# UNISONIC TECHNOLOGIES CO., LTD

## ULN202L05

# 4-CH DARLINGTON SINK DRIVER AND 3-TERMINAL 0.2A 5V VOLTAGE REGULATOR
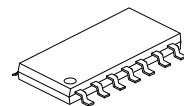
SOP-14

## ■ DESCRIPTION

The UTC **ULN202L05** is comprised of 4-ch Darlington Sink Driver and 3-TERMINAL Voltage Regulator.

The Sink Driver is a high-voltage, high-current NPN darlington driver. Every channel includes clamp diode for switching inductive load. The applications of the UTC **ULN202L05** include relay, hammer, lamp and display (LED) drivers.

The 5V Voltage Regulator is a three-terminal regulator with 0.2A output current capability.

## ■ FEATURES

**For Darlington Sink Drivers**
* Output current (single output): 500mA max
* High sustaining voltage output: 50V min
* Output clamp diodes
* Inputs compatible with various types of logic

**For 5V VOLTAGE REGULATOR**
* Output Current up to 200mA
* Thermal Overload Shutdown Protection
* Short Circuit Current Limiting

## ■ ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| ULN202L05L-S14-R | ULN202L05G-S14-R | SOP-14 | Tape Reel |
| ULN202L05L-S14-T | ULN202L05G-S14-T | SOP-14 | Tube |

ULN202L05G-S14-R

(1) Packing Type
(2) Package Type
(3) Green Package

(1) R: Tape Reel

(2) S14: SOP-14

(3) G: Halogen Free and Lead Free, L: Lead Free

## ■ MARKING

UTC □□□□
ULN202L05□

→ Date Code
→ L: Lead Free
→ G: Halogen Free
→ Lot Code

# ULN202L05

■ **PIN CONFIGURATION**

```
       B1  ┌ 1        ○      14 ┐  C1
       B2  ┌ 2               13 ┐  C2
       B3  ┌ 3               12 ┐  C3
       B4  ┌ 4               11 ┐  C4
      GND  ┌ 5               10 ┐  COM
      V_O  ┌ 6                9 ┐  NC
      V_I  ┌ 7                8 ┐  GND
```
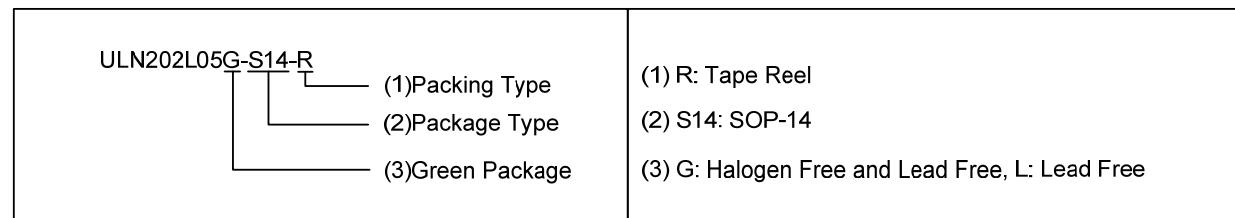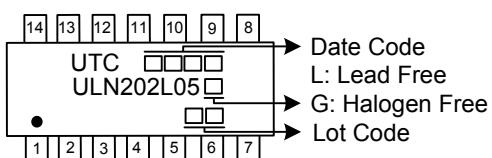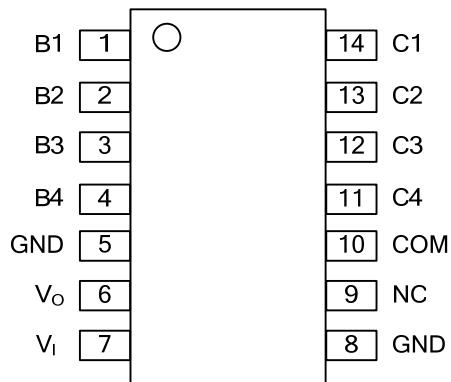
■ **PIN DESCRIPTION**

| PIN NO. | PIN NAME | DESCRIPTION |
|---------|----------|-------------|
| 1 | B1 | Input of the 1st-ch Darlington Sink Driver |
| 2 | B2 | Input of the 2nd-ch Darlington Sink Driver |
| 3 | B3 | Input of the 3rd-ch Darlington Sink Driver |
| 4 | B4 | Input of the 4th-ch Darlington Sink Driver |
| 5 | GND | Ground of Darlington Sink Drivers |
| 6 | $V_O$ | Output of 5V Voltage Regulator |
| 7 | $V_I$ | Input of 5V Voltage Regulator |
| 8 | GND | Ground of 5V Voltage Regulator |
| 9 | NC | No connection |
| 10 | COM | COMMON of Darlington Sink Drivers |
| 11 | C4 | Output of the 4th-ch Darlington Sink Driver |
| 12 | C3 | Output of the 3rd-ch Darlington Sink Driver |
| 13 | C2 | Output of the 2nd-ch Darlington Sink Driver |
| 14 | C1 | Output of the 1st-ch Darlington Sink Driver |

■ **BLOCK DIAGRAM**

UTC ULN202L05

# ULN202L05
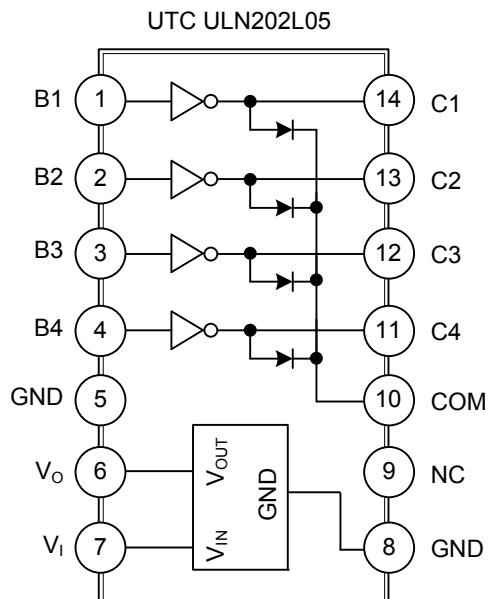
## ■ ABSOLUTE MAXIMUM RATING

| PARAMETER | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Power Dissipation ($T_A$=25°C) | $P_D$ | 0.9 | W |
| Junction Temperature | $T_J$ | +125 | °C |
| Operating Temperature | $T_{OPR}$ | -40 ~ +85 | °C |
| Storage Temperature | $T_{STG}$ | -55 ~ +150 | °C |
| **Darlington Sink Drivers** | | | |
| Output Sustaining Voltage | $V_{OUT}$ | -0.5 ~ 50 | V |
| Input Voltage | $V_{IN}$ | -0.5 ~ 30 | V |
| Clamp Diode Reverse Voltage | $V_R$ | 50 | V |
| Output Current | $I_{OUT}$ | 500 | mA/ch |
| Clamp Diode Forward Current | $I_F$ | 500 | mA |
| **5V VOLTAGE REGULATOR** | | | |
| Input Voltage | $V_{IN}$ | 30 | V |
| Output Current | $I_{OUT}$ | 200 | mA |

## ■ ELECTRICAL CHARACTERISTICS

**Darlington Sink Drivers** ($T_A$ = 25°C unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Output Leakage Current | $I_{LEAK}$ | $V_{CE}$=50V, $T_A$=25°C | | | | 50 | μA |
| | | $V_{CE}$=50V, $T_A$=85°C | | | | 100 | |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | $I_{OUT}$=350mA, $I_{IN}$=500μA | | | 1.3 | 1.6 | V |
| | | $I_{OUT}$=200mA, $I_{IN}$=350μA | | | 1.1 | 1.3 | |
| | | $I_{OUT}$=100mA, $I_{IN}$=250μA | | | 0.9 | 1.1 | |
| DC Current Transfer Ratio | $h_{FE}$ | $V_{CE}$=2V, $I_{OUT}$=350mA | | 1000 | | | |
| Input Current (Output On) | $I_{IN\,(ON)}$ | $V_{IN}$=2.4V, $I_{OUT}$=350mA | | | 0.4 | 0.7 | mA |
| Input Current (Output Off) | $I_{IN\,(OFF)}$ | $I_{OUT}$=500μA, $T_A$=85°C | | 50 | 65 | | μA |
| Input Voltage (Output On) | $V_{IN(ON)}$ | $V_{CE}$=2 V | $I_{OUT}$=350mA | | | 2.6 | V |
| | | | $I_{OUT}$=200mA | | | 2.0 | |
| Clamp Diode Reverse Current | $I_R$ | $V_R$=50V, $T_A$=25°C | | | | 50 | μA |
| | | $V_R$=50V, $T_A$=85°C | | | | 100 | |
| Clamp Diode Forward Voltage | $V_F$ | $I_F$=350mA | | | | 2.0 | V |
| Input Capacitance | $C_{IN}$ | | | | 15 | | pF |
| Turn-On Delay | $t_{ON}$ | $V_{OUT}$=50V, $R_L$=125Ω, $C_L$=15pF | | | 0.1 | | μs |
| Turn-Off Delay | $t_{OFF}$ | $V_{OUT}$=50V, $R_L$=125Ω, $C_L$=15pF | | | 0.2 | | |

■ **ELECTRICAL CHARACTERISTICS(Cont.)**

**5V VOLTAGE REGULATOR**

($V_{IN}$=10V, $I_{OUT}$=40mA, 0°C<$T_J$<125°C, C1=0.33µF, Co=0.1µF, unless otherwise specified) (Note 1)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $T_J$= 25°C | | 4.80 | 5.0 | 5.20 | V |
| | | 7V≤$V_{IN}$≤20V, $I_{OUT}$=1mA-40mA | | 4.75 | | 5.25 | |
| | | 7V≤$V_{IN}$≤$V_{MAX}$, $I_{OUT}$=1mA-200mA(Note 2) | | 4.75 | | 5.25 | V |
| Load Regulation | $\Delta V_{OUT}$ | $T_J$=25°C, $I_{OUT}$=1mA-100mA | | | 11 | 60 | mV |
| | | $T_J$=25°C, $I_{OUT}$=1mA-40mA | | | 5.0 | 30 | |
| Line regulation | $\Delta V_{OUT}$ | 7V≤$V_{IN}$≤20V, $T_J$=25°C | | | 8 | 150 | mV |
| | | 8V≤$V_{IN}$≤20V, $T_J$=25°C | | | 6 | 100 | |
| Quiescent Current | $I_Q$ | $V_{IN}$=10V, $I_{OUT}$=0mA, $T_J$=25°C | | | 2.0 | 5.5 | mA |
| Quiescent Current Change | $\Delta I_Q$ | 8V≤$V_{IN}$≤20V | | | | 1.5 | mA |
| | | 1mA≤$V_{IN}$≤40mA | | | | 0.1 | |
| Max output current | $I_{OUT(MAX)}$ | $T_J$=25°C | Vin=7V | | 400 | | mA |
| | | | Vin=30V | | 150 | | |
| Output Noise Voltage | $e_N$ | 10Hz ≤ f ≤ 100kHz | | | 40 | | µV |
| Temperature coefficient of $V_{OUT}$ | $\Delta V_O/\Delta T$ | $I_{OUT}$=5mA | | | -0.65 | | mV/°C |
| Ripple Rejection | RR | 8V≤$V_{IN}$≤20V, f=120Hz, $T_J$=25°C | | 41 | 80 | | dB |
| Dropout Voltage | $V_D$ | $T_J$=25°C, $I_{OUT}$=100mA | | | 1.7 | | V |

Notes: 1. The Maximum steady state usable output current are dependent on input voltage, heat sinking, lead length of the package and copper pattern of PCB. The data above represent pulse test conditions with junction temperatures specified at the initiation of test.

2. Power dissipation<0.5W.

■  **TYPICAL APPLICATION CIRCUIT**