

NL17SG17

Schmitt Buffer

The NL17SG17 MiniGate™ is an advanced high-speed CMOS Schmitt Buffer in ultra-small footprint.

The NL17SG17 input structures provides protection when voltages up to 4.6 V are applied.

Features

- Wide Operating V_{CC} Range: 0.9 V to 3.6 V
- High Speed: $t_{PD} = 3.7$ ns (Typ) at $V_{CC} = 3.0$ V, $C_L = 15$ pF
- Low Power Dissipation: $I_{CC} = 0.5$ μ A (Max) at $T_A = 25^\circ$ C
- 4.6 V Overvoltage Tolerant (OVT) Input Pins
- Ultra-Small Packages
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

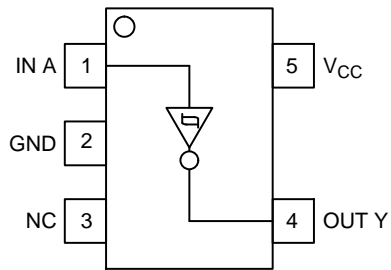


Figure 1. SOT-953 (Top Thru View)

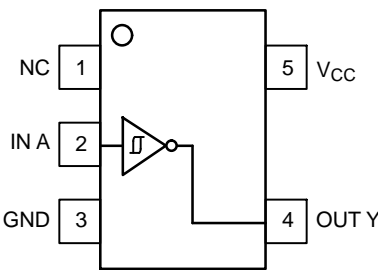


Figure 2. SC-88A (Top View)

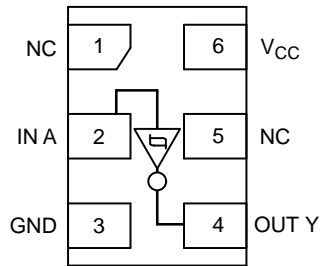


Figure 3. UDFN6 (Top View)

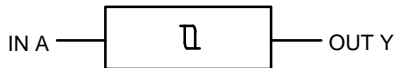


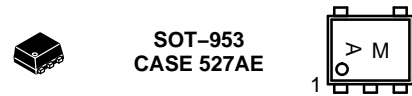
Figure 4. Logic Symbol



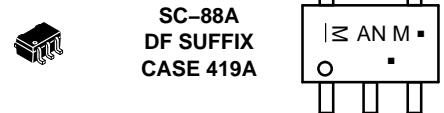
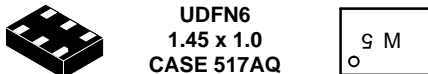
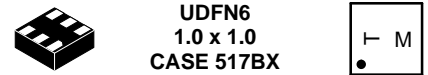
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MARKING DIAGRAMS



A = Specific Device Code
(A with 90 degree clockwise rotation)



M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing location.

| PIN ASSIGNMENT | | | |
|----------------|----------|----------|----------|
| | SOT-953 | SC-88A | UDFN6 |
| 1 | IN A | NC | NC |
| 2 | GND | IN A | IN A |
| 3 | NC | GND | GND |
| 4 | OUT Y | OUT Y | OUT Y |
| 5 | V_{CC} | V_{CC} | NC |
| 6 | | | V_{CC} |

| FUNCTION TABLE | |
|----------------|----------|
| A Input | Y Output |
| L | L |
| H | H |

ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

NL17SG17

MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------|---|--|-------------|
| V_{CC} | DC Supply Voltage | -0.5 to +5.5 | V |
| V_{IN} | DC Input Voltage | -0.5 to +4.6 | V |
| V_{OUT} | DC Output Voltage Output at High or Low State Power-Down Mode ($V_{CC} = 0$ V) | -0.5 to $V_{CC} + 0.5$ -0.5 to +4.6 | V |
| I_{IK} | DC Input Diode Current $V_{IN} < GND$ | -20 | mA |
| I_{OK} | DC Output Diode Current $V_{OUT} < GND$ | -20 | mA |
| I_{OUT} | DC Output Source/Sink Current | ± 20 | mA |
| I_{CC} | DC Supply Current per Supply Pin | ± 20 | mA |
| I_{GND} | DC Ground Current per Ground Pin | ± 20 | mA |
| T_{STG} | Storage Temperature Range | -65 to +150 | $^{\circ}C$ |
| T_L | Lead Temperature, 1 mm from Case for 10 Seconds | 260 | $^{\circ}C$ |
| T_J | Junction Temperature Under Bias | +150 | $^{\circ}C$ |
| MSL | Moisture Sensitivity | Level 1 | |
| F_R | Flammability Rating Oxygen Index: 28 to 34 | UL 94 V-0 @ 0.125 in | |
| V_{ESD} | ESD Withstand Voltage Human Body Model (Note 2) Machine Model (Note 3) | >2000 >100 | V |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow.
2. Tested to EIA/JESD22-A114-A.
3. Tested to EIA/JESD22-A115-A.
4. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Characteristics | Min | Max | Unit |
|-----------------------|--|------------|-----------------|-------------|
| V_{CC} | Positive DC Supply Voltage | 0.9 | 3.6 | V |
| V_{IN} | Digital Input Voltage | 0.0 | 3.6 | V |
| V_{OUT} | Output Voltage Output at High or Low State Power-Down Mode ($V_{CC} = 0$ V) | 0.0 0.0 | V_{CC} 3.6 | V |
| T_A | Operating Temperature Range | -55 | +125 | $^{\circ}C$ |
| $\Delta t / \Delta V$ | Input Transition Rise or Fall Rate | 0 | No Limit | ns/V |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

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DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Condition | V _{CC} (V) | T _A = 25°C | | | -55°C ≤ T _A ≤ 125°C | | Unit |
|-----------------|--|--|---------------------------|-----------------------|------------------------|------------------------|--------------------------------|------------------------|------|
| | | | | Min | Typ | Max | Min | Max | |
| V _{T+} | Positive-Going Input Threshold Voltage | | 0.9 | 0.64 | 0.7 | 0.86 | 0.62 | 0.87 | V |
| | | | 1.1 | 0.73 | 0.81 | 0.95 | 0.71 | 1 | |
| | | | 1.4 | 0.86 | 0.94 | 1.16 | 0.84 | 1.2 | |
| | | | 1.65 | 0.95 | 1.06 | 1.25 | 0.94 | 1.3 | |
| | | | 2.3 | 1.22 | 1.36 | 1.6 | 1.18 | 1.65 | |
| | | | 3.0 | 1.51 | 1.8 | 2.05 | 1.38 | 2.1 | |
| V _{T-} | Negative-Going Input Threshold Voltage | | 0.9 | 0.09 | 0.23 | 0.30 | 0.08 | 0.33 | V |
| | | | 1.1 | 0.15 | 0.33 | 0.39 | 0.12 | 0.43 | |
| | | | 1.4 | 0.3 | 0.47 | 0.54 | 0.25 | 0.55 | |
| | | | 1.65 | 0.35 | 0.6 | 0.65 | 0.3 | 0.65 | |
| | | | 2.3 | 0.55 | 0.85 | 0.88 | 0.5 | 0.88 | |
| | | | 3.0 | 0.95 | 1.13 | 1.16 | 0.9 | 1.16 | |
| V _H | Hysteresis Voltage | | 0.9 | 0.15 | 0.5 | 0.75 | 0.2 | 0.8 | V |
| | | | 1.1 | 0.15 | 0.5 | 0.75 | 0.2 | 0.8 | |
| | | | 1.4 | 0.15 | 0.5 | 0.75 | 0.2 | 0.8 | |
| | | | 1.65 | 0.15 | 0.5 | 0.75 | 0.2 | 0.8 | |
| | | | 2.3 | 0.15 | 0.5 | 0.75 | 0.2 | 0.8 | |
| | | | 3.0 | 0.25 | 0.65 | 0.85 | 0.3 | 0.9 | |
| V _{OH} | High-Level Output Voltage | V _{IN} = V _{IH} or V _{IL} | I _{OH} = -20 μA | 0.9 | 0.75 | | 0.75 | | V |
| | | | I _{OH} = -0.3 mA | 1.1 to 1.3 | 0.75 x V _{CC} | | 0.75 x V _{CC} | | |
| | | | I _{OH} = -1.7 mA | 1.4 to 1.6 | 0.75 x V _{CC} | | 0.75 x V _{CC} | | |
| | | | I _{OH} = -3.0 mA | 1.65 to 1.95 | V _{CC} - 0.45 | | V _{CC} - 0.45 | | |
| | | | I _{OH} = -4.0 mA | 2.3 to 2.7 | 2.0 | | 2.0 | | |
| | | | I _{OH} = -8.0 mA | 3.0 to 3.6 | 2.48 | | 2.48 | | |
| V _{OL} | Low-Level Output Voltage | V _{IN} = V _{IH} or V _{IL} | I _{OL} = 20 μA | 0.9 | | 0.1 | | 0.1 | V |
| | | | I _{OL} = 0.3 mA | 1.1 to 1.3 | | 0.25 x V _{CC} | | 0.25 x V _{CC} | |
| | | | I _{OL} = 1.7 mA | 1.4 to 1.6 | | 0.25xV _{CC} | | 0.25 x V _{CC} | |
| | | | I _{OL} = 3.0 mA | 1.65 to 1.95 | | 0.45 | | 0.45 | |
| | | | I _{OL} = 4.0 mA | 2.3 to 2.7 | | 0.4 | | 0.4 | |
| | | | I _{OL} = 8.0 mA | 3.0 to 3.6 | | 0.4 | | 0.4 | |
| I _{IN} | Input Leakage Current | 0 ≤ V _{IN} ≤ 3.6 V | 0 to 3.6 | | | ±0.1 | | ±1.0 | μA |
| I _{CC} | Quiescent Supply Current | V _{IN} = V _{CC} or GND | 3.6 | | | 0.5 | | 10.0 | μA |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NL17SG17

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns)

| Symbol | Parameter | Test Condition | V_{CC} (V) | $T_A = 25^\circ\text{C}$ | | | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ | | Unit |
|--------------------------|--|--|--------------|--------------------------|------|------|--|------|------|
| | | | | Min | Typ | Max | Min | Max | |
| t_{PLH} , t_{PHL} | Propagation Delay, A to Y | $C_L = 10$ pF, $R_L = 1$ M Ω | 0.9 | – | 27.3 | – | – | – | ns |
| | | | 1.1 to 1.3 | – | 13.0 | 22.6 | 1.0 | 35.9 | |
| | | | 1.4 to 1.6 | – | 7.5 | 10.5 | 1.0 | 11.3 | |
| | | | 1.65 to 1.95 | – | 6.0 | 7.8 | 1.0 | 8.2 | |
| | | | 2.3 to 2.7 | – | 4.3 | 5.4 | 1.0 | 5.8 | |
| | | | 3.0 to 3.6 | – | 3.5 | 4.4 | 1.0 | 4.6 | |
| | | $C_L = 15$ pF, $R_L = 1$ M Ω | 0.9 | – | 29.5 | – | – | – | ns |
| | | | 1.1 to 1.3 | – | 14.3 | 25.1 | 1.0 | 41.8 | |
| | | | 1.4 to 1.6 | – | 8.0 | 11.5 | 1.0 | 12.6 | |
| | | | 1.65 to 1.95 | – | 6.3 | 8.4 | 1.0 | 8.7 | |
| | | | 2.3 to 2.7 | – | 4.6 | 5.7 | 1.0 | 6.1 | |
| | | | 3.0 to 3.6 | – | 3.7 | 4.6 | 1.0 | 5.0 | |
| | | $C_L = 30$ pF, $R_L = 1$ M Ω | 0.9 | – | 40.5 | – | – | – | ns |
| | | | 1.1 to 1.3 | – | 19.6 | 35.7 | 1.0 | 58.1 | |
| | | | 1.4 to 1.6 | – | 10.7 | 15.8 | 1.0 | 17.6 | |
| | | | 1.65 to 1.95 | – | 7.8 | 10.7 | 1.0 | 11.7 | |
| | | | 2.3 to 2.7 | – | 5.4 | 6.9 | 1.0 | 8.1 | |
| | | | 3.0 to 3.6 | – | 4.3 | 5.2 | 1.0 | 6.1 | |
| C_{IN} | Input Capacitance | | 0 to 3.6 | | 3 | – | – | pF | |
| C_O | Output Capacitance | $V_O = \text{GND}$ | 0 | | 3 | – | – | pF | |
| C_{PD} | Power Dissipation Capacitance (Note 5) | $f = 10$ MHz | 0.9 to 3.6 | – | 4 | – | – | pF | |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

5. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the dynamic operating current consumption without load. Average operating current can be obtained by the equation: $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$. C_{PD} is used to determine the no-load dynamic power consumption; $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$.

NL17SG17

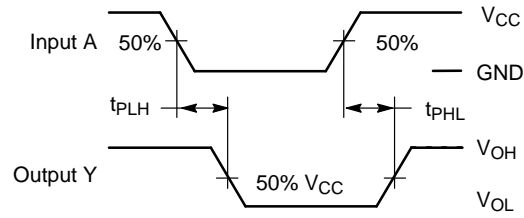
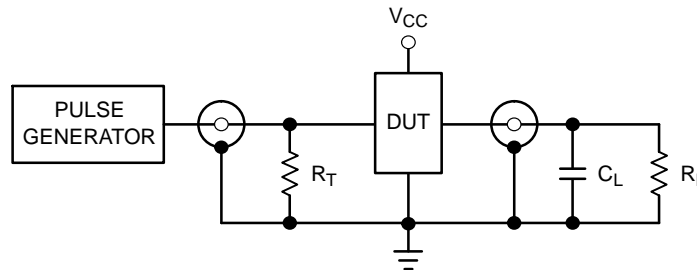


Figure 5. Switching Waveform



$R_T = Z_{OUT}$ of pulse generator (typically 50 Ω)

Figure 6. Test Circuit

ORDERING INFORMATION

| Device | Package | Shipping† |
|-----------------|------------------------------|--------------------|
| NL17SG17P5T5G | SOT-953 (Pb-Free) | 8000 / Tape & Reel |
| NL17SG17DFT2G | SC-88A (Pb-Free) | 3000 / Tape & Reel |
| NL17SG17AMUTCG | UDFN6 1.45x1 mm (Pb-Free) | 3000 / Tape & Reel |
| NL17SG17CMUTCG* | UDFN6 1x1 mm (Pb-Free) | 3000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*In Development

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 2:1

SC-88A (SC-70-5/SOT-353)
CASE 419A-02
ISSUE L

DATE 17 JAN 2013



SOLDER FOOTPRINT



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.071 | 0.087 | 1.80 | 2.20 |
| B | 0.045 | 0.053 | 1.15 | 1.35 |
| C | 0.031 | 0.043 | 0.80 | 1.10 |
| D | 0.004 | 0.012 | 0.10 | 0.30 |
| G | 0.026 BSC | | 0.65 BSC | |
| H | --- | 0.004 | --- | 0.10 |
| J | 0.004 | 0.010 | 0.10 | 0.25 |
| K | 0.004 | 0.012 | 0.10 | 0.30 |
| N | 0.008 REF | | 0.20 REF | |
| S | 0.079 | 0.087 | 2.00 | 2.20 |

GENERIC MARKING DIAGRAM*



- XXX = Specific Device Code
- M = Date Code
- = Pb-Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

- | | | | | |
|--|--|--|--|--|
| <p>STYLE 1: PIN 1. BASE 2. EMITTER 3. BASE 4. COLLECTOR 5. COLLECTOR</p> | <p>STYLE 2: PIN 1. ANODE 2. EMITTER 3. BASE 4. COLLECTOR 5. CATHODE</p> | <p>STYLE 3: PIN 1. ANODE 1 2. N/C 3. ANODE 2 4. CATHODE 2 5. CATHODE 1</p> | <p>STYLE 4: PIN 1. SOURCE 1 2. DRAIN 1/2 3. SOURCE 1 4. GATE 1 5. GATE 2</p> | <p>STYLE 5: PIN 1. CATHODE 2. COMMON ANODE 3. CATHODE 2 4. CATHODE 3 5. CATHODE 4</p> |
| <p>STYLE 6: PIN 1. EMITTER 2 2. BASE 2 3. EMITTER 1 4. COLLECTOR 5. COLLECTOR 2/BASE 1</p> | <p>STYLE 7: PIN 1. BASE 2. EMITTER 3. BASE 4. COLLECTOR 5. COLLECTOR</p> | <p>STYLE 8: PIN 1. CATHODE 2. COLLECTOR 3. N/C 4. BASE 5. EMITTER</p> | <p>STYLE 9: PIN 1. ANODE 2. CATHODE 3. ANODE 4. ANODE 5. ANODE</p> | <p>Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.</p> |

| | | |
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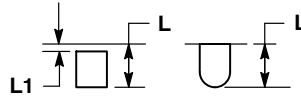
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



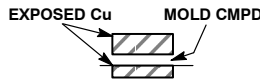
SCALE 4:1

UDFN6, 1.45x1.0, 0.5P
CASE 517AQ
ISSUE O

DATE 15 MAY 2008



DETAIL A
OPTIONAL
CONSTRUCTIONS



DETAIL B
OPTIONAL
CONSTRUCTIONS

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

| MILLIMETERS | | |
|-------------|----------|------|
| DIM | MIN | MAX |
| A | 0.45 | 0.55 |
| A1 | 0.00 | 0.05 |
| A2 | 0.07 REF | |
| b | 0.20 | 0.30 |
| D | 1.45 BSC | |
| E | 1.00 BSC | |
| e | 0.50 BSC | |
| L | 0.30 | 0.40 |
| L1 | --- | 0.15 |

MOUNTING FOOTPRINT



DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

**GENERIC
MARKING DIAGRAM***



X = Specific Device Code
M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

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| DESCRIPTION: | UDFN6, 1.45x1.0, 0.5P | PAGE 1 OF 1 |

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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

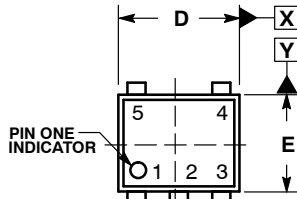
ON Semiconductor®



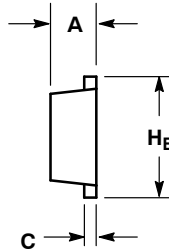
SCALE 4:1

SOT-953
CASE 527AE
ISSUE E

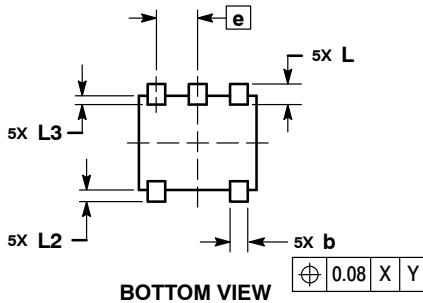
DATE 02 AUG 2011



TOP VIEW

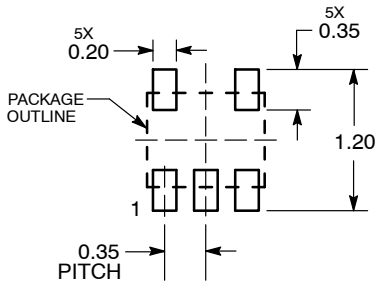


SIDE VIEW



BOTTOM VIEW

SOLDERING FOOTPRINT*



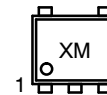
DIMENSIONS: MILLIMETERS

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN | NOM | MAX |
| A | 0.34 | 0.37 | 0.40 |
| b | 0.10 | 0.15 | 0.20 |
| C | 0.07 | 0.12 | 0.17 |
| D | 0.95 | 1.00 | 1.05 |
| E | 0.75 | 0.80 | 0.85 |
| e | 0.35 BSC | | |
| HE | 0.95 | 1.00 | 1.05 |
| L | 0.175 REF | | |
| L2 | 0.05 | 0.10 | 0.15 |
| L3 | --- | --- | 0.15 |

GENERIC MARKING DIAGRAM*



X = Specific Device Code
M = Month Code

*This information is generic. Please refer to device data sheet for actual part marking.
Pb-Free indicator, "G" or microdot "▪", may or may not be present.

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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