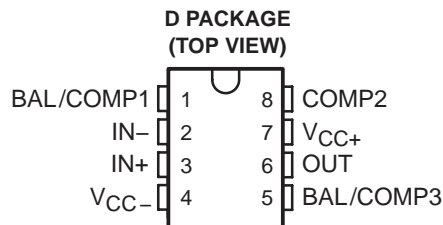


# LM218-Q1 FAST GENERAL-PURPOSE OPERATIONAL AMPLIFIER

SLOS450A – NOVEMBER 2004 – REVISED APRIL 2008

- Qualified for Automotive Applications
- Small-Signal Bandwidth . . . 15 MHz Typ
- Slew Rate . . . 20 V/μs Min
- Bias Current . . . 250 nA Max
- Supply-Voltage Range . . . ±5 V to ±20 V
- Internal Frequency Compensation
- Input and Output Overload Protection
- Same Pin Assignments as General-Purpose Operational Amplifiers



## description/ordering information

The LM218 is a precision, fast operational amplifier designed for applications requiring wide bandwidth and high slew rate. It features a factor-of-ten increase in speed over general-purpose devices without sacrificing dc performance.

This operational amplifier has internal unity-gain frequency compensation. This considerably simplifies its application because no external components are necessary for operation. However, unlike most internally compensated amplifiers, external frequency compensation may be added for optimum performance. For inverting applications, feed-forward compensation boosts the slew rate to over 150 V/μs and almost double the bandwidth. Overcompensation can be used with the amplifier for greater stability when maximum bandwidth is not needed. Further, a single capacitor can be added to reduce the settling time for 0.1% error band to under 1 μs.

The high speed and fast settling time of this operational amplifier makes it useful in A/D converters, oscillators, active filters, sample-and-hold circuits, and general-purpose amplifiers.

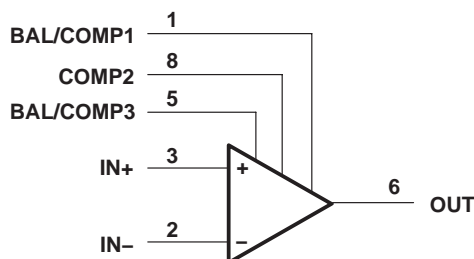
## ORDERING INFORMATION†

T <sub>A</sub>	V <sub>IO</sub> max AT 25°C	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	10 mV	SOIC (D)	Reel of 2500	LM218IDRQ1	LM218I

† For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at <http://www.ti.com>.

‡ Package drawings, thermal data, and symbolization are available at <http://www.ti.com/packaging>.

## symbol

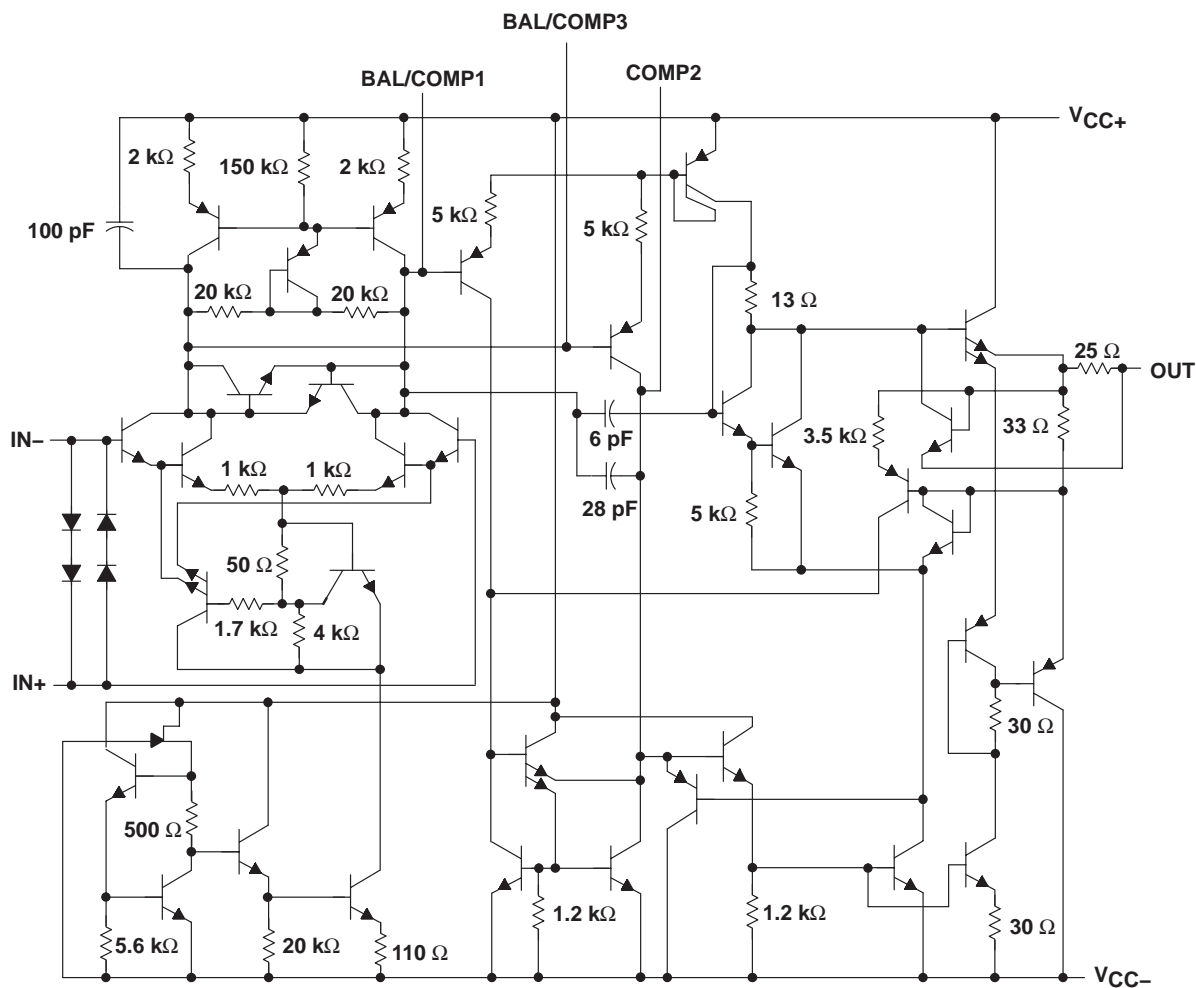


# LM218-Q1

## FAST GENERAL-PURPOSE OPERATIONAL AMPLIFIER

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### schematic



Component values shown are nominal.

# LM218-Q1

## FAST GENERAL-PURPOSE OPERATIONAL AMPLIFIER

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### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Supply voltage: $V_{CC+}$ (see Note 1)	20 V
$V_{CC-}$ (see Note 1)	–20 V
Input voltage, $V_I$ (either input, see Notes 1 and 2)	±15 V
Differential input current, $V_{ID}$ (see Note 3)	±10 V
Duration of output short circuit (see Note 4)	Unlimited
Operating virtual junction temperature, $T_J$	150°C
Package thermal impedance, $\theta_{JA}$ (see Notes 5 and 6)	126°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	260°C
Storage temperature range, $T_{stg}$	–65°C to 150°C

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. All voltage values, unless otherwise noted, are with respect to the midpoint between  $V_{CC+}$  and  $V_{CC-}$ .
  2. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 V, whichever is less.
  3. The inputs are shunted with two opposite-facing base-emitter diodes for overvoltage protection. Therefore, excessive current flows if a different input voltage in excess of approximately 1 V is applied between the inputs, unless some limiting resistance is used.
  4. The output can be shorted to ground for either power supply. For the LM218, the unlimited duration of the short circuit applies at (or below) 85°C case temperature or 75°C free-air temperature.
  5. Maximum power dissipation is a function of  $T_J(\max)$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_J(\max) - T_A)/\theta_{JA}$ . Operating at the absolute maximum  $T_J$  of 150°C can affect reliability.
  6. The package thermal impedance is calculated in accordance with JESD 51-7.

### electrical characteristics at specified free-air temperature (see Note 7)

PARAMETER	TEST CONDITIONS <sup>‡</sup>	$T_A$ <sup>§</sup>	MIN	TYP	MAX	UNIT
$V_{IO}$ Input offset voltage	$V_O = 0$	25°C		2	10	mV
		Full range			15	
$I_{IO}$ Input offset current	$V_O = 0$	25°C		6	50	nA
		Full range			100	
$I_{IB}$ Input bias current	$V_O = 0$	25°C		120	250	nA
		Full range			500	
$V_{ICR}$ Common-mode input voltage range	$V_{CC\pm} = \pm 15$ V	Full range	± 11.5			V
$V_{OM}$ Maximum peak output voltage swing	$V_{CC\pm} = \pm 15$ V, $R_L = 2$ k $\Omega$	Full range	± 12	± 13		V
$A_{VD}$ Large-signal differential voltage amplification	$V_{CC\pm} = \pm 15$ V, $V_O = \pm 10$ V, $R_L \geq 2$ k $\Omega$	25°C	50	200		V/mV
		Full range	25			
$B_1$ Unity-gain bandwidth	$V_{CC\pm} = \pm 15$ V	25°C		15		MHz
$r_i$ Input resistance		25°C		3		M $\Omega$
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}$	Full range	80	100		dB
$k_{SVR}$ Supply-voltage rejection ratio ( $\Delta V_{CC}/\Delta V_{IO}$ )		Full range	70	80		dB
$I_{CC}$ Supply current	$V_O = 0$ , No load	25°C		5	8	mA

<sup>‡</sup> All characteristics are measured under open-loop conditions with common-mode input voltage, unless otherwise specified.

<sup>§</sup> Full range for LM218I is –40°C to 85°C.

NOTE 7: Unless otherwise noted,  $V_{CC} = \pm 5$  V to  $\pm 20$  V. All typical values are at  $V_{CC\pm} = \pm 15$  V and  $T_A = 25^\circ\text{C}$ .

### operating characteristics, $V_{CC\pm} = \pm 15$ V, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
SR Slew rate at unity gain	$\Delta V_I = 10$ V, $C_L = 100$ pF, See Figure 1	20	70		V/ $\mu\text{s}$



# LM218-Q1

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### PARAMETER MEASUREMENT INFORMATION

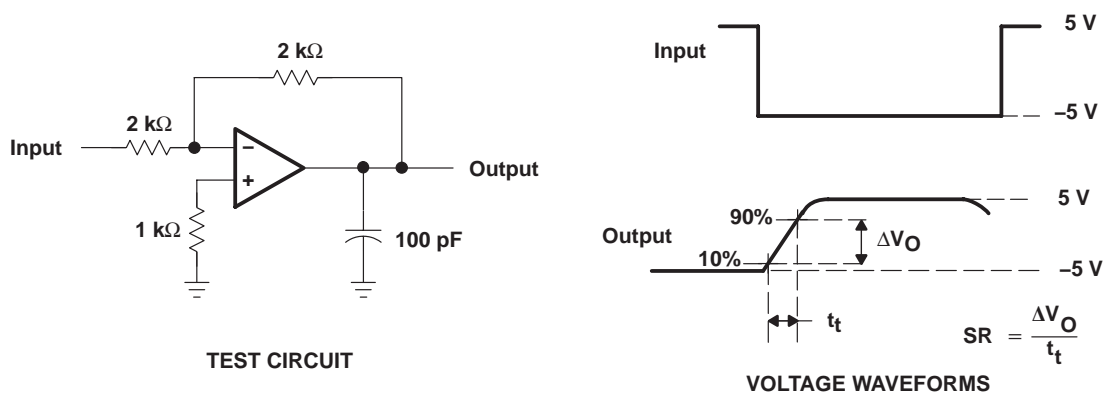


Figure 1. Slew Rate

## PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
LM218IDRG4Q1	Active	Production	SOIC (D)   8	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LM218I
LM218IDRG4Q1.A	Active	Production	SOIC (D)   8	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LM218I

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

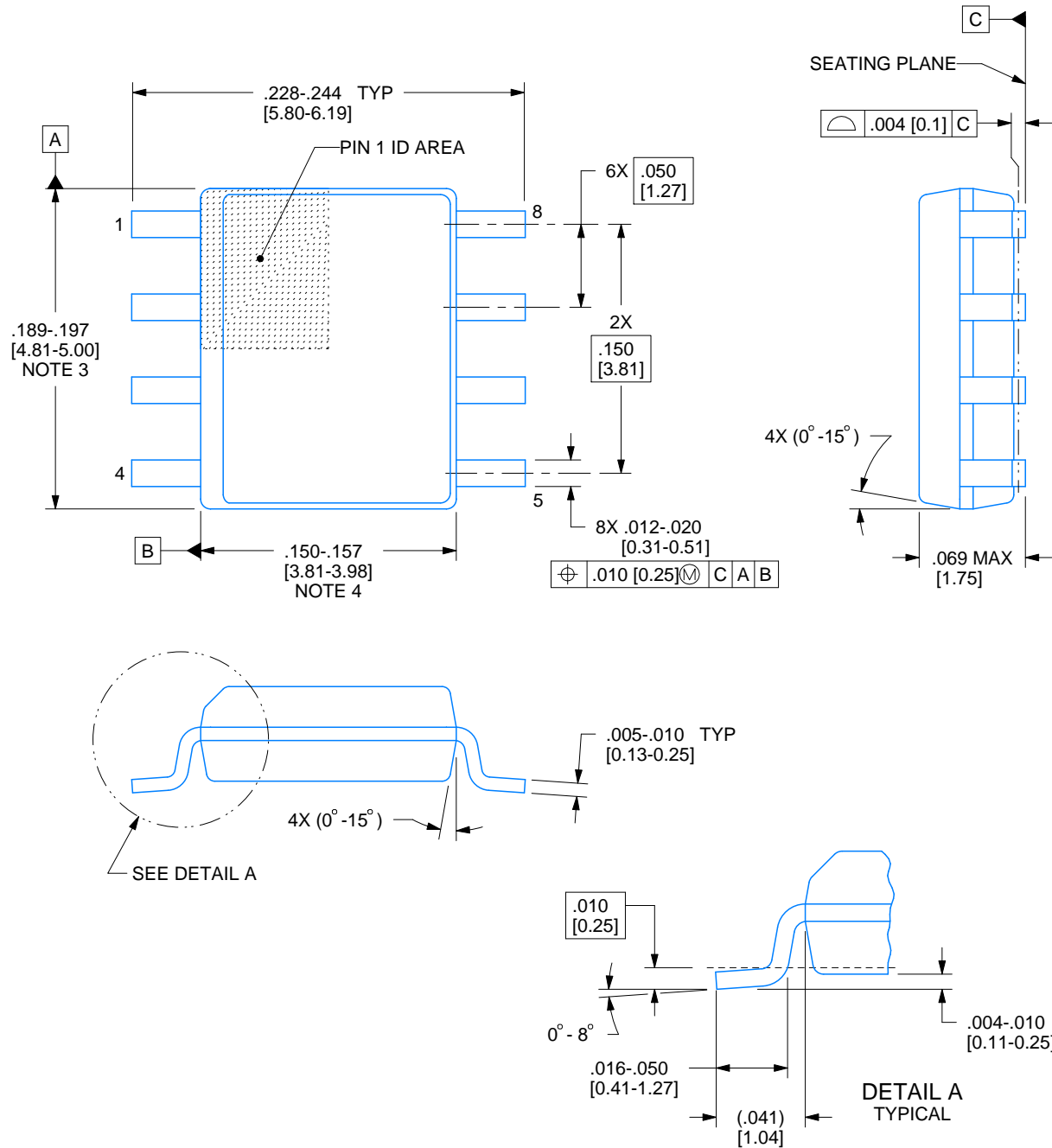
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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**D0008A****PACKAGE OUTLINE****SOIC - 1.75 mm max height**

SMALL OUTLINE INTEGRATED CIRCUIT



4214825/C 02/2019

**NOTES:**

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.

# EXAMPLE BOARD LAYOUT

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:8X



SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE  
BASED ON .005 INCH [0.125 MM] THICK STENCIL  
SCALE:8X

4214825/C 02/2019

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.



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