

MC10EL57, MC100EL57

5V ECL 4:1 Differential Multiplexer

Description

The MC10/100EL57 is a fully differential 4:1 multiplexer. By leaving the SEL1 line open (pulled LOW via the input pulldown resistors) the device can also be used as a differential 2:1 multiplexer with SEL0 input selecting between D0 and D1.

The SEL1 is the most significant select line. The binary number applied to the select inputs will select the same numbered data input (i.e., 00 selects D0).

Multiple V_{BB} outputs are provided for single-ended or AC coupled interfaces. The V_{BB} pin, an internally generated voltage supply, is available to this device only. For single-ended input conditions, the unused differential input is connected to V_{BB} as a switching reference voltage. V_{BB} may also rebias AC coupled inputs. When used, decouple V_{BB} and V_{CC} via a 0.01 μ F capacitor and limit current sourcing or sinking to 0.5 mA. When not used, V_{BB} should be left open.

The 100 Series contains temperature compensation.

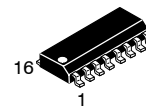
Features

- Useful as Either 4:1 or 2:1 Multiplexer
- V_{BB} Output for Single-Ended Operation
- PECL Mode Operating Range: $V_{CC} = 4.2$ V to 5.7 V with $V_{EE} = 0$ V
- NECL Mode Operating Range: $V_{CC} = 0$ V with $V_{EE} = -4.2$ V to -5.7 V
- Internal Input Pulldown Resistors on All Inputs
- Q Outputs Will Default LOW with Inputs Open or at V_{EE}
- Pb-Free Packages are Available*



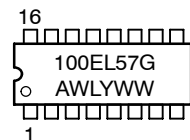
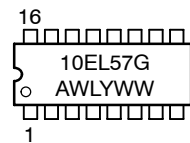
ON Semiconductor®

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SO-16
D SUFFIX
CASE 751B

MARKING DIAGRAMS*



A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week
G = Pb-Free Package

*For additional marking information, refer to Application Note AND8002/D.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

*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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Table 1. ATTRIBUTES

| Characteristics | | Value |
|--|------------------------|----------------------|
| Internal Input Pulldown Resistor | | 75 K Ω |
| Internal Input Pullup Resistor | | N/A |
| ESD Protection | Human Body Model | > 1 kV |
| | Machine Model | > 100 V |
| | Charge Device Model | > 2 kV |
| Moisture Sensitivity (Note 1) | | Level 1 |
| Flammability Rating | Oxygen Index: 28 to 34 | UL 94 V-0 @ 0.125 in |
| Transistor Count | | 109 Devices |
| Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test | | |

1. For additional Moisture Sensitivity information, refer to Application Note AND8003/D.

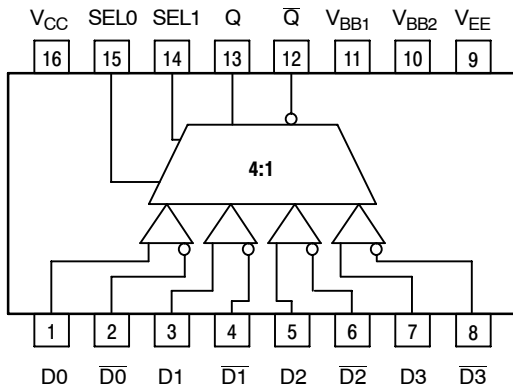


Table 3. FUNCTION TABLE

| SEL1* | SEL0* | DATA OUT |
|-------|-------|----------|
| L | L | D0 |
| L | H | D1 |
| H | L | D2 |
| H | H | D3 |

* Pin will default low when left open.

Figure 1. Logic Diagram and Pinout Assignment

Table 2. PIN DESCRIPTION

| PIN | FUNCTION |
|-------------------------|--------------------------|
| D0-3, $\overline{D0-3}$ | ECL Diff Data Inputs |
| SEL0,1 | ECL MUX Select Inputs |
| Q, \overline{Q} | ECL Data Outputs |
| V_{BB1} , V_{BB2} | Reference Voltage Output |
| V_{CC} | Positive Supply |
| V_{EE} | Negative Supply |

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Table 4. MAXIMUM RATINGS

| Symbol | Parameter | Condition 1 | Condition 2 | Rating | Unit |
|------------------|--|--|--|-------------|--------------|
| V _{CC} | PECL Mode Power Supply | V _{EE} = 0 V | | 8 | V |
| V _{EE} | NECL Mode Power Supply | V _{CC} = 0 V | | -8 | V |
| V _I | PECL Mode Input Voltage NECL Mode Input Voltage | V _{EE} = 0 V V _{CC} = 0 V | V _I ≤ V _{CC} V _I ≥ V _{EE} | 6 -6 | V V |
| I _{out} | Output Current | Continuous Surge | | 50 100 | mA mA |
| I _{BB} | V _{BB} Sink/Source | | | ± 0.5 | mA |
| T _A | Operating Temperature Range | | | -40 to +85 | °C |
| T _{stg} | Storage Temperature Range | | | -65 to +150 | °C |
| θ _{JA} | Thermal Resistance (Junction-to-Ambient) | 0 lfpm 500 lfpm | SOIC-16 SOIC-16 | 130 75 | °C/W °C/W |
| θ _{JC} | Thermal Resistance (Junction-to-Case) | Standard Board | SOIC-16 | 33 to 36 | °C/W |
| T _{sol} | Wave Solder | Pb Pb-Free | <2 to 3 sec @ 248°C <2 to 3 sec @ 260°C | 265 265 | °C |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Table 5. 10EL SERIES PECL DC CHARACTERISTICS V_{CC} = 5.0 V; V_{EE} = 0 V (Note 1)

| Symbol | Characteristic | -40°C | | | 25°C | | | 85°C | | | Unit |
|--------------------|--|-------|------|------|------|------|------|------|------|------|------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| I _{EE} | Power Supply Current | | | 24 | | | 24 | | | 24 | mA |
| V _{OH} | Output HIGH Voltage (Note 5) | 3920 | 4010 | 4110 | 4020 | 4105 | 4190 | 4090 | 4185 | 4280 | mV |
| V _{OL} | Output LOW Voltage (Note 2) | 3050 | 3200 | 3350 | 3050 | 3210 | 3370 | 3050 | 3227 | 3405 | mV |
| V _{IH} | Input HIGH Voltage (Single-Ended) | 3770 | | 4110 | 3870 | | 4190 | 3940 | | 4280 | mV |
| V _{IL} | Input LOW Voltage (Single-Ended) | 3050 | | 3500 | 3050 | | 3520 | 3050 | | 3555 | mV |
| V _{BB} | Output Voltage Reference | 3.57 | | 3.7 | 3.65 | | 3.75 | 3.69 | | 3.81 | V |
| V _{IHCMR} | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3) | 2.5 | | 4.6 | 2.5 | | 4.6 | 2.5 | | 4.6 | V |
| I _{IH} | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| I _{IL} | Input LOW Current | 0.5 | | | 0.5 | | | 0.3 | | | μA |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

1. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.06 V / -0.5 V.
2. Outputs are terminated through a 50 Ω resistor to V_{CC} - 2.0 V.
3. V_{IHCMR} min varies 1:1 with V_{EE}. V_{IHCMR} max varies 1:1 with V_{CC}. The V_{IHCMR} range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V_{ppmin} and 1 V.

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Table 6. 10EL SERIES NECL DC CHARACTERISTICS $V_{CC} = 0\text{ V}$; $V_{EE} = -5.0\text{ V}$ (Note 4)

| Symbol | Characteristic | -40°C | | | 25°C | | | 85°C | | | Unit |
|-------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| I_{EE} | Power Supply Current | | | 24 | | | 24 | | | 24 | mA |
| V_{OH} | Output HIGH Voltage (Note 5) | -1080 | -990 | -890 | -980 | -895 | -810 | -910 | -815 | -720 | mV |
| V_{OL} | Output LOW Voltage (Note 5) | -1950 | -1800 | -1650 | -1950 | -1790 | -1630 | -1950 | -1773 | -1595 | mV |
| V_{IH} | Input HIGH Voltage (Single-Ended) | -1230 | | -890 | -1130 | | -810 | -1060 | | -720 | mV |
| V_{IL} | Input LOW Voltage (Single-Ended) | -1950 | | -1500 | -1950 | | -1480 | -1950 | | -1445 | mV |
| V_{BB} | Output Voltage Reference | -1.43 | | -1.30 | -1.35 | | -1.25 | -1.31 | | -1.19 | V |
| V_{IHCMR} | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 6) | -2.5 | | -0.4 | -2.5 | | -0.4 | -2.5 | | -0.4 | V |
| I_{IH} | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| I_{IL} | Input LOW Current | 0.5 | | | 0.5 | | | 0.3 | | | μA |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

4. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +0.06 V / -0.5 V.

5. Outputs are terminated through a 50 Ω resistor to $V_{CC} - 2.0\text{ V}$.

6. V_{IHCMR} min varies 1:1 with V_{EE} . V_{IHCMR} max varies 1:1 with V_{CC} . The V_{IHCMR} range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V_{ppmin} and 1 V.

Table 7. 100EL SERIES PECL DC CHARACTERISTICS $V_{CC} = 5.0\text{ V}$; $V_{EE} = 0\text{ V}$ (Note 7)

| Symbol | Characteristic | -40°C | | | 25°C | | | 85°C | | | Unit |
|-------------|--|-------|------|------|------|------|------|------|------|------|---------------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| I_{EE} | Power Supply Current | | | 24 | | | 24 | | | 27 | mA |
| V_{OH} | Output HIGH Voltage (Note 8) | 3915 | 3995 | 4120 | 3975 | 4045 | 4120 | 3975 | 4050 | 4120 | mV |
| V_{OL} | Output LOW Voltage (Note 8) | 3170 | 3305 | 3445 | 3190 | 3295 | 3380 | 3190 | 3295 | 3380 | mV |
| V_{IH} | Input HIGH Voltage (Single-Ended) | 3835 | | 4120 | 3835 | | 4120 | 3835 | | 4120 | mV |
| V_{IL} | Input LOW Voltage (Single-Ended) | 3190 | | 3525 | 3190 | | 3525 | 3190 | | 3525 | mV |
| V_{BB} | Output Voltage Reference | 3.62 | | 3.74 | 3.62 | | 3.74 | 3.62 | | 3.74 | V |
| V_{IHCMR} | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 9) | 2.5 | | 4.6 | 2.5 | | 4.6 | 2.5 | | 4.6 | V |
| I_{IH} | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| I_{IL} | Input LOW Current | 0.5 | | | 0.5 | | | 0.5 | | | μA |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

7. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +0.8 V / -0.5 V.

8. Outputs are terminated through a 50 Ω resistor to $V_{CC} - 2.0\text{ V}$.

9. V_{IHCMR} min varies 1:1 with V_{EE} . V_{IHCMR} max varies 1:1 with V_{CC} . The V_{IHCMR} range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V_{ppmin} and 1 V.

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Table 8. 100EL SERIES NECL DC CHARACTERISTICS $V_{CC} = 0\text{ V}$; $V_{EE} = -5.0\text{ V}$ (Note 10)

| Symbol | Characteristic | -40°C | | | 25°C | | | 85°C | | | Unit |
|-------------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| I_{EE} | Power Supply Current | | | 24 | | | 24 | | | 27 | mA |
| V_{OH} | Output HIGH Voltage (Note 11) | -1085 | -1005 | -880 | -1025 | -955 | -880 | -1025 | -955 | -880 | mV |
| V_{OL} | Output LOW Voltage (Note 11) | -1830 | -1695 | -1555 | -1810 | -1705 | -1620 | -1810 | -1705 | -1620 | mV |
| V_{IH} | Input HIGH Voltage (Single-Ended) | -1165 | | -880 | -1165 | | -880 | -1165 | | -880 | mV |
| V_{IL} | Input LOW Voltage (Single-Ended) | -1810 | | -1475 | -1810 | | -1475 | -1810 | | -1475 | mV |
| V_{BB} | Output Voltage Reference | -1.38 | | -1.26 | -1.38 | | -1.26 | -1.38 | | -1.26 | V |
| V_{IHCMR} | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 12) | -2.5 | | -0.4 | -2.5 | | -0.4 | -2.5 | | -0.4 | V |
| I_{IH} | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| I_{IL} | Input LOW Current | 0.5 | | | 0.5 | | | 0.5 | | | μA |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

10. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +0.8 V / -0.5 V.

11. Outputs are terminated through a 50 Ω resistor to $V_{CC} - 2.0\text{ V}$.

12. V_{IHCMR} min varies 1:1 with V_{EE} . V_{IHCMR} max varies 1:1 with V_{CC} . The V_{IHCMR} range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V_{ppmin} and 1 V.

Table 9. AC CHARACTERISTICS $V_{CC} = 5.0\text{ V}$; $V_{EE} = 0\text{ V}$ or $V_{CC} = 0\text{ V}$; $V_{EE} = -5.0\text{ V}$ (Note 13)

| Symbol | Characteristic | -40°C | | | 25°C | | | 85°C | | | Unit |
|------------------------|--|------------|-----|------------|------------|-----|------------|------------|-----|------------|------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| f_{max} | Maximum Toggle Frequency | | TBD | | | TBD | | | TBD | | GHz |
| t_{PLH} t_{PHL} | Propagation Delay DATA→Q/ \bar{Q} SEL→Q/ \bar{Q} | 350 440 | | 550 690 | 360 440 | | 560 690 | 380 460 | | 580 710 | ps |
| t_{SKEW} | Input Skew D_n, D_m to Q | | | 100 | | | 100 | | | 100 | ps |
| t_{JITTER} | Cycle-to-Cycle Jitter | | TBD | | | TBD | | | TBD | | ps |
| V_{PP} | Input Swing (Note 14) | 150 | | 1000 | 150 | | 1000 | 150 | | 1000 | mV |
| t_r t_f | Output Rise/Fall Times Q (20% - 80%) | 125 | | 375 | 125 | | 375 | 125 | | 375 | ps |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

13. 10 Series: V_{EE} can vary +0.06 V / -0.5 V.

100 Series: V_{EE} can vary +0.8 V / -0.5 V.

14. V_{ppmin} is minimum input swing for which AC parameters guaranteed. The device has a DC gain of ≈ 40 .

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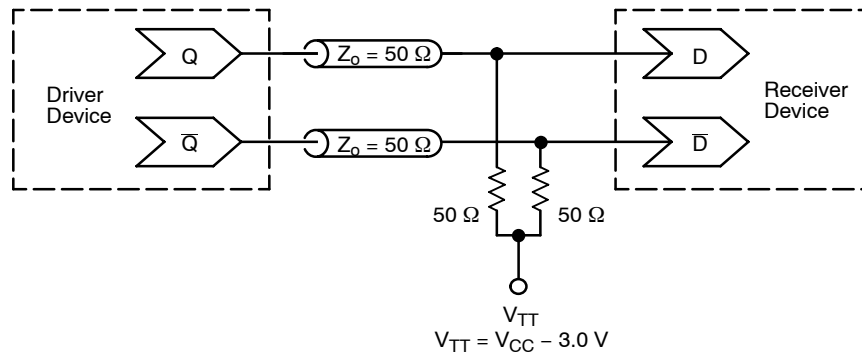


Figure 2. Typical Termination for Output Driver and Device Evaluation
(See Application Note AND8020/D – Termination of ECL Logic Devices.)

ORDERING INFORMATION

| Device | Package | Shipping [†] |
|---------------|----------------------|-----------------------|
| MC10EL57D | SOIC-16 | 48 Units / Rail |
| MC10EL57DG | SOIC-16 (Pb-Free) | 48 Units / Rail |
| MC10EL57DR2 | SOIC-16 | 2500 / Tape & Reel |
| MC10EL57DR2G | SOIC-16 (Pb-Free) | 2500 / Tape & Reel |
| MC100EL57D | SOIC-16 | 48 Units / Rail |
| MC100EL57DG | SOIC-16 (Pb-Free) | 48 Units / Rail |
| MC100EL57DR2 | SOIC-16 | 2500 / Tape & Reel |
| MC100EL57DR2G | SOIC-16 (Pb-Free) | 2500 / 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.

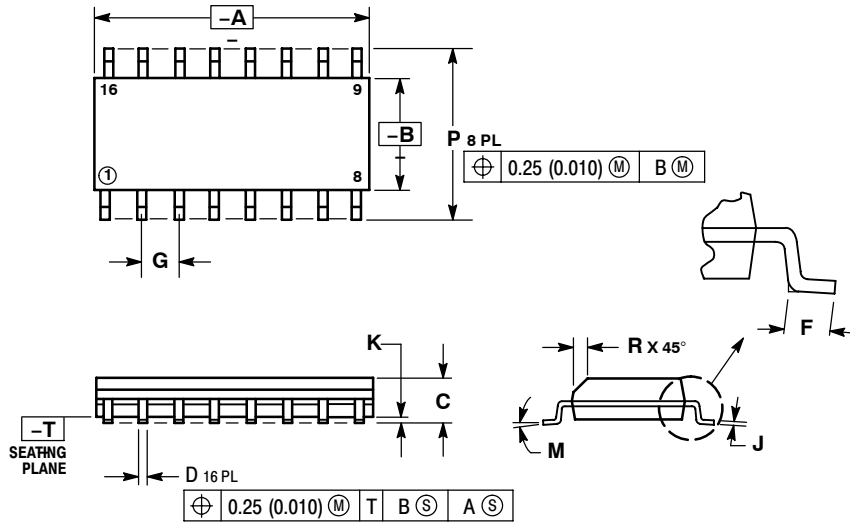
Resource Reference of Application Notes

- AN1405/D** – ECL Clock Distribution Techniques
- AN1406/D** – Designing with PECL (ECL at +5.0 V)
- AN1503/D** – ECLinPS™ I/O SPICE Modeling Kit
- AN1504/D** – Metastability and the ECLinPS Family
- AN1568/D** – Interfacing Between LVDS and ECL
- AN1672/D** – The ECL Translator Guide
- AND8001/D** – Odd Number Counters Design
- AND8002/D** – Marking and Date Codes
- AND8020/D** – Termination of ECL Logic Devices
- AND8066/D** – Interfacing with ECLinPS
- AND8090/D** – AC Characteristics of ECL Devices

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PACKAGE DIMENSIONS

SO-16
D SUFFIX
CASE 751B-05
ISSUE J



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 9.80 | 10.00 | 0.386 | 0.393 |
| B | 3.80 | 4.00 | 0.150 | 0.157 |
| C | 1.35 | 1.75 | 0.054 | 0.068 |
| D | 0.35 | 0.49 | 0.014 | 0.019 |
| F | 0.40 | 1.25 | 0.016 | 0.049 |
| G | 1.27 BSC | | 0.050 BSC | |
| J | 0.19 | 0.25 | 0.008 | 0.009 |
| K | 0.10 | 0.25 | 0.004 | 0.009 |
| M | 0° | 7° | 0° | 7° |
| P | 5.80 | 6.20 | 0.229 | 0.244 |
| R | 0.25 | 0.50 | 0.010 | 0.019 |

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