



# 3.3V CMOS SINGLE 2-INPUT EXCLUSIVE-OR GATE

IDT74ALVC1G86

## FEATURES:

- 0.5 MICRON CMOS Technology
- ESD > 2000V per MIL-STD-883, Method 3015;  
> 200V using machine model (C = 200pF, R = 0)
- 0.65mm pitch PSOP package
- Extended commercial range of - 40°C to + 85°C
- Vcc = 3.3V ± 0.3V, Normal Range
- Vcc = 1.65V to 3.6V, Extended Range
- Vcc = 2.5V ± 0.2V
- CMOS power levels (0.4µW typ. static)
- Rail-to-Rail output swing for increased noise margin

## Drive Features for ALVC1G86:

- High Output Drivers: ±24mA
- Suitable for heavy loads

## DESCRIPTION:

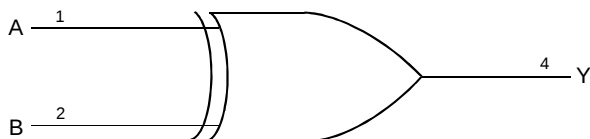
This single 2-input exclusive-OR gate is built using advanced dual metal CMOS technology. The ALVC1G86 is designed for 1.65V to 3.6V Vcc operation and performs the Boolean function  $Y = \overline{A} \oplus B$  or  $Y = \overline{AB} + \overline{A}B$  in positive logic. A common application is as a true/complement element. If the input is low, the other input is reproduced in true form at the outputs. If the input is high, the signal on the other input is reproduced inverted at the output.

The ALVC1G86 has been designed with a ±24mA output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

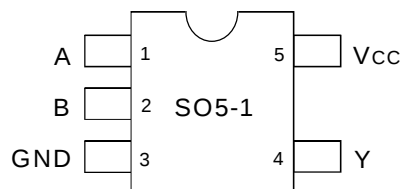
## APPLICATIONS:

- 3.3V High Speed Systems
- 3.3V and lower voltage computing systems

## FUNCTIONAL BLOCK DIAGRAM



## PIN CONFIGURATION



PSOP  
TOP VIEW

## PIN DESCRIPTION

| Pin Names | Description |
|-----------|-------------|
| A, B      | Data Inputs |
| Y         | Data Output |

## FUNCTION TABLE (1)

| Inputs |   | Output |
|--------|---|--------|
| A      | B | Y      |
| L      | L | L      |
| L      | H | H      |
| H      | L | H      |
| H      | H | L      |

### NOTE:

1. H = HIGH Voltage Level  
L = LOW Voltage Level

## ABSOLUTE MAXIMUM RATING (1)

| Symbol                | Description                                                                      | Max.                          | Unit |
|-----------------------|----------------------------------------------------------------------------------|-------------------------------|------|
| V <sub>TERM</sub> (2) | Terminal Voltage with Respect to GND                                             | – 0.5 to + 4.6                | V    |
| V <sub>TERM</sub> (3) | Terminal Voltage with Respect to GND                                             | –0.5 to V <sub>CC</sub> + 0.5 | V    |
| T <sub>STG</sub>      | Storage Temperature                                                              | – 65 to + 150                 | °C   |
| I <sub>OUT</sub>      | DC Output Current                                                                | – 50 to + 50                  | mA   |
| I <sub>IK</sub>       | Continuous Clamp Current, V <sub>I</sub> < 0 or V <sub>I</sub> > V <sub>CC</sub> | ± 50                          | mA   |
| I <sub>OK</sub>       | Continuous Clamp Current, V <sub>O</sub> < 0                                     | – 50                          | mA   |
| I <sub>CC</sub>       | Continuous Current through each V <sub>CC</sub> or GND                           | ±100                          | mA   |

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### NOTES:

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
- V<sub>CC</sub> terminals.
- All terminals except V<sub>CC</sub>.

## CAPACITANCE (T<sub>A</sub> = +25°C, f = 1.0MHz)

| Symbol           | Parameter(1)         | Conditions            | Typ. | Max. | Unit |
|------------------|----------------------|-----------------------|------|------|------|
| C <sub>IN</sub>  | Input Capacitance    | V <sub>IN</sub> = 0V  | 5    | 7    | pF   |
| C <sub>OUT</sub> | Output Capacitance   | V <sub>OUT</sub> = 0V | 7    | 9    | pF   |
| C <sub>I/O</sub> | I/O Port Capacitance | V <sub>IN</sub> = 0V  | 7    | 9    | pF   |

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### NOTE:

- As applicable to the device type.

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Condition: T<sub>A</sub> = – 40°C to +85°C, V<sub>CC</sub> = 2.3V to 3.6V

| Symbol                                                   | Parameter                                           | Test Conditions                                                             |                                  | Min.                   | Typ.(1) | Max.                   | Unit |
|----------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------|------------------------|---------|------------------------|------|
| V <sub>IH</sub>                                          | Input HIGH Voltage Level                            | V <sub>CC</sub> = 1.65V to 1.95V                                            |                                  | 0.65 x V <sub>CC</sub> | —       | —                      | V    |
|                                                          |                                                     | V <sub>CC</sub> = 2.3V to 2.7V                                              |                                  | 1.7                    | —       | —                      |      |
|                                                          |                                                     | V <sub>CC</sub> = 2.7V to 3.6V                                              |                                  | 2                      | —       | —                      |      |
| V <sub>IL</sub>                                          | Input LOW Voltage Level                             | V <sub>CC</sub> = 1.65V to 1.95V                                            |                                  | —                      | —       | 0.35 x V <sub>CC</sub> | V    |
|                                                          |                                                     | V <sub>CC</sub> = 2.3V to 2.7V                                              |                                  | —                      | —       | 0.7                    |      |
|                                                          |                                                     | V <sub>CC</sub> = 2.7V to 3.6V                                              |                                  | —                      | —       | 0.8                    |      |
| I <sub>IH</sub>                                          | Input HIGH Current                                  | V <sub>CC</sub> = 3.6V                                                      | V <sub>I</sub> = V <sub>CC</sub> | —                      | —       | ± 5                    | μA   |
| I <sub>IL</sub>                                          | Input LOW Current                                   | V <sub>CC</sub> = 3.6V                                                      | V <sub>I</sub> = GND             | —                      | —       | ± 5                    |      |
| I <sub>OZH</sub>                                         | High Impedance Output Current (3-State Output pins) | V <sub>CC</sub> = 3.6V                                                      | V <sub>O</sub> = V <sub>CC</sub> | —                      | —       | ± 10                   | μA   |
| I <sub>OZL</sub>                                         |                                                     |                                                                             | V <sub>O</sub> = GND             | —                      | —       | ± 10                   | μA   |
| V <sub>IK</sub>                                          | Clamp Diode Voltage                                 | V <sub>CC</sub> = 2.3V, I <sub>IN</sub> = – 18mA                            |                                  | —                      | – 0.7   | – 1.2                  | V    |
| V <sub>H</sub>                                           | Input Hysteresis                                    | V <sub>CC</sub> = 3.3V                                                      |                                  | —                      | 100     | —                      | mV   |
| I <sub>CC1</sub><br>I <sub>CC2</sub><br>I <sub>CC3</sub> | Quiescent Power Supply Current                      | V <sub>CC</sub> = 3.6V<br>V <sub>IN</sub> = GND or V <sub>CC</sub>          |                                  | —                      | 0.1     | 10                     | μA   |
| ΔI <sub>CC</sub>                                         | Quiescent Power Supply Current Variation            | One input at V <sub>CC</sub> – 0.6V, other inputs at V <sub>CC</sub> or GND |                                  | —                      | —       | 750                    | μA   |

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### NOTE:

- Typical values are at V<sub>CC</sub> = 3.3V, +25°C ambient.

## OUTPUT DRIVE CHARACTERISTICS

| Symbol | Parameter           | Test Conditions <sup>(1)</sup> |               | Min.      | Max. | Unit |
|--------|---------------------|--------------------------------|---------------|-----------|------|------|
| VOH    | Output HIGH Voltage | VCC = 1.65V to 3.6V            | IOH = – 0.1mA | VCC – 0.2 | —    | V    |
|        |                     | VCC = 1.65V                    | IOH = – 4mA   | 1.2       |      |      |
|        |                     | VCC = 2.3V                     | IOH = – 6mA   | 2         | —    |      |
|        |                     | VCC = 2.3V                     | IOH = – 12mA  | 1.7       | —    |      |
|        |                     | VCC = 2.7V                     |               | 2.2       | —    |      |
|        |                     | VCC = 3.0V                     |               | 2.4       | —    |      |
|        |                     | VCC = 3.0V                     | IOH = – 24mA  | 2         | —    |      |
| VOL    | Output LOW Voltage  | VCC = 1.65V to 3.6V            | IOL = 0.1mA   | —         | 0.2  | V    |
|        |                     | VCC = 1.65V                    | IOL = 4mA     |           | 0.45 |      |
|        |                     | VCC = 2.3V                     | IOL = 6mA     | —         | 0.4  |      |
|        |                     |                                | IOL = 12mA    | —         | 0.7  |      |
|        |                     | VCC = 2.7V                     | IOL = 12mA    | —         | 0.4  |      |
|        |                     | VCC = 3.0V                     | IOL = 24mA    | —         | 0.55 |      |

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### NOTE:

1. VIH and VIL must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate VCC range. TA = – 40°C to + 85°C.

## OPERATING CHARACTERISTICS, TA = 25°C

| Symbol | Parameter                     | Test Conditions     | VCC = 1.8V ± 0.15V | VCC = 2.5V ± 0.2V | VCC = 3.3V ± 0.3V | Unit |
|--------|-------------------------------|---------------------|--------------------|-------------------|-------------------|------|
|        |                               |                     | Typical            | Typical           | Typical           |      |
| CPD    | Power Dissipation Capacitance | CL = 0pF, f = 10Mhz | —                  | —                 | —                 | pF   |

## SWITCHING CHARACTERISTICS<sup>(1)</sup>

| Symbol | Parameter                        | VCC = 1.8V ± 0.15V |      | VCC = 2.5V ± 0.2V |      | VCC = 2.7V |      | VCC = 3.3V ± 0.3V |      | Unit |
|--------|----------------------------------|--------------------|------|-------------------|------|------------|------|-------------------|------|------|
|        |                                  | Min.               | Max. | Min.              | Max. | Min.       | Max. | Min.              | Max. |      |
| tPLH   | Propagation Delay<br>A or B to Y | 1                  | 11   | 1                 | 5.5  | —          | 4.5  | 1                 | 4    | ns   |
| tPHL   |                                  |                    |      |                   |      |            |      |                   |      |      |

### NOTE:

1. See test circuits and waveforms. TA = – 40°C to + 85°C.

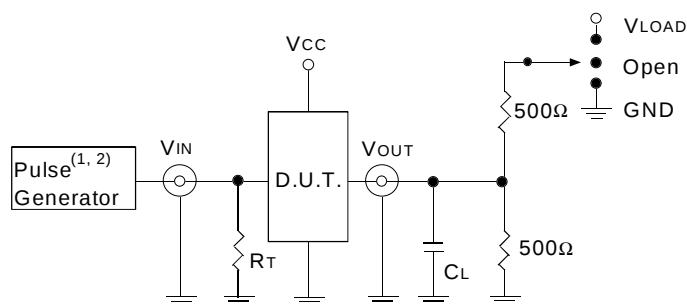
## TEST CIRCUITS AND WAVEFORMS:

### TEST CONDITIONS

| Symbol     | $V_{CC}^{(1)} = 3.3V \pm 0.3V$ | $V_{CC}^{(1)} = 2.7V$ | $V_{CC}^{(2)} = 2.5V \pm 0.2V$ | Unit |
|------------|--------------------------------|-----------------------|--------------------------------|------|
| $V_{LOAD}$ | 6                              | 6                     | $2 \times V_{CC}$              | V    |
| $V_{IH}$   | 2.7                            | 2.7                   | $V_{CC}$                       | V    |
| $V_T$      | 1.5                            | 1.5                   | $V_{CC} / 2$                   | V    |
| $V_{LZ}$   | 300                            | 300                   | 150                            | mV   |
| $V_{HZ}$   | 300                            | 300                   | 150                            | mV   |
| $C_L$      | 50                             | 50                    | 30                             | pF   |

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### TEST CIRCUITS FOR ALL OUTPUTS



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#### DEFINITIONS:

$C_L$  = Load capacitance: includes jig and probe capacitance.

$R_T$  = Termination resistance: should be equal to  $Z_{OUT}$  of the Pulse Generator.

#### NOTES:

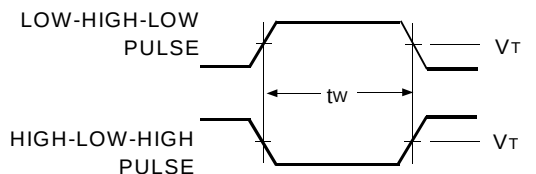
1. Pulse Generator for All Pulses: Rate  $\leq 10\text{MHz}$ ;  $t_F \leq 2.5\text{ns}$ ;  $t_R \leq 2.5\text{ns}$ .
2. Pulse Generator for All Pulses: Rate  $\leq 10\text{MHz}$ ;  $t_F \leq 2\text{ns}$ ;  $t_R \leq 2\text{ns}$ .

### SWITCH POSITION

| Test                                    | Switch     |
|-----------------------------------------|------------|
| Open Drain<br>Disable Low<br>Enable Low | $V_{LOAD}$ |
| Disable High<br>Enable High             | GND        |
| All Other tests                         | Open       |

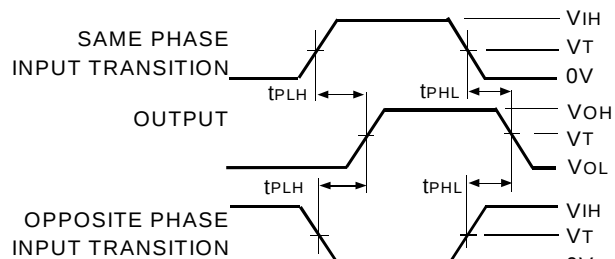
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### PULSE WIDTH



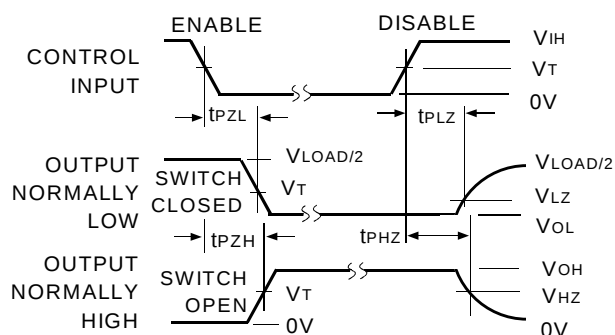
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### PROPAGATION DELAY



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### ENABLE AND DISABLE TIMES

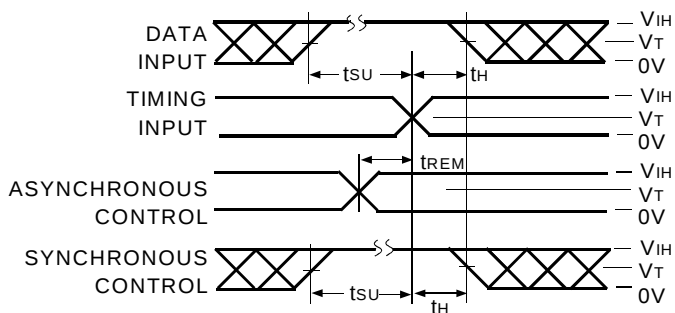


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#### NOTE:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

### SET-UP, HOLD, AND RELEASE TIMES



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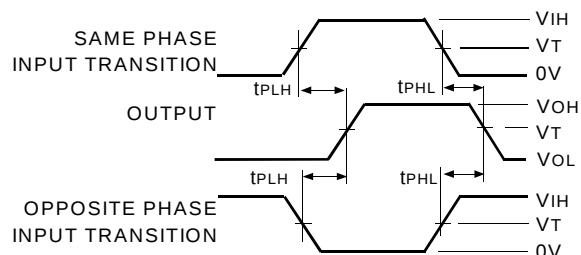
## 1.8V ± 0.15V TEST CIRCUITS AND WAVEFORMS:

### TEST CONDITIONS

| Symbol            | V <sub>CC</sub> (1) = 1.8V ± 0.15V | Unit |
|-------------------|------------------------------------|------|
| V <sub>LOAD</sub> | 2 x V <sub>CC</sub>                | V    |
| V <sub>IH</sub>   | V <sub>CC</sub>                    | V    |
| V <sub>T</sub>    | V <sub>CC</sub> / 2                | V    |
| V <sub>LZ</sub>   | 150                                | mV   |
| V <sub>HZ</sub>   | 150                                | mV   |
| C <sub>L</sub>    | 30                                 | pF   |

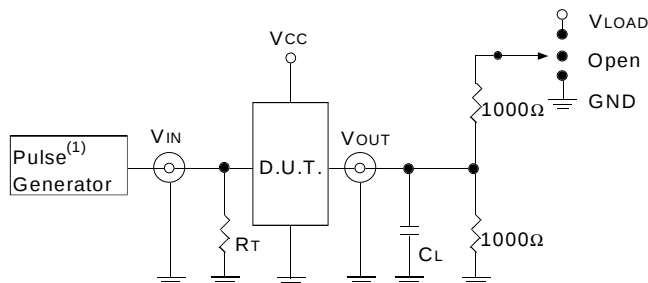
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### PROPAGATION DELAY



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### TEST CIRCUITS FOR ALL OUTPUTS



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#### DEFINITIONS:

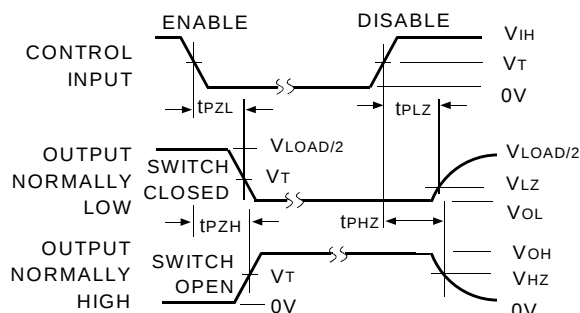
C<sub>L</sub> = Load capacitance: includes jig and probe capacitance.

R<sub>T</sub> = Termination resistance: should be equal to Z<sub>OUT</sub> of the Pulse Generator.

#### NOTE:

1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t<sub>r</sub> ≤ 2ns; t<sub>r</sub> ≤ 2ns.

### ENABLE AND DISABLE TIMES



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#### NOTE:

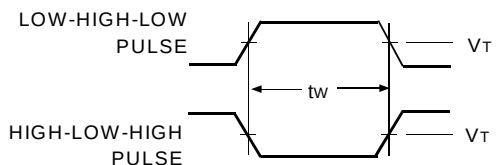
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

### SWITCH POSITION

| Test                                    | Switch            |
|-----------------------------------------|-------------------|
| Open Drain<br>Disable Low<br>Enable Low | V <sub>LOAD</sub> |
| Disable High<br>Enable High             | GND               |
| All Other tests                         | Open              |

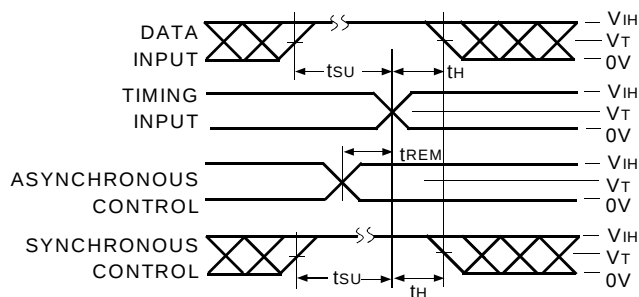
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### PULSE WIDTH



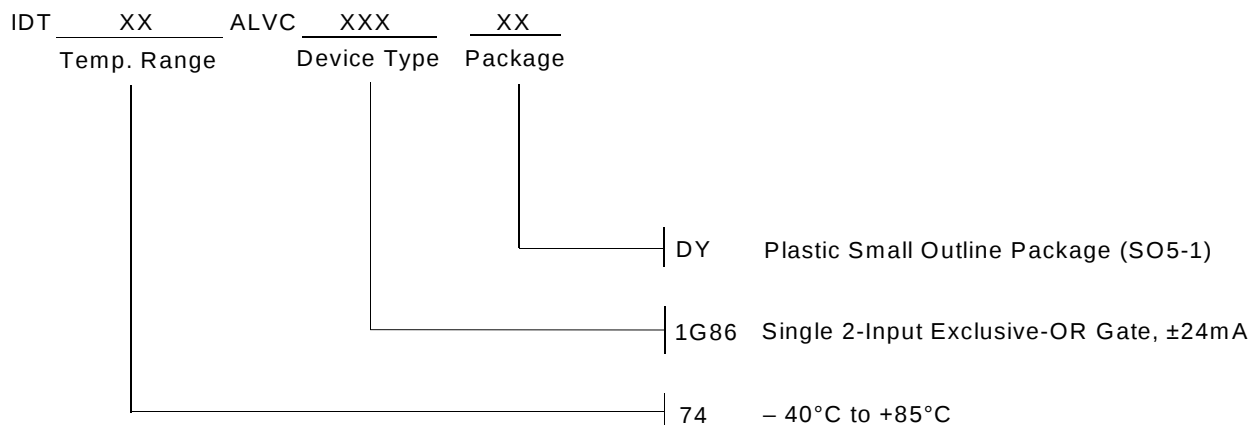
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### SET-UP, HOLD, AND RELEASE TIMES



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## ORDERING INFORMATION



## PICOGATE-LOGIC (DY) PACKAGES

Due to their small size, PicoGate-Logic packages require more complex symbolization guidelines. IDT's 5-pin PSOP (DY) packaged devices utilize a three-symbol name rule. The first symbol denotes device technology, the second symbol denotes device function, and the third symbol denotes a wafer fab/assembly site code for internal tracking.

### EXAMPLES:

1. A PicoGate-Logic device with package code LR\* is an IDT74LVC1G79A.
2. A PicoGate-Logic device with package code GC\* is an IDT74ALVC1G04.

### PICOGATE-LOGIC (DY) PACKAGE SYMBOLIZATION GUIDELINES

| TECHNOLOGY          | CODE | FUNCTION | CODE |
|---------------------|------|----------|------|
| ALVC                | G    | 00       | A    |
| ALVCH               | J    | 02       | B    |
| LVC                 | L    | 04       | C    |
| LVCH <sup>(1)</sup> |      | U04      | D    |
|                     |      | 06       | T    |
|                     |      | 07       | V    |
|                     |      | 08       | E    |
|                     |      | 14       | F    |
|                     |      | 32       | G    |
|                     |      | 79       | R    |
|                     |      | 86       | H    |
|                     |      | 125      | M    |
|                     |      | 126      | N    |
|                     |      | 132      | Y    |

### NOTE:

1. Code to be determined.



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