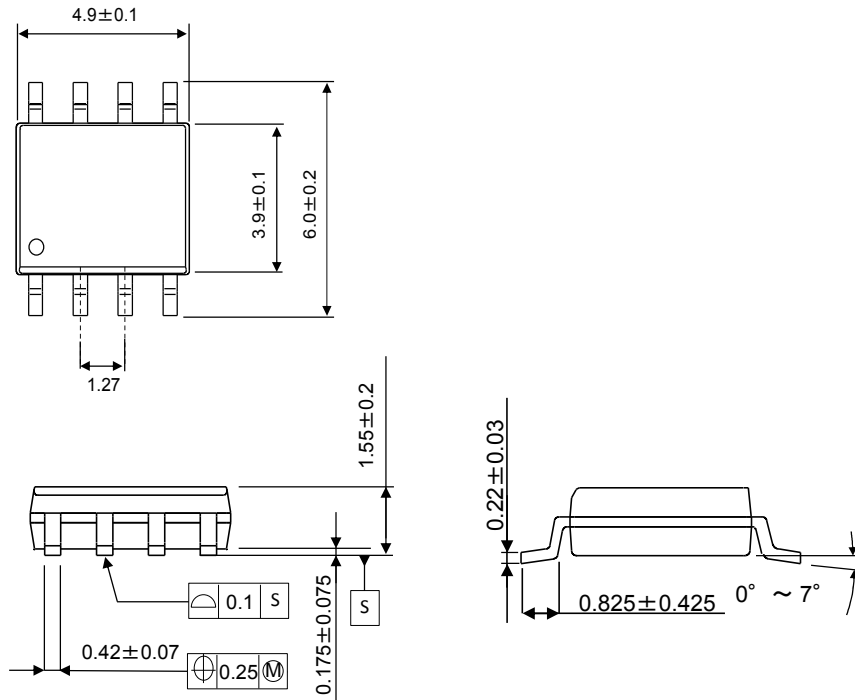
# NJM393C/NJM393CA

## TYPICAL CHARACTERISTICS

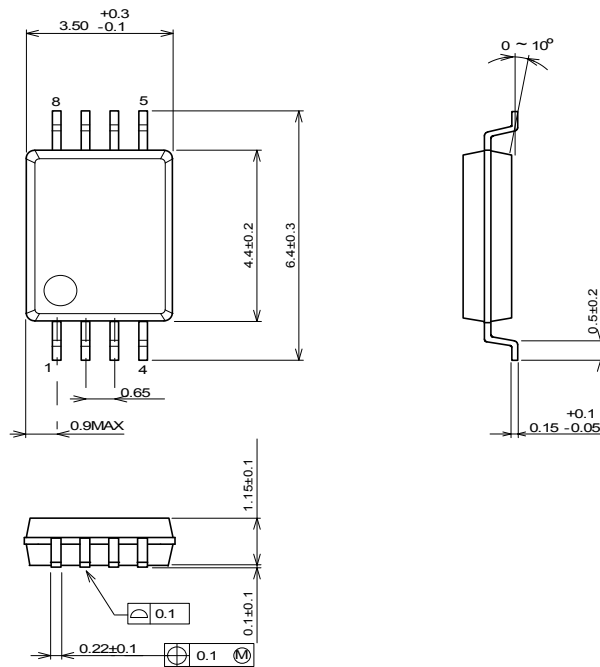


■PACKAGE OUTLINE UNIT : mm

SOP8



SSOP8



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