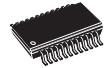


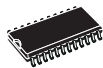
## Low voltage 16-bit constant current LED sink driver



QSOP-24



TSSOP24



SO-24



TSSOP24  
(exposed pad)

### Features

- Low voltage power supply down to 3 V
- 16 constant current output channels
- Adjustable output current through external resistor
- Serial data IN/parallel data OUT
- Can be driven by a 3.3 V microcontroller
- Output current: 5 to 100 mA
- Max clock frequency 30 MHz
- ESD protection: 2 kV HBM, 200 V MM

### Description

The **STP16CP05** is a monolithic, low voltage, low current power 16-bit shift register designed for LED panel displays. The **STP16CP05** contains a 16-bit serial-in, parallel-out shift register that feeds a 16-bit, D-type storage register. In the output stage, sixteen regulated current sources provide from 5 mA to 100 mA constant current to drive the LEDs.

The output current setup time is 40 ns (typ.), thus improving the system performance.

The LEDs' brightness can be controlled by using an external resistor to adjust the **STP16CP05** output current.

The **STP16CP05** guarantees a 20 V output driving capability, allowing users to connect more LEDs in series. The high clock frequency, 30 MHz, makes the device suitable for high data rate transmission. The 3.3 V voltage supply is useful in applications that interface with a 3.3 V micro controller.

#### Maturity status link

[STP16CP05](#)

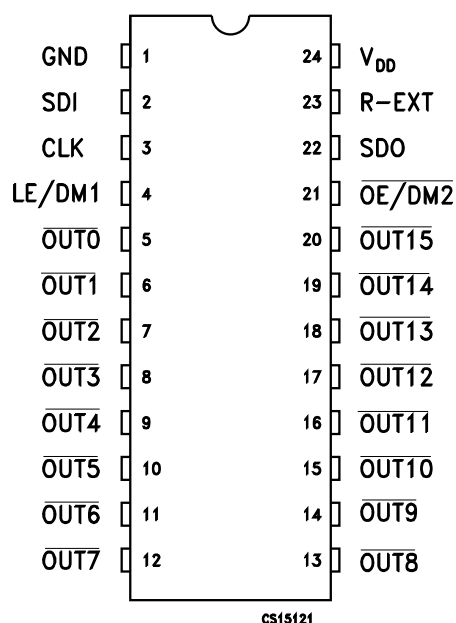
## 1 Summary description

**Table 1.** Typical current accuracy

| Output voltage | Current accuracy |             | Output current | V <sub>DD</sub> | Temperature |
|----------------|------------------|-------------|----------------|-----------------|-------------|
|                | Between bits     | Between ICs |                |                 |             |
| ≥ 1.3 V        | ± 1.5 %          | ± 5 %       | 20 to 100 mA   | 3.3 V to 5 V    | 25 °C       |

### 1.1 Pin connection and description

**Figure 1.** Pin connection



GIPD280920150957MT

*Note:* The exposed pad should be electrically connected to a metal land electrically isolated or connected to ground.

**Table 2.** Pin description

| Pin n° | Symbol                     | Name and function                                                        |
|--------|----------------------------|--------------------------------------------------------------------------|
| 1      | GND                        | Ground terminal                                                          |
| 2      | SDI                        | Serial data input terminal                                               |
| 3      | CLK                        | Clock input terminal                                                     |
| 4      | LE/DM1                     | Latch input terminal                                                     |
| 5-20   | OUT 0-15                   | Output terminal                                                          |
| 21     | $\overline{\text{OE/DM2}}$ | Input terminal of output enable (active low)                             |
| 22     | SDO                        | Serial data out terminal                                                 |
| 23     | R-EXT                      | Input terminal for an external resistor for constant current programming |
| 24     | V <sub>DD</sub>            | Supply voltage terminal                                                  |

## 2 Electrical ratings

### 2.1 Absolute maximum ratings

Stressing the device above the ratings listed in the “absolute maximum ratings” table may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other condition above those indicated in the operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**Table 3. Absolute maximum ratings**

| Symbol    | Parameter                  | Value            | Unit |
|-----------|----------------------------|------------------|------|
| $V_{DD}$  | Supply voltage             | 0 to 7           | V    |
| $V_O$     | Output voltage             | -0.5 to 20       | V    |
| $I_O$     | Output current             | 100              | mA   |
| $V_I$     | Input voltage              | -0.4 to $V_{DD}$ | V    |
| $I_{GND}$ | GND terminal current       | 1600             | mA   |
| $f_{CLK}$ | Clock frequency            | 50               | MHz  |
| $T_J$     | Junction temperature range | -40 to +170      | °C   |

### 2.2 Thermal data

**Table 4. Thermal data**

| Symbol     | Parameter                                          |                                    | Value       | Unit |
|------------|----------------------------------------------------|------------------------------------|-------------|------|
| $T_{OPR}$  | Operating temperature range                        |                                    | -40 to +125 | °C   |
| $T_{STG}$  | Storage temperature range                          |                                    | -55 to +150 | °C   |
| $R_{thJA}$ | Thermal resistance junction-ambient <sup>(1)</sup> | SO-24                              | 42.7        | °C/W |
|            |                                                    | TSSOP24                            | 55          | °C/W |
|            |                                                    | TSSOP24 exposed pad <sup>(2)</sup> | 37.5        | °C/W |
|            |                                                    | QSOP-24                            | 55          | °C/W |

1. According with JEDEC standard 51-7.

2. The exposed pad should be soldered directly to the PCB to realize the thermal benefits.

## 2.3 Recommended operating conditions

@  $T_A = 25\text{ }^{\circ}\text{C}$

**Table 5. Recommended operating conditions**

| Symbol         | Parameter                                  | Test conditions                                        | Min.         | Typ. | Max.         | Unit |
|----------------|--------------------------------------------|--------------------------------------------------------|--------------|------|--------------|------|
| $V_{DD}$       | Supply voltage                             |                                                        | 3.0          | -    | 5.5          | V    |
| $V_O$          | Output voltage                             |                                                        |              | -    | 20           | V    |
| $I_O$          | Output current                             | OUTn                                                   | 3            | -    | 100          | mA   |
| $I_{OH}$       | Output current                             | SERIAL-OUT                                             |              | -    | +1           | mA   |
| $I_{OL}$       | Output current                             | SERIAL-OUT                                             |              | -    | -1           | mA   |
| $V_{IH}$       | Input voltage                              |                                                        | $0.7 V_{DD}$ | -    | $V_{DD}$     | V    |
| $V_{IL}$       | Input voltage                              |                                                        | -0.3         | -    | $0.3 V_{DD}$ | V    |
| $t_{wLAT}$     | LE/DM1 pulse width                         | $V_{DD} = 3.0\text{ V to }5.0\text{ V}$                | 6            | -    |              | ns   |
| $t_{wCLK}$     | CLK pulse width                            |                                                        | 8            | -    |              | ns   |
| $t_{wEN}$      | $\overline{OE}/\overline{DM2}$ pulse width |                                                        | 100          | -    |              | ns   |
| $t_{SETUP(D)}$ | Setup time for DATA                        |                                                        | 5            | -    |              | ns   |
| $t_{HOLD(D)}$  | Hold time for DATA                         |                                                        | 3            | -    |              | ns   |
| $t_{SETUP(L)}$ | Setup time for LATCH                       |                                                        | 18           | -    |              | ns   |
| $f_{CLK}$      | Clock frequency                            | Cascade operation $V_{DD} = 5\text{ V}$ <sup>(1)</sup> |              | -    | 30           | MHz  |

1. If the device is connected in cascade, it may not be possible achieve the maximum data transfer. Please consider the timings carefully.

### 3 Electrical characteristics

$V_{DD} = 3.3 \text{ V to } 5 \text{ V}$ ,  $T_A = 25 \text{ }^\circ\text{C}$ , unless otherwise specified.

**Table 6. Electrical characteristics**

| Symbol           | Parameter                                        | Test conditions                                         | Min.                 | Typ.      | Max.         | Unit             |
|------------------|--------------------------------------------------|---------------------------------------------------------|----------------------|-----------|--------------|------------------|
| $V_{IH}$         | Input voltage high level                         |                                                         | $0.7 V_{DD}$         |           | $V_{DD}$     | V                |
| $V_{IL}$         | Input voltage low level                          |                                                         | GND                  |           | $0.3 V_{DD}$ | V                |
| $I_{OH}$         | Output leakage current                           | $V_{OH} = 20 \text{ V}$                                 |                      |           | 1            | $\mu\text{A}$    |
| $V_{OL}$         | Output voltage (serial-OUT)                      | $I_{OL} = 1 \text{ mA}$                                 |                      |           | 0.4          | V                |
| $V_{OH}$         | Output voltage (serial-OUT)                      | $I_{OH} = -1 \text{ mA}$                                | $V_{DD}-0.4\text{V}$ |           |              | V                |
| $I_{OL1}$        | Output current                                   | $V_O = 0.3 \text{ V}$ , $R_{ext} = 4.2 \text{ k}\Omega$ | 4.25                 | 5         | 5.75         | mA               |
| $I_{OL2}$        |                                                  | $V_O = 0.3 \text{ V}$ , $R_{ext} = 1 \text{ k}\Omega$   | 19                   | 20        | 21           |                  |
| $I_{OL3}$        |                                                  | $V_O = 1.3 \text{ V}$ , $R_{ext} = 200 \Omega$          | 96                   | 100       | 104          |                  |
| $\Delta I_{OL1}$ | Output current error between bit (all output ON) | $V_O = 0.3 \text{ V}$ , $R_{ext} = 4.2 \text{ k}\Omega$ |                      | $\pm 5$   | $\pm 8$      | %                |
| $\Delta I_{OL2}$ |                                                  | $V_O = 0.3 \text{ V}$ , $R_{ext} = 1 \text{ k}\Omega$   |                      | $\pm 1.5$ | $\pm 3$      |                  |
| $\Delta I_{OL3}$ |                                                  | $V_O = 1.3 \text{ V}$ , $R_{ext} = 200 \Omega$          |                      | $\pm 1.2$ | $\pm 3$      |                  |
| $R_{SIN(up)}$    | Pull-up resistor                                 |                                                         | 150                  | 300       | 600          | $\text{k}\Omega$ |
| $R_{SIN(down)}$  | Pull-down resistor                               |                                                         | 100                  | 200       | 400          | $\text{k}\Omega$ |
| $I_{DD(OFF1)}$   | Supply current (OFF)                             | $R_{ext} = 1 \text{ k}\Omega$ , OUT 0 to 15 = OFF       |                      | 4         |              | mA               |
| $I_{DD(OFF2)}$   |                                                  | $R_{ext} = 250 \Omega$ , OUT 0 to 15 = OFF              |                      | 11.2      |              |                  |
| $I_{DD(ON1)}$    | Supply current (ON)                              | $R_{ext} = 1 \text{ k}\Omega$ , OUT 0 to 15 = ON        |                      | 4.5       |              |                  |
| $I_{DD(ON2)}$    |                                                  | $R_{ext} = 250 \Omega$ , OUT 0 to 15 = ON               |                      | 11.7      |              |                  |
| Thermal          | Thermal protection                               |                                                         |                      | 170       |              | $^\circ\text{C}$ |

$V_{DD} = 5 \text{ V}$ ,  $T_A = 25 \text{ }^\circ\text{C}$ , unless otherwise specified.

**Table 7. Switching characteristics**

| Symbol     | Parameter                                                | Test conditions          | Min. | Typ. | Max. | Unit |
|------------|----------------------------------------------------------|--------------------------|------|------|------|------|
| $t_{PLH1}$ | Propagation delay time, CLK-OUTn, LE/DM1 = H, OE/DM2 = L | $V_{DD} = 3.3 \text{ V}$ | -    | 45   | 74   | ns   |
|            |                                                          | $V_{DD} = 5 \text{ V}$   | -    | 24   | 38   |      |
| $t_{PLH2}$ | Propagation delay time, LE/DM1-OUTn, OE/DM2 = L          | $V_{DD} = 3.3 \text{ V}$ | -    | 48   | 77   | ns   |
|            |                                                          | $V_{DD} = 5 \text{ V}$   | -    | 27   | 46   |      |
| $t_{PLH3}$ | Propagation delay time, OE/DM2-OUTn, LE/DM1 = H          | $V_{DD} = 3.3 \text{ V}$ | -    | 75   | 128  | ns   |
|            |                                                          | $V_{DD} = 5 \text{ V}$   | -    | 43   | 64   |      |
| $t_{PLH}$  | Propagation delay time, CLK-SDO                          | $V_{DD} = 3.3 \text{ V}$ | -    | 19   | 28   | ns   |
|            |                                                          | $V_{DD} = 5 \text{ V}$   | -    | 11   | 16.5 |      |
| $t_{PHL1}$ | Propagation delay time, CLK-OUTn, LE/DM1 = H, OE/DM2 = L | $V_{DD} = 3.3 \text{ V}$ | -    | 15   | 23   |      |

| Symbol            | Parameter                                                             | Test conditions                                                                                                                                                               |                         | Min. | Typ. | Max. | Unit |
|-------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------|------|------|------|
| t <sub>PHL1</sub> | Propagation delay time, CLK-OUT <sub>n</sub> , LE/DM1 = H, OE/DM2 = L | V <sub>IH</sub> = V <sub>DD</sub> V <sub>IL</sub> = GND C <sub>L</sub> = 10 pF I <sub>O</sub> = 20 mA V <sub>L</sub> = 3.0 V<br>R <sub>ext</sub> = 1 KΩ R <sub>L</sub> = 60 Ω | V <sub>DD</sub> = 5 V   | -    | 10   | 14   | ns   |
| t <sub>PHL2</sub> | Propagation delay time, LE/DM1 -OUT <sub>n</sub> , OE/DM2 = L         |                                                                                                                                                                               | V <sub>DD</sub> = 3.3 V | -    | 13   | 18.5 |      |
|                   |                                                                       |                                                                                                                                                                               | V <sub>DD</sub> = 5 V   | -    | 9    | 12   | ns   |
| t <sub>PHL3</sub> | Propagation delay time, OE/DM2 -OUT <sub>n</sub> , LE/DM1 = H         |                                                                                                                                                                               | V <sub>DD</sub> = 3.3 V | -    | 17   | 24.5 |      |
|                   |                                                                       |                                                                                                                                                                               | V <sub>DD</sub> = 5 V   | -    | 14   | 19.5 | ns   |
| t <sub>PHL</sub>  | Propagation delay time, CLK-SDO                                       |                                                                                                                                                                               | V <sub>DD</sub> = 3.3 V | -    | 23   | 35   |      |
|                   |                                                                       |                                                                                                                                                                               | V <sub>DD</sub> = 5 V   | -    | 14   | 21   | ns   |
|                   |                                                                       |                                                                                                                                                                               | V <sub>DD</sub> = 3.3 V | -    | 35   | 68   |      |
| t <sub>ON</sub>   | Output rise time 10~90% of voltage waveform                           |                                                                                                                                                                               | V <sub>DD</sub> = 5 V   | -    | 21   | 31.5 | ns   |
|                   |                                                                       |                                                                                                                                                                               | V <sub>DD</sub> = 3.3 V | -    | 10.5 | 15   |      |
| t <sub>OFF</sub>  | Output fall time 90~10% of voltage waveform                           | V <sub>DD</sub> = 5 V                                                                                                                                                         | -                       | 11   | 15.5 | ns   |      |
|                   |                                                                       |                                                                                                                                                                               |                         |      |      |      |      |
| t <sub>r</sub>    | CLK rise time <sup>(1)</sup>                                          |                                                                                                                                                                               |                         | -    |      | 5000 | ns   |
| t <sub>f</sub>    | CLK fall time <sup>(1)</sup>                                          |                                                                                                                                                                               |                         | -    |      | 5000 | ns   |

1. In order to achieve high cascade data transfer, please consider tr/tf timings carefully.

## 4 Equivalent circuit of inputs and outputs

Figure 2.  $\overline{\text{OE}}/\text{DM2}$  terminal

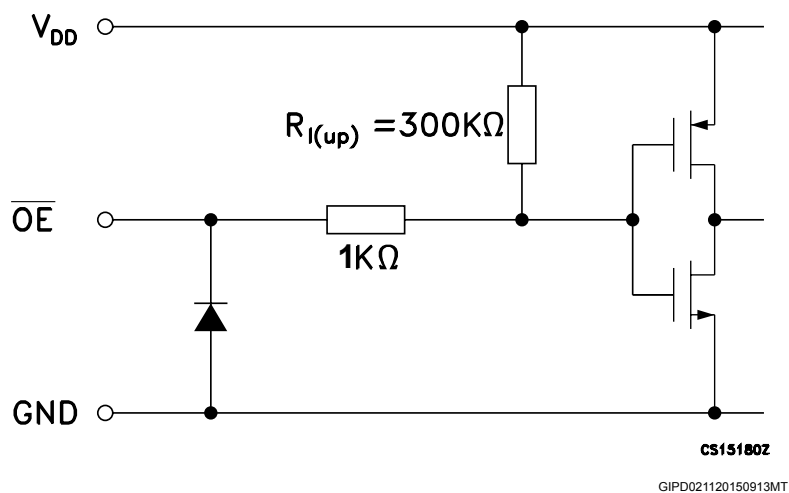


Figure 3. LE/DM1 terminal

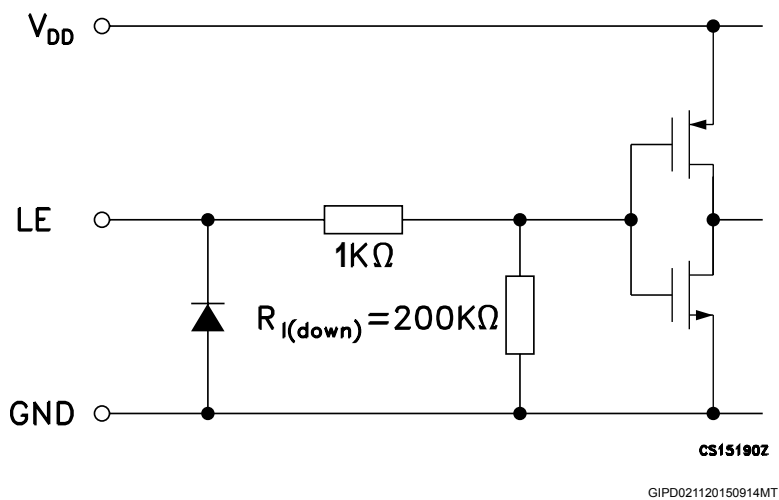
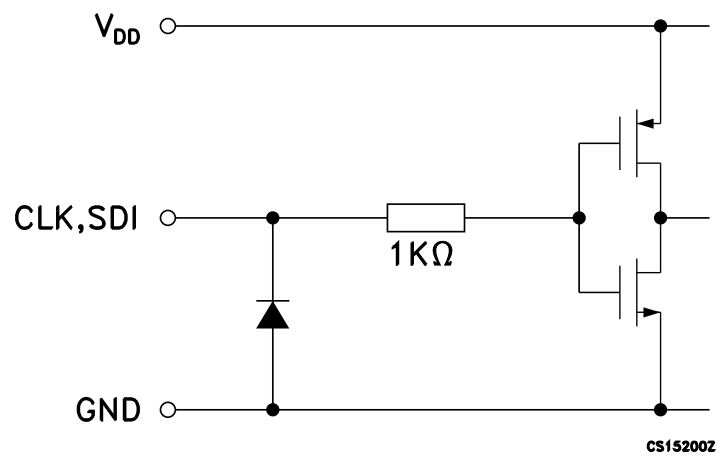
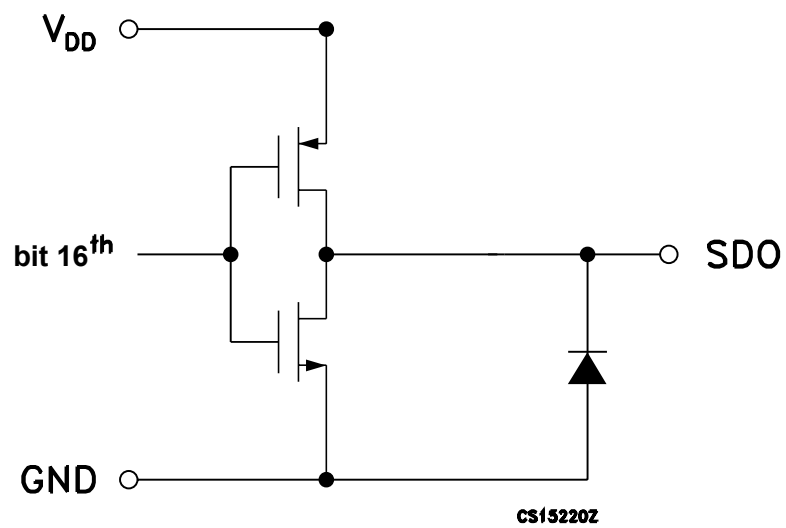


Figure 4. CLK, SDI terminal



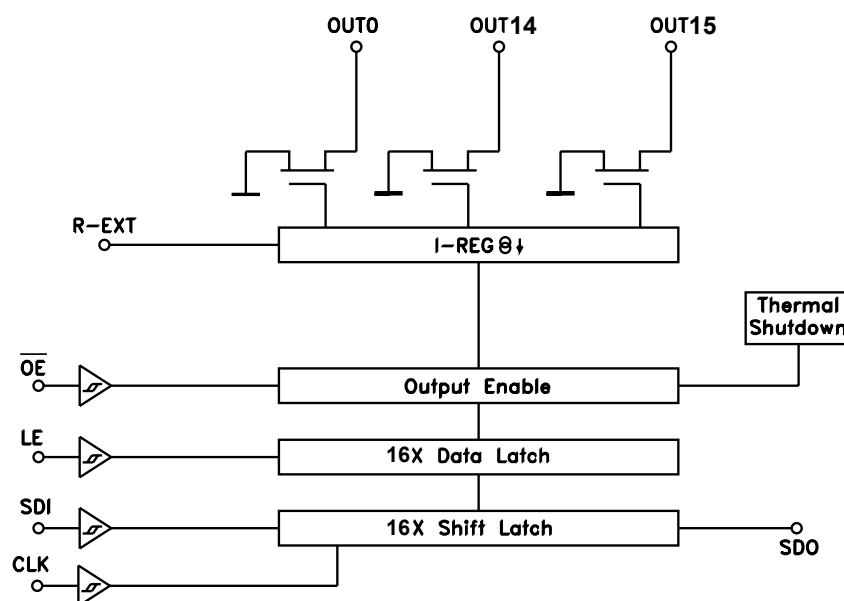
GIPD290920151407MT

Figure 5. SDO terminal



AMG130220170700MT

Figure 6. Block diagram



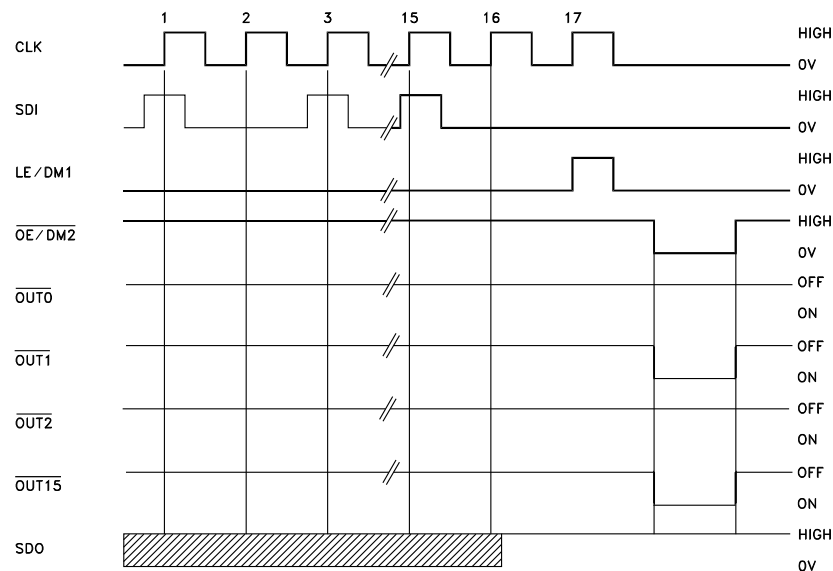
GIPD021120151028MT

## 5 Timing diagrams

**Table 8. Truth table**

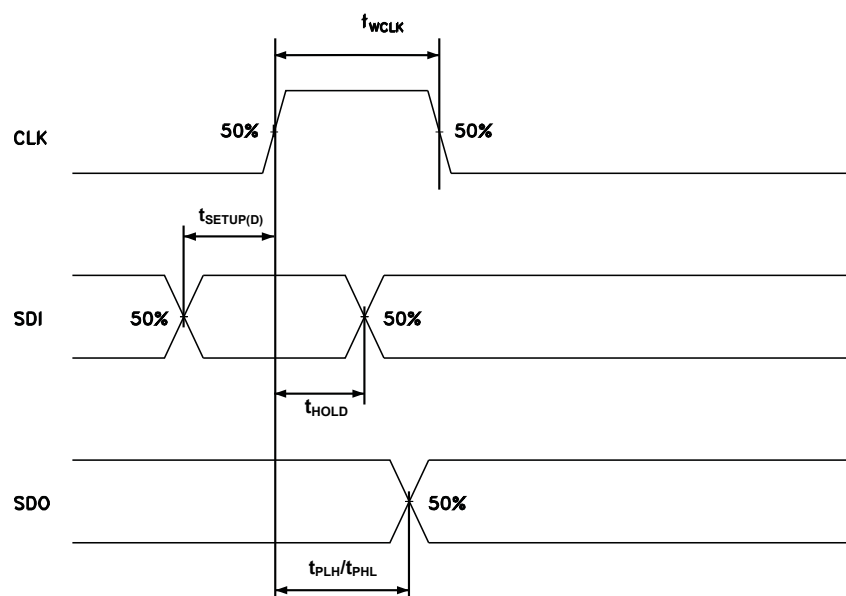
| CLOCK | LE/DM1 | OE/DM2 | SERIAL-IN | OUT0 ..... OUT7 ..... OUT15      | SDO     |
|-------|--------|--------|-----------|----------------------------------|---------|
|       | H      | L      | Dn        | Dn ..... Dn - 7 ..... Dn -15     | Dn - 15 |
|       | L      | L      | Dn + 1    | No change                        | Dn - 14 |
|       | H      | L      | Dn + 2    | Dn + 2 ..... Dn - 5 ..... Dn -13 | Dn - 13 |
|       | X      | L      | Dn + 3    | Dn + 2 ..... Dn - 5 ..... Dn -13 | Dn - 13 |
|       | X      | H      | Dn + 3    | OFF                              | Dn - 13 |

Note:  $OUTn = ON$  when  $Dn = H$   $OUTn = OFF$  when  $Dn = L$ .

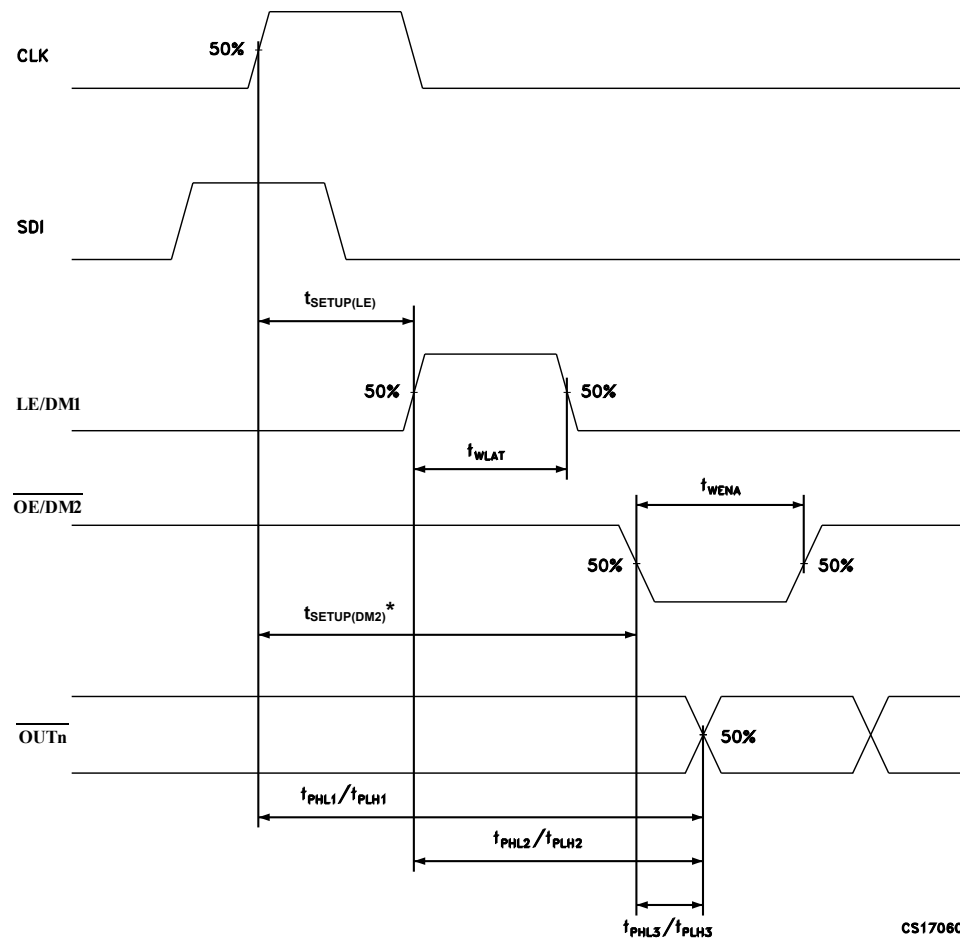
**Figure 7. Timing diagram**


GIPD300920151126MT

Note: 1 Latch and output enable terminals are level-sensitive and are not synchronized with rising or falling edge of CLK signal. 2 When LE/DM1 terminal is low level, the latch circuit holds previous set of data. 3 When LE/DM1 terminal is high level, the latch circuit refreshes new set of data from SDI chain. 4 When OE/DM2 terminal is at low level, the output terminals Out 0 to Out 15 respond to data in the latch circuits, either '1' for ON or '0' for OFF. 5 When OE/DM2 terminal is at high level, all output terminals are switched OFF.

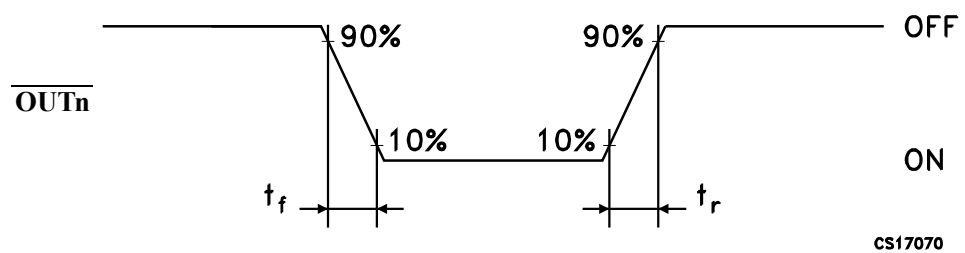
**Figure 8. Clock, serial-in, serial-out**


AMG130220170701MT

**Figure 9. Clock, serial-in, latch, enable, outputs**


\* Only for detection feature.

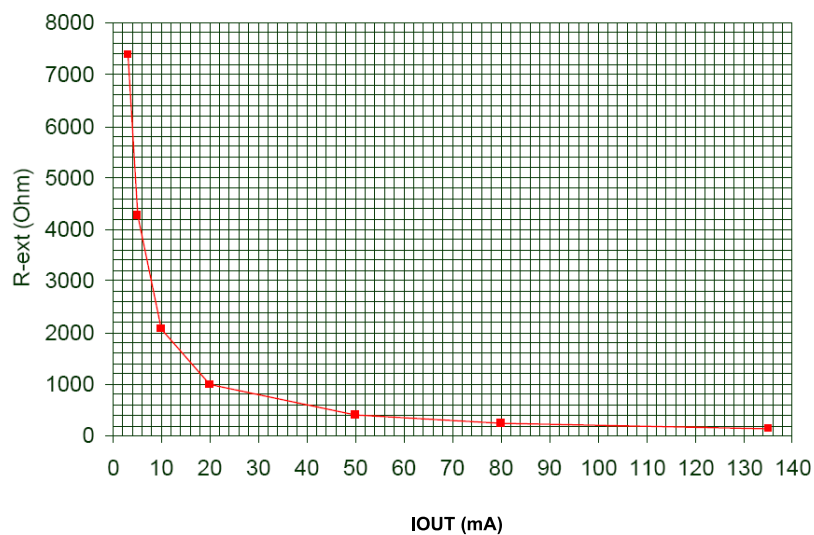
AMG130220170702MT

**Figure 10. Outputs**


GIPD300920151146MT

## 6 Typical characteristics

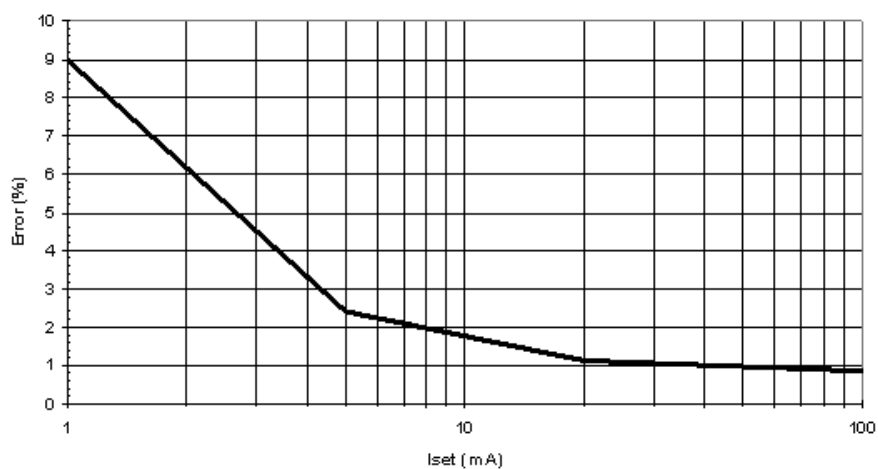
**Figure 11. Output current- $R_{EXT}$  resistor**



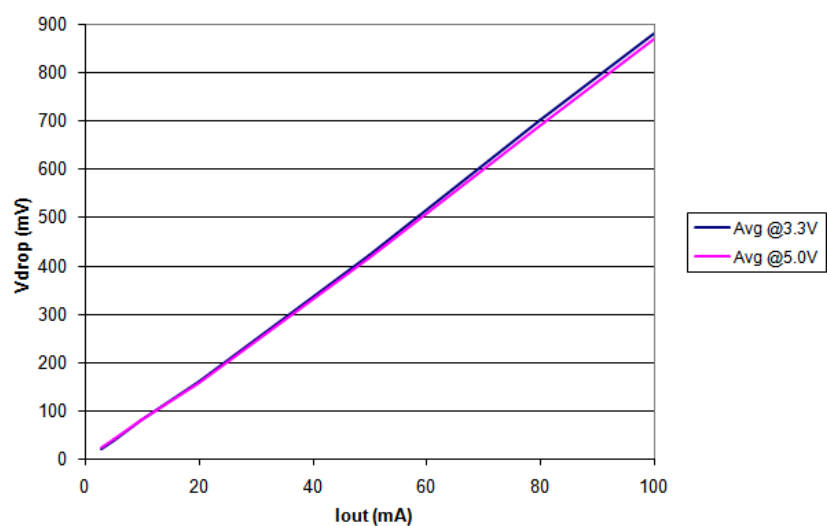
GIPD051020151340MT

**Table 9. Output current- $R_{EXT}$  resistor**

| $R_{EXT}$ ( $\Omega$ ) | Output current (mA) |
|------------------------|---------------------|
| 7370                   | 3                   |
| 4270                   | 5                   |
| 2056                   | 10                  |
| 1006                   | 20                  |
| 382                    | 50                  |
| 251                    | 80                  |
| 200                    | 100                 |

**Figure 12. Output current vs  $\pm \Delta I_{OL}(\%)$   $T_A = 25^\circ\text{C}$** 


GIPD051020151346MT

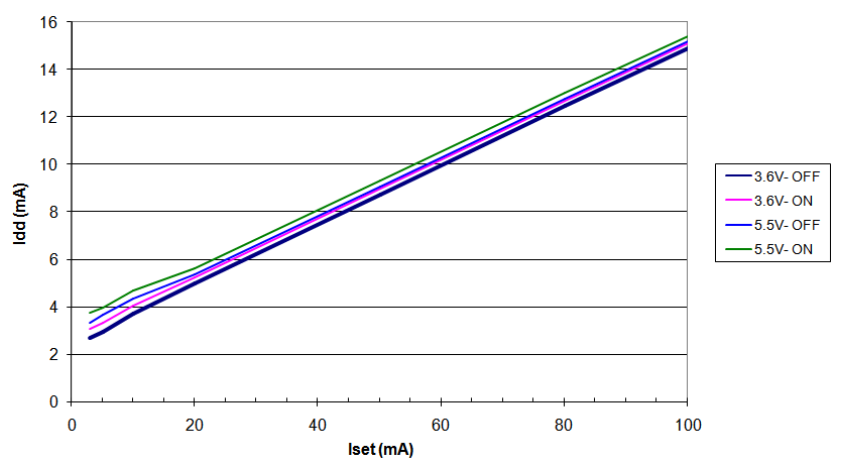
**Figure 13.  $I_{SET}$  vs drop out voltage ( $V_{drop}$ )  $T_A = 25^\circ\text{C}$** 


GIPD051020151348MT

**Table 10.  $I_{SET}$  vs. dropout voltage ( $V_{drop}$ )**

| $I_{out}$ (mA) | Avg (mV) @ 3.3 V | Avg (mV) @ 5.0 V |
|----------------|------------------|------------------|
| 3              | 20               | 22               |
| 5              | 37               | 40               |
| 10             | 79               | 79               |
| 20             | 160              | 158              |
| 50             | 422              | 415              |
| 80             | 700              | 690              |
| 100            | 880              | 870              |

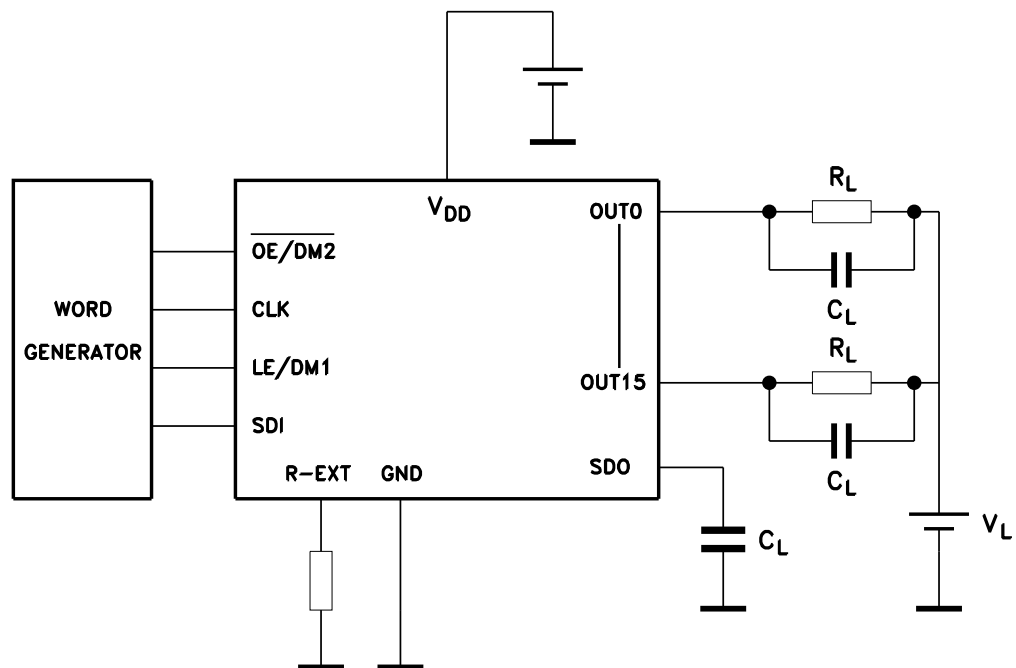
**Figure 14.**  $I_{DD}$  ON/OFF,  $T_A = 25\text{ °C}$



GIPD051020151353MT

## 7 Test circuit

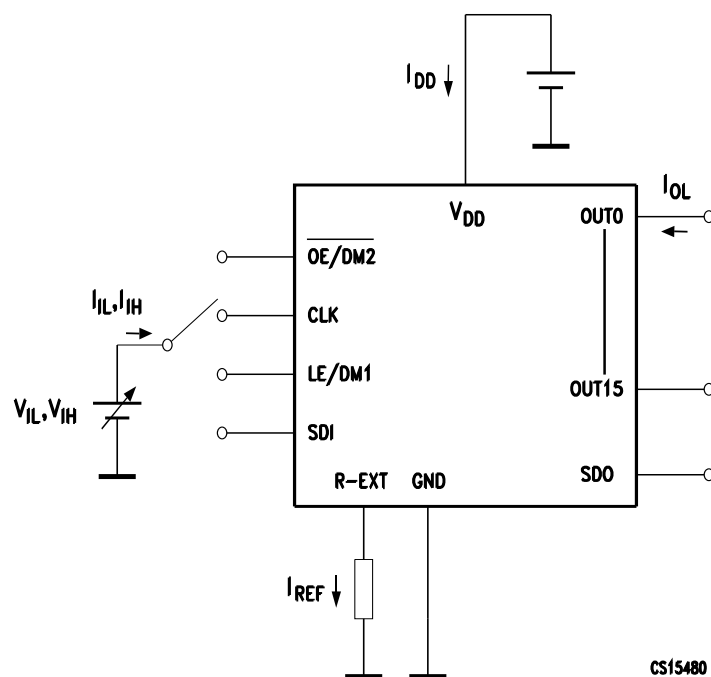
Figure 15. DC characteristic



CS15470

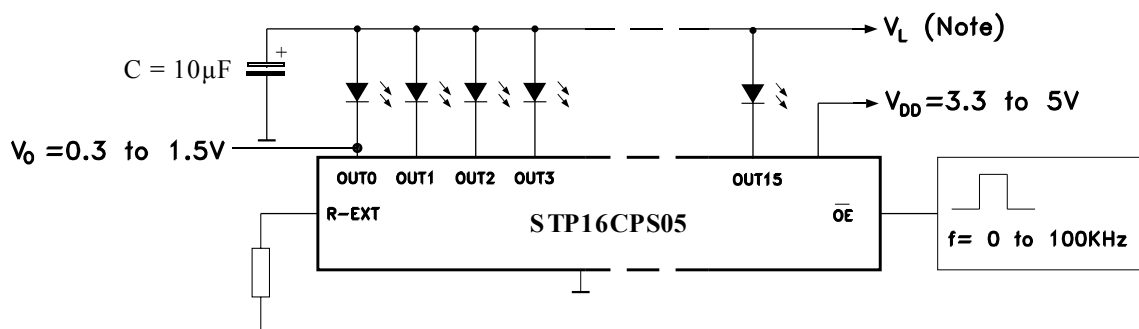
GIPD051020151408MT

Figure 16. AC characteristic



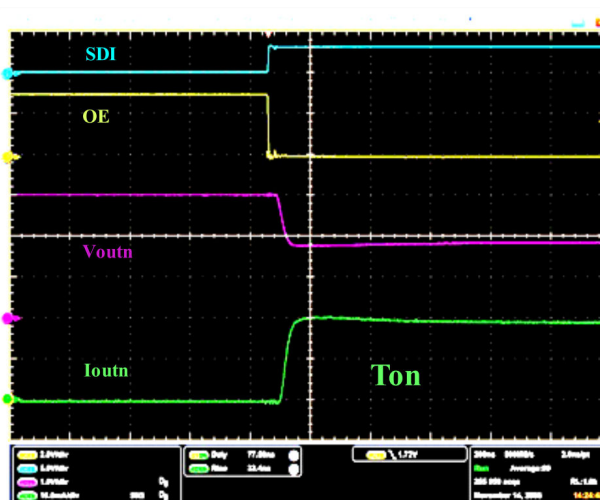
CS15480

GIPD051020151411MT

**Figure 17. Typical application schematic**


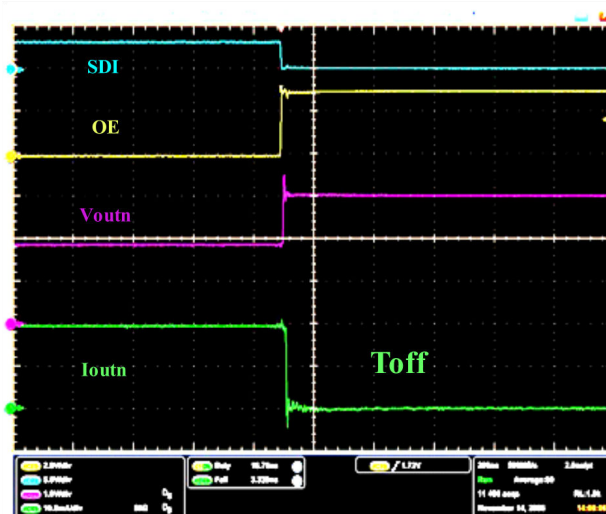
GIPD051020151415MT

**Note:**  $V_L$  will be determined by the  $V_F$  of the LEDs. Test condition: temp. = 25 °C,  $V_{DD}$  = 3.0 V,  $V_{IN}$  =  $V_{DD}$ ,  $C_L$  = 10 pF, freq. = 1 MHz, Ch1 =  $\overline{OE}/DM2$ , Ch2 = SDI, Ch3 =  $V_{OUT}$ , Ch4 =  $I_{OUT}$

**Figure 18. Turn ON output current setup**


GIPD081020151217MT

Figure 19. Turn OFF output current setup



GIPD081020151225MT

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## 8 Package information

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In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

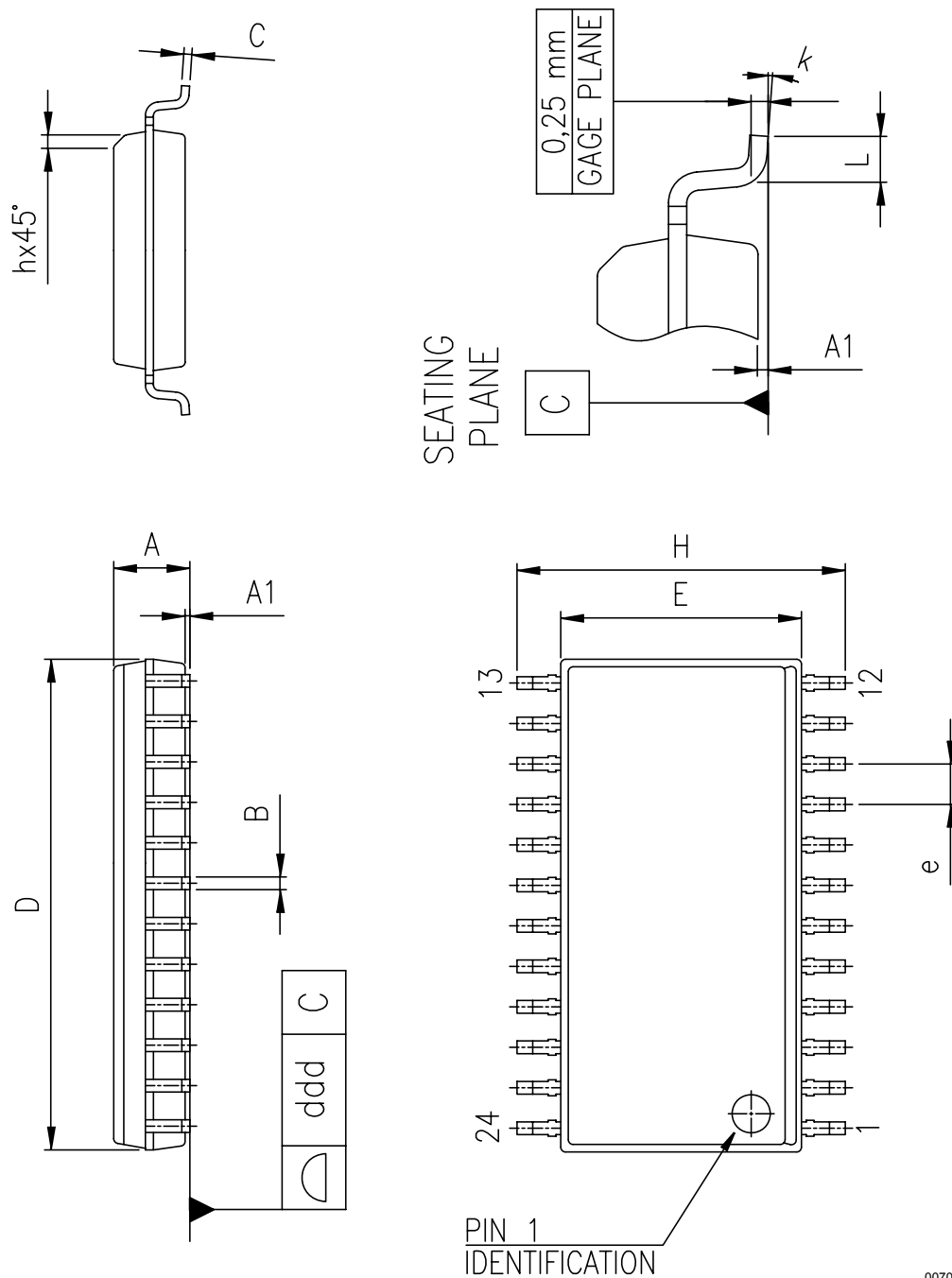


**Table 11. QSOP-24 mechanical data**

| Dim. | mm   |       |       |
|------|------|-------|-------|
|      | Min. | Typ.  | Max.  |
| A    | 1.54 | 1.62  | 1.73  |
| A1   | 0.10 | 0.15  | 0.25  |
| A2   |      | 1.47  |       |
| b    | 0.20 |       | 0.31  |
| c    | 0.17 |       | 0.254 |
| D    | 8.56 | 8.66  | 8.76  |
| E    | 5.80 | 6.00  | 6.20  |
| E1   | 3.80 | 3.91  | 4.01  |
| e    |      | 0.635 |       |
| L    | 0.40 | 0.635 | 0.89  |
| h    | 0.25 | 0.33  | 0.41  |
| <    | 0°   |       | 8°    |

## 8.2 SO-24 0070769 package information

Figure 21. SO-24 package outline



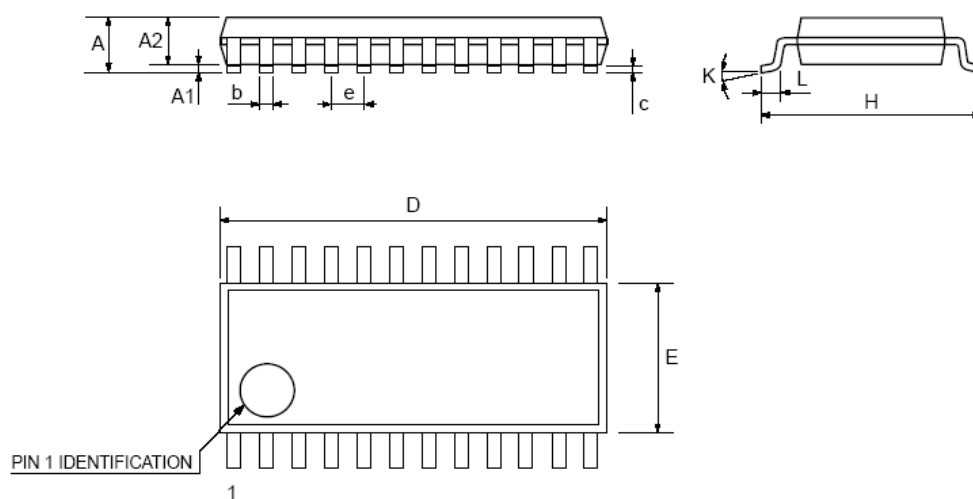
0070769

**Table 12. SO-24 mechanical data**

| Dim. | mm    |      |       |
|------|-------|------|-------|
|      | Min.  | Typ. | Max.  |
| A    | 2.35  |      | 2.65  |
| A1   | 0.10  |      | 0.30  |
| B    | 0.33  |      | 0.51  |
| C    | 0.23  |      | 0.32  |
| D    | 15.20 |      | 15.60 |
| E    | 7.40  |      | 7.60  |
| e    |       | 1.27 |       |
| H    | 10.00 |      | 10.65 |
| h    | 0.25  |      | 0.75  |
| L    | 0.40  |      | 1.27  |
| k    | 0     |      | 8     |
| ddd  |       |      | 0.10  |

### 8.3 TSSOP24 package information

**Figure 22. TSSOP24 package outline**



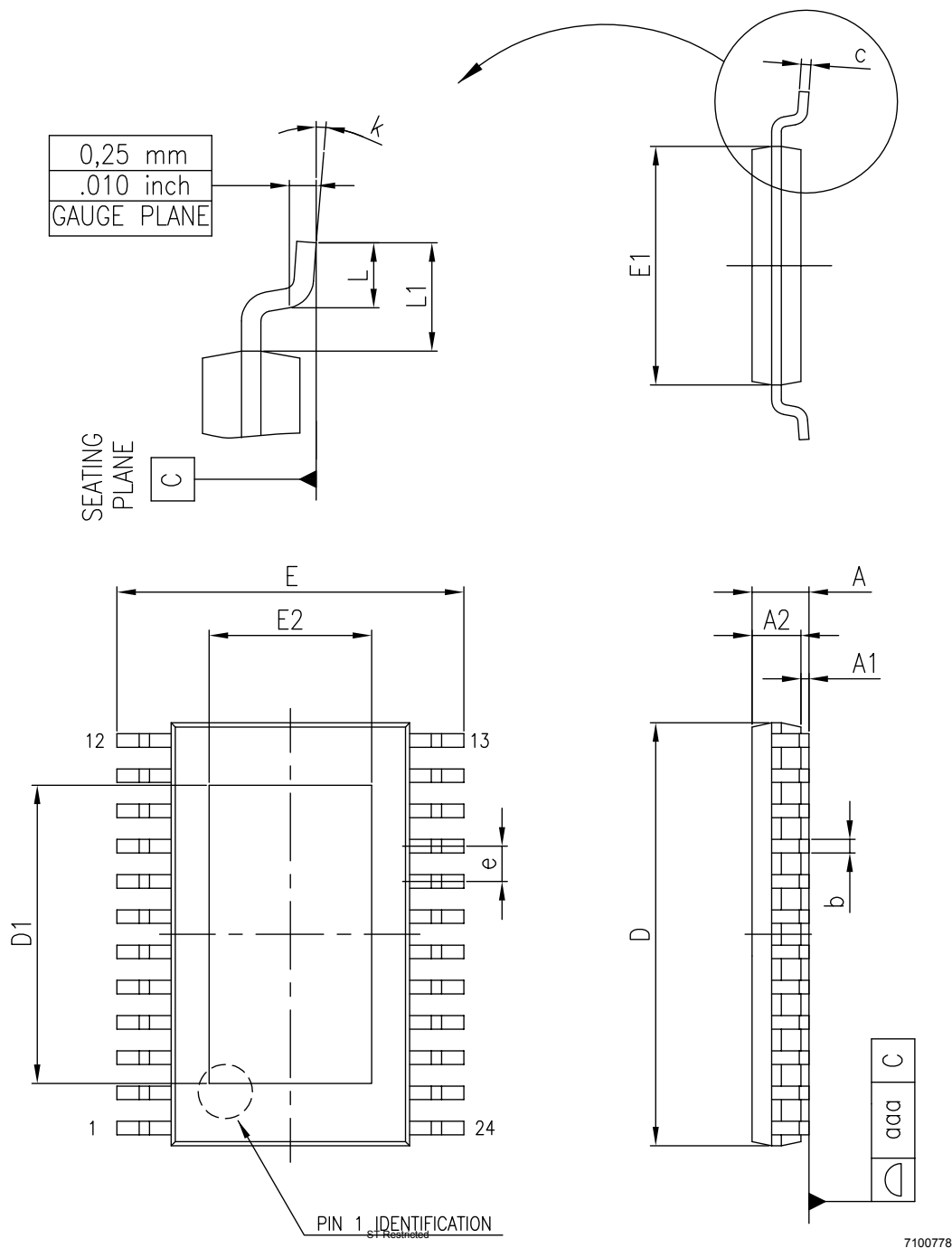
7047476B

**Table 13. TSSOP24 mechanical data**

| Dim. | mm   |          |      |
|------|------|----------|------|
|      | Min. | Typ.     | Max. |
| A    |      |          | 1.1  |
| A1   | 0.05 |          | 0.15 |
| A2   |      | 0.9      |      |
| b    | 0.19 |          | 0.30 |
| c    | 0.09 |          | 0.20 |
| D    | 7.7  |          | 7.9  |
| E    | 4.3  |          | 4.5  |
| e    |      | 0.65 BSC |      |
| H    | 6.25 |          | 6.5  |
| K    | 0°   |          | 8°   |
| L    | 0.50 |          | 0.70 |

## 8.4 TSSOP24 exposed pad package information

**Figure 23. TSSOP24 exposed pad package outline**



**Table 14. TSSOP24 exposed pad mechanical data**

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    |      |      | 1.20 |
| A1   |      |      | 0.15 |
| A2   | 0.80 | 1.00 | 1.05 |
| b    | 0.19 |      | 0.30 |
| c    | 0.09 |      | 0.20 |
| D    | 7.70 | 7.80 | 7.90 |
| D1   | 4.80 | 5.00 | 5.20 |
| E    | 6.20 | 6.40 | 6.60 |
| E1   | 4.30 | 4.40 | 4.50 |
| E2   | 3.00 | 3.20 | 3.40 |
| e    |      |      |      |
| L    | 0.45 | 0.60 | 0.75 |
| L1   |      | 1.00 |      |
| K    | 0    |      | 8    |
| aaa  |      |      | 0.10 |

## 8.5 TSSOP24, TSSOP24 exposed pad and SO-24 packing information

Figure 24. TSSOP24, TSSOP24 exposed pad and SO-24 reel outline

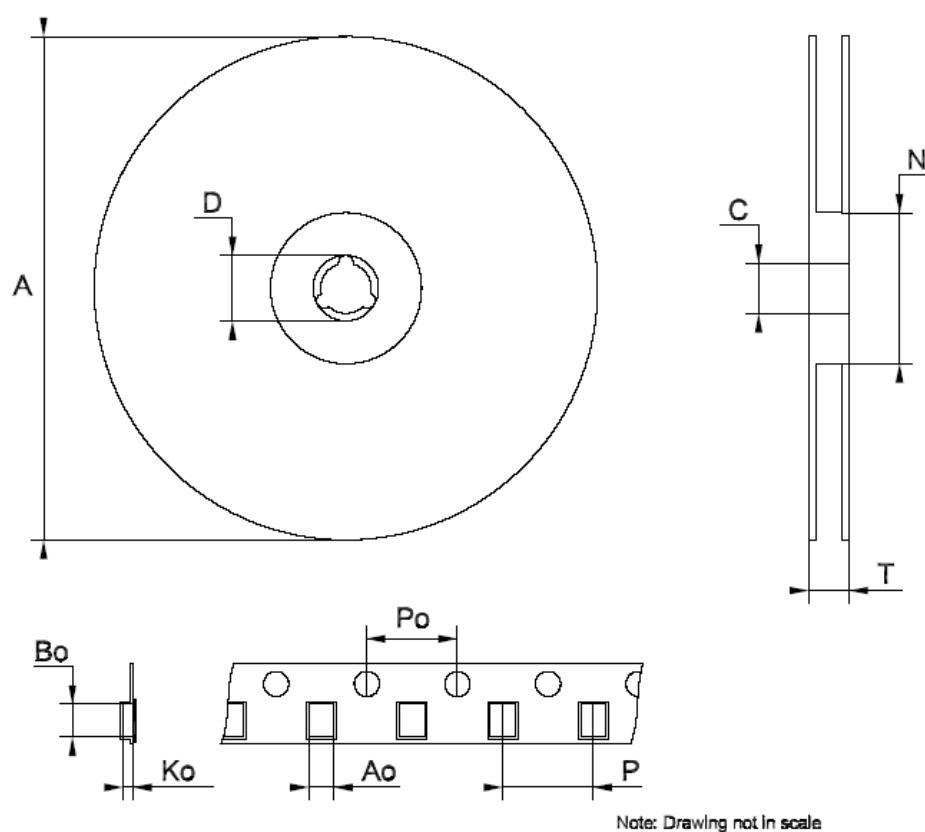


Table 15. TSSOP24 and TSSOP24 exposed pad tape and reel mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    | 330  | -    | 331  |
| C    | 13.0 | -    | 14.0 |
| D    | 18.7 | -    |      |
| N    | 100  | -    |      |
| T    | 16.5 | -    | 18.5 |
| Ao   | 6.85 | -    | 7.05 |
| Bo   | 8.20 | -    | 8.40 |
| Ko   | 1.5  | -    | 1.7  |
| Po   | 3.9  | -    | 4.1  |
| P    | 7.9  | -    | 8.1  |

**Table 16. SO-24 tape and reel mechanical data**

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    |      | -    | 330  |
| C    | 12.8 | -    | 13.2 |
| D    | 20.2 | -    |      |
| N    | 60   | -    |      |
| T    |      | -    | 30.4 |
| Ao   | 10.8 | -    | 11.0 |
| Bo   | 15.7 | -    | 15.9 |
| Ko   | 2.9  | -    | 3.1  |
| Po   | 3.9  | -    | 4.1  |
| P    | 11.9 | -    | 12.1 |

## 9 Device summary

**Table 17. Device summary**

| Order code    | Package             | Packing             |
|---------------|---------------------|---------------------|
| STP16CP05MTR  | SO-24               | 1000 parts per reel |
| STP16CP05TTR  | TSSOP24             | 2500 parts per reel |
| STP16CP05XTTR | TSSOP24 exposed pad | 2500 parts per reel |
| STP16CP05PTR  | QSOP-24             | 2500 parts per reel |

## Revision history

**Table 18. Document revision history**

| Date        | Revision | Changes                                                                                                                                                     |
|-------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 28-Jul-2006 | 1        | First release                                                                                                                                               |
| 21-Dec-2006 | 2        | Final datasheet                                                                                                                                             |
| 17-May-2007 | 3        | Updated Table 7 on page 6                                                                                                                                   |
| 10-Jul-2007 | 4        | Updated Table 9: Truth table on page 10                                                                                                                     |
| 12-Mar-2008 | 5        | Updated Table 15: TSSOP24 exposed-pad on page 23, added QSOP-24Table 12 and Figure 2 on page 19                                                             |
| 07-May-2008 | 6        | Updated Section 5 on page 10                                                                                                                                |
| 03-Dec-2008 | 7        | Updated cover page, Table 6 on page 5, Table 7 on page 6, Table 8 on page 7, Figure 2 on page 13, Table 10 on page 13, Figure 2, 2, and Figure 2 on page 15 |
| 12-May-2009 | 8        | Updated cover page, Table 6 on page 5, Table 7 on page 6, Table 8 on page 7                                                                                 |
| 22-Oct-2009 | 9        | Updated Note: on page 3                                                                                                                                     |
| 20-Jan-2010 | 10       | Updated Table 5 on page 4                                                                                                                                   |
| 18-Jun-2014 | 11       | Updated Section 8: Package mechanical data and Section 9: Packaging mechanical data.                                                                        |
| 01-Apr-2016 | 12       | Updated <i>Table 12: "QSOP-24 mechanical data"</i> . Minor text changes.                                                                                    |
| 08-Mar-2017 | 13       | Updated SDO terminal, Clock, serial/in, serial/out and Clock, serial/in, latch, enable, outputs.<br>Minor text changes.                                     |
| 21-Feb-2024 | 14       | Updated <i>Table 15. TSSOP24 and TSSOP24 exposed pad tape and reel mechanical data.</i>                                                                     |

## Contents

|          |                                                                  |           |
|----------|------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Summary description .....</b>                                 | <b>2</b>  |
| 1.1      | Pin connection and description .....                             | 2         |
| <b>2</b> | <b>Electrical ratings .....</b>                                  | <b>3</b>  |
| 2.1      | Absolute maximum ratings .....                                   | 3         |
| 2.2      | Thermal data .....                                               | 3         |
| 2.3      | Recommended operating conditions .....                           | 4         |
| <b>3</b> | <b>Electrical characteristics.....</b>                           | <b>5</b>  |
| <b>4</b> | <b>Equivalent circuit of inputs and outputs.....</b>             | <b>7</b>  |
| <b>5</b> | <b>Timing diagrams.....</b>                                      | <b>10</b> |
| <b>6</b> | <b>Typical characteristics .....</b>                             | <b>13</b> |
| <b>7</b> | <b>Test circuit .....</b>                                        | <b>16</b> |
| <b>8</b> | <b>Package information.....</b>                                  | <b>19</b> |
| 8.1      | QSOP-24 package information .....                                | 20        |
| 8.2      | SO-24 0070769 package information .....                          | 22        |
| 8.3      | TSSOP24 package information .....                                | 24        |
| 8.4      | TSSOP24 exposed pad package information .....                    | 25        |
| 8.5      | TSSOP24, TSSOP24 exposed pad and SO-24 packing information ..... | 27        |
| <b>9</b> | <b>Device summary.....</b>                                       | <b>29</b> |
|          | <b>Revision history .....</b>                                    | <b>30</b> |

## List of tables

|                  |                                                                         |    |
|------------------|-------------------------------------------------------------------------|----|
| <b>Table 1.</b>  | Typical current accuracy . . . . .                                      | 2  |
| <b>Table 2.</b>  | Pin description . . . . .                                               | 2  |
| <b>Table 3.</b>  | Absolute maximum ratings . . . . .                                      | 3  |
| <b>Table 4.</b>  | Thermal data . . . . .                                                  | 3  |
| <b>Table 5.</b>  | Recommended operating conditions . . . . .                              | 4  |
| <b>Table 6.</b>  | Electrical characteristics . . . . .                                    | 5  |
| <b>Table 7.</b>  | Switching characteristics . . . . .                                     | 5  |
| <b>Table 8.</b>  | Truth table . . . . .                                                   | 10 |
| <b>Table 9.</b>  | Output current-R-EXT resistor . . . . .                                 | 13 |
| <b>Table 10.</b> | $I_{SET}$ vs. dropout voltage ( $V_{drop}$ ) . . . . .                  | 14 |
| <b>Table 11.</b> | QSOP-24 mechanical data . . . . .                                       | 21 |
| <b>Table 12.</b> | SO-24 mechanical data . . . . .                                         | 23 |
| <b>Table 13.</b> | TSSOP24 mechanical data . . . . .                                       | 24 |
| <b>Table 14.</b> | TSSOP24 exposed pad mechanical data . . . . .                           | 26 |
| <b>Table 15.</b> | TSSOP24 and TSSOP24 exposed pad tape and reel mechanical data . . . . . | 27 |
| <b>Table 16.</b> | SO-24 tape and reel mechanical data . . . . .                           | 28 |
| <b>Table 17.</b> | Device summary . . . . .                                                | 29 |
| <b>Table 18.</b> | Document revision history . . . . .                                     | 30 |

## List of figures

|            |                                                                           |    |
|------------|---------------------------------------------------------------------------|----|
| Figure 1.  | Pin connection . . . . .                                                  | 2  |
| Figure 2.  | OE/DM2 terminal . . . . .                                                 | 7  |
| Figure 3.  | LE/DM1 terminal . . . . .                                                 | 7  |
| Figure 4.  | CLK, SDI terminal . . . . .                                               | 8  |
| Figure 5.  | SDO terminal . . . . .                                                    | 8  |
| Figure 6.  | Block diagram . . . . .                                                   | 9  |
| Figure 7.  | Timing diagram . . . . .                                                  | 10 |
| Figure 8.  | Clock, serial-in, serial-out . . . . .                                    | 11 |
| Figure 9.  | Clock, serial-in, latch, enable, outputs . . . . .                        | 12 |
| Figure 10. | Outputs . . . . .                                                         | 12 |
| Figure 11. | Output current- $R_{EXT}$ resistor . . . . .                              | 13 |
| Figure 12. | Output current vs $\pm \Delta I_{OL}(\%)$ $T_A = 25^\circ C$ . . . . .    | 14 |
| Figure 13. | $I_{SET}$ vs drop out voltage ( $V_{drop}$ ) $T_A = 25^\circ C$ . . . . . | 14 |
| Figure 14. | $I_{DD}$ ON/OFF, $T_A = 25^\circ C$ . . . . .                             | 15 |
| Figure 15. | DC characteristic . . . . .                                               | 16 |
| Figure 16. | AC characteristic . . . . .                                               | 16 |
| Figure 17. | Typical application schematic . . . . .                                   | 17 |
| Figure 18. | Turn ON output current setup . . . . .                                    | 17 |
| Figure 19. | Turn OFF output current setup . . . . .                                   | 18 |
| Figure 20. | QSOP-24 package outline . . . . .                                         | 20 |
| Figure 21. | SO-24 package outline . . . . .                                           | 22 |
| Figure 22. | TSSOP24 package outline . . . . .                                         | 24 |
| Figure 23. | TSSOP24 exposed pad package outline . . . . .                             | 25 |
| Figure 24. | TSSOP24, TSSOP24 exposed pad and SO-24 reel outline . . . . .             | 27 |

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