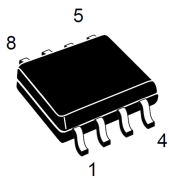


## Intelligent power switch



SO-8

### Features

- 0.5 A output current
- Low-side or high-side switch configuration
- Supply voltage range from 6 V to 48 V
- Overload and short-circuit protections
- Internal voltage clamping
- Supply and output reversal protection
- Thermal shutdown
- GND and  $V_S$  open wire protection
- Adjustable delay at switch-on
- Indicator status LED driver
- +5 V regulated AUX voltage
- High burst immunity

### Application

- Industrial PC peripheral input/output
- Numerical control machines

### Description

The TDE1707BFP and TDE1707CFP are 0.5 A integrated power switches with up to 48 V power supply capability. Two output configurations are possible. The former is the load to GND (high-side mode) and the latter is the load to  $V_S$  (low-side mode). This device is dedicated to proximity detectors; its internal +5 V supply can be used to supply external circuits (please refer to AN495 and AN1213 on [www.st.com](http://www.st.com)). A signal is internally generated to block the IN signal, and prevent the output switch, as long as an abnormal condition is detected. The power-on transition, as well as the chip overtemperature and the output overcurrent, generate this signal. A minimum delay of 25  $\mu$ s (typ. value) is added to the trailing edge of this signal to ensure that a stable normal situation is present when the signal disappears. The delay (the disappearance of block signal) can be further increased by connecting a capacitor between pin 3 and ground. It can drive resistive or inductive loads.

#### Product status link

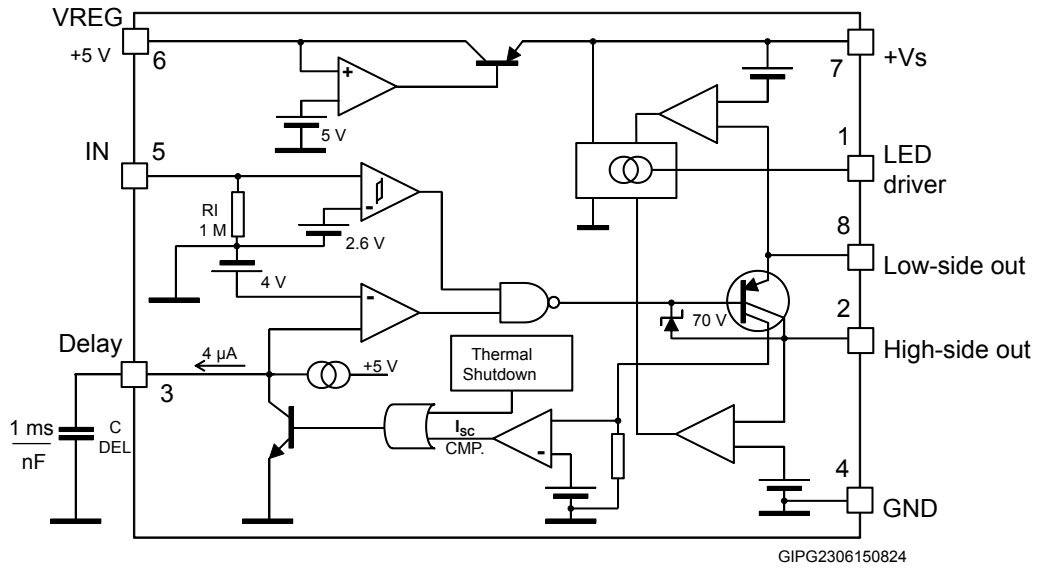
TDE1707

#### Product label



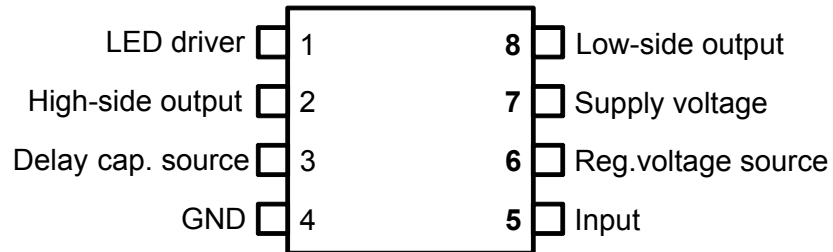
# 1 Block diagram

Figure 1. Block diagram



## 2 Pin configuration

**Figure 2. Pin connections (top view)**



GIPG230615900LM

**Table 1. Pin description**

Pin	Function
1	LED driver
2	High-side output
3	Delay cap. source
4	GND
5	Input
6	Regulator voltage source
7	Supply voltage
8	Low-side output

### 3 Maximum ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
V <sub>S</sub>	Supply voltage	50	V
	Supply reverse voltage	50	V
I <sub>O</sub>	Output current	Internally limited	mA
V <sub>REG</sub>	Regulated pin voltage	0 to 7	V
V <sub>delay</sub>	Delay cap. source pin	0 to 5	V
V <sub>O</sub>	Output voltage	55	V
V <sub>IN</sub>	Input voltage	-10 to 50	V
T <sub>STG</sub>	Storage temperature range	-55 to 150	°C
T <sub>J</sub>	Operating junction temperature range	-25 to 85	°C
P <sub>tot</sub>	Power dissipation	Internally limited	W
E <sub>i</sub>	Energy inductive load	150	mJ

**Table 3. Thermal data**

Symbol	Parameter	Value (TDE1707BFP)	Value (TDE1707CFP)	Unit
R <sub>th(JC)</sub>	Thermal resistance junction-case	15	15	°C/W
R <sub>th(JA)</sub>	Thermal resistance junction-ambient	150	130	

## 4 Electrical characteristics

$V_S = 24\text{ V}$ ,  $T_J = -25\text{ to }+85\text{ °C}$  unless otherwise stated

**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_S$ 7	Supply voltage		6		48	V
$I_{SR}$ 7	Supply reverse current	$V_{SR} = -48\text{ V}$			1.5	mA
$I_q$ 7	Quiescent current	$I_{REG} = I_{LED} = 0\text{ mA}$ ; $V_I < 2\text{ V}$ ; $V_S = 6\text{ V to }48\text{ V}$			1.5	mA
$I_O$ 8/2	Output current	$V_S = 6\text{ V to }32\text{ V}$			500	mA
		$V_S = 32\text{ V to }48\text{ V}$			300	mA
$V_{SAT}$ 8/2	Output voltage drop <sub>8-2</sub>	$I_O = 500\text{ mA}$		1.1	1.6	V
		$I_O = 300\text{ mA}$			1.5	V
$I_{SC}$ 8/2	Short-circuit current		0.7		1.5	A
$V_{CL}$ 8/2	Internal voltage clamp	$I_{CL} = 10\text{ mA}$	55		70	V
$I_{OLK}$ 8/2	Output leakage	$V_I < 2\text{ V}$ ; $V_O = 0\text{ to }V_S$ (Pin 2)		100	300	$\mu\text{A}$
		$V_I < 2\text{ V}$ ; $V_O = 0\text{ to }V_S$ (Pin 8)			100	
$V_{ith}$ 5	Input voltage threshold		2		3	V
$V_{ihys}$ 5	Input threshold hysteresis			300		mV
$I_{Ik}$ 5	Input current	$V_I = 5\text{ V}$		2	5	$\mu\text{A}$
$V_{REG}$ 6	Regulated output voltage	$I_{REG} < 5\text{ mA}$	4.5	5	5.5	V
$I_{scr}$ 6	Short-circuit regulated		6	30	50	mA
$I_{REG}$ 6	Output regulator current	$V_S = 35\text{ V}$			6	mA
		$V_S = 48\text{ V}$			4	mA
$I_{OLD}$ 1	Current source sink LED driver	Output ON ( $\pm$ )	2	3	4	mA
$V_{OLD}$ 1	Voltage drop LED driver	$I_{OS} = 2\text{ mA}$ ( $\pm$ )		1.2	1.6	V
$O_{ldlk}$ 1	LED driver off leakage	$V_I < 2\text{ V}$ ; $R_L < 1\text{ k}\Omega$			10	$\mu\text{A}$
$I_{dch}$ 3	Delay cap. charge current	$T_J = 25\text{ °C}$	2	4	6	$\mu\text{A}$
$V_{dth}$ 3	Delay voltage trigger	$T_J = 25\text{ °C}$		4		V

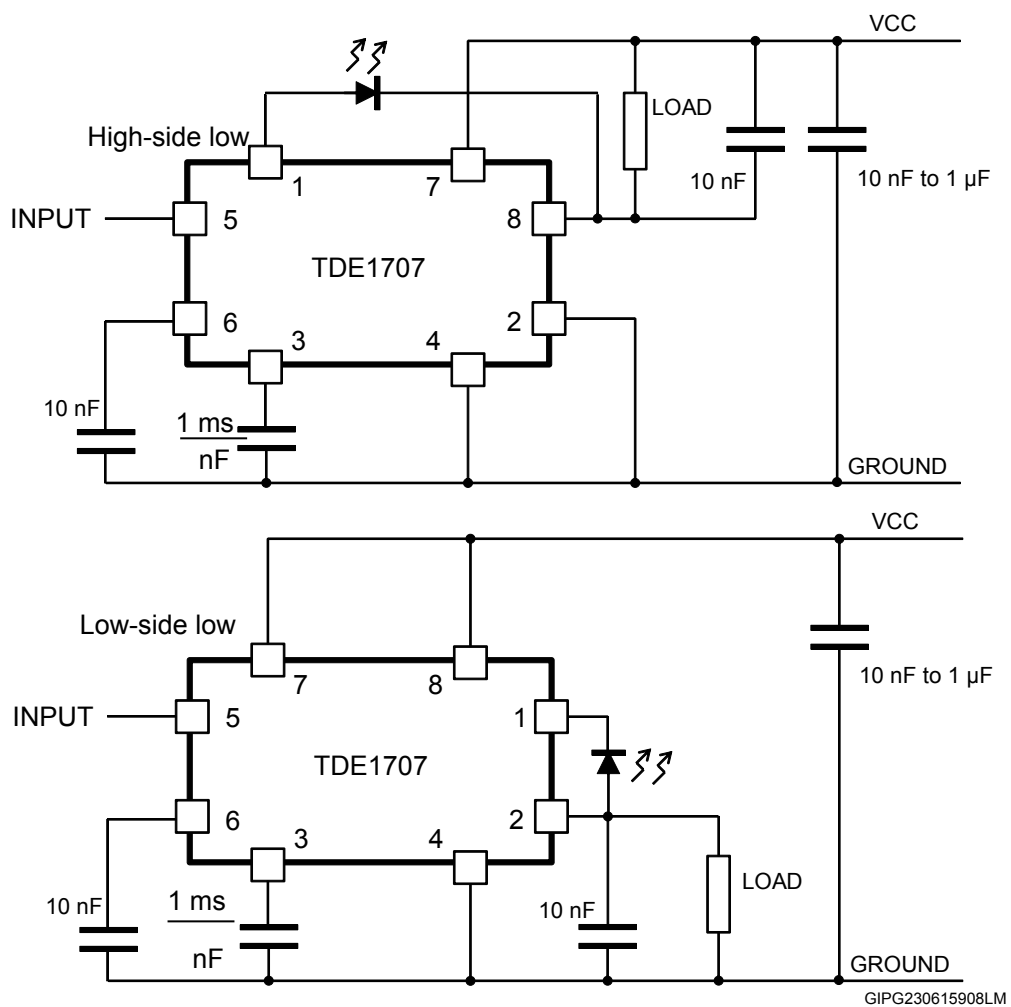
## 5 Application information

The LED driver reports the output status. It can source or sink current ( $I_{OL\text{D}}$  typ. = 3 mA), according to the output configuration chosen. The thresholds, represented by the output comparator in the block diagram, are set from 1.5 V to 2 V. For instance, in high-side load case of the application circuit, when the voltage on pin 8 differs from  $V_{CC}$  less than 1.5 V, the output is sensed in "OFF" state and the LED driver is disabled. If instead pin 8 differs from  $V_{CC}$  more than 3 V (the output comparator threshold value plus the drop voltage on the LED), then the output is sensed "ON" and the driver forces the current on the LED.

**Table 5. Dynamic characteristics**

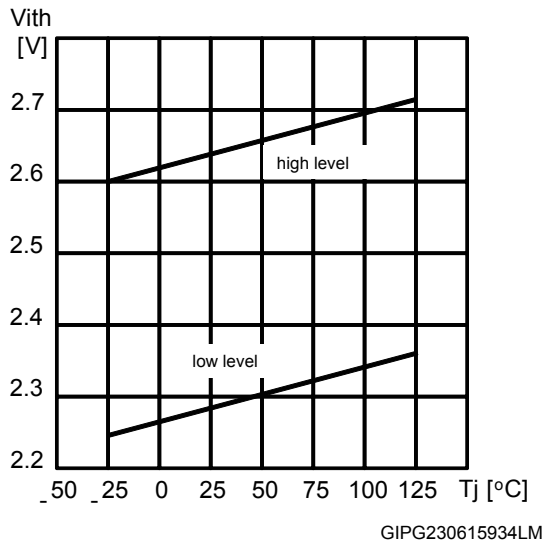
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{on}$	Propagation turn-on time	$V_I = 0$ to 5 V		15		$\mu\text{s}$
$t_{off}$	Propagation turn-off time	$V_I = 5$ to 0 V		15		$\mu\text{s}$
$t_{don}$	Delayed turn-on time / nF delay capacitor		0.65	1	2	ms
$t_{dmin}$	Minimum delayed $t_{on}$ , delay capacitor = 0			25		$\mu\text{s}$

**Figure 3. Application circuit**

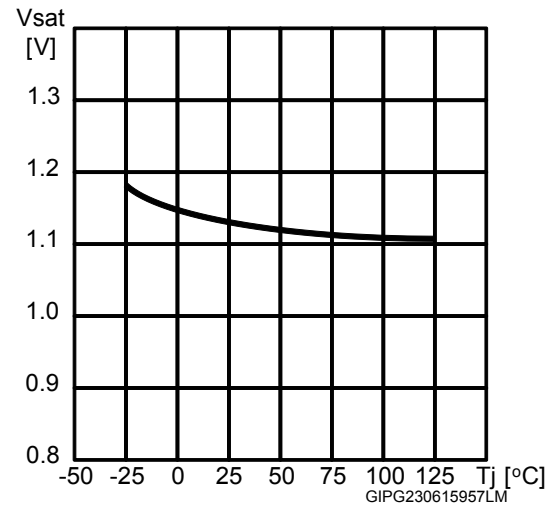


## 6 Thermal behavior

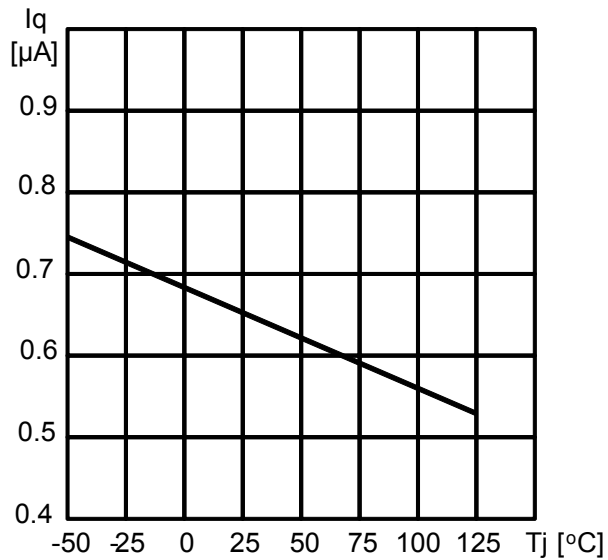
**Figure 4. Input threshold voltage vs. temperature ( $V_S = 24\text{ V}$ )**



**Figure 5. Saturation voltage vs. temperature ( $V_S = 24\text{ V}$ ;  $I_O = 500\text{ mA}$ )**



**Figure 6. Quiescent current vs. temperature ( $V_S = 24\text{ V}$ )**



## 7 Package information

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.

### 7.1 SO-8 package information

Figure 7. SO-8 mechanical data

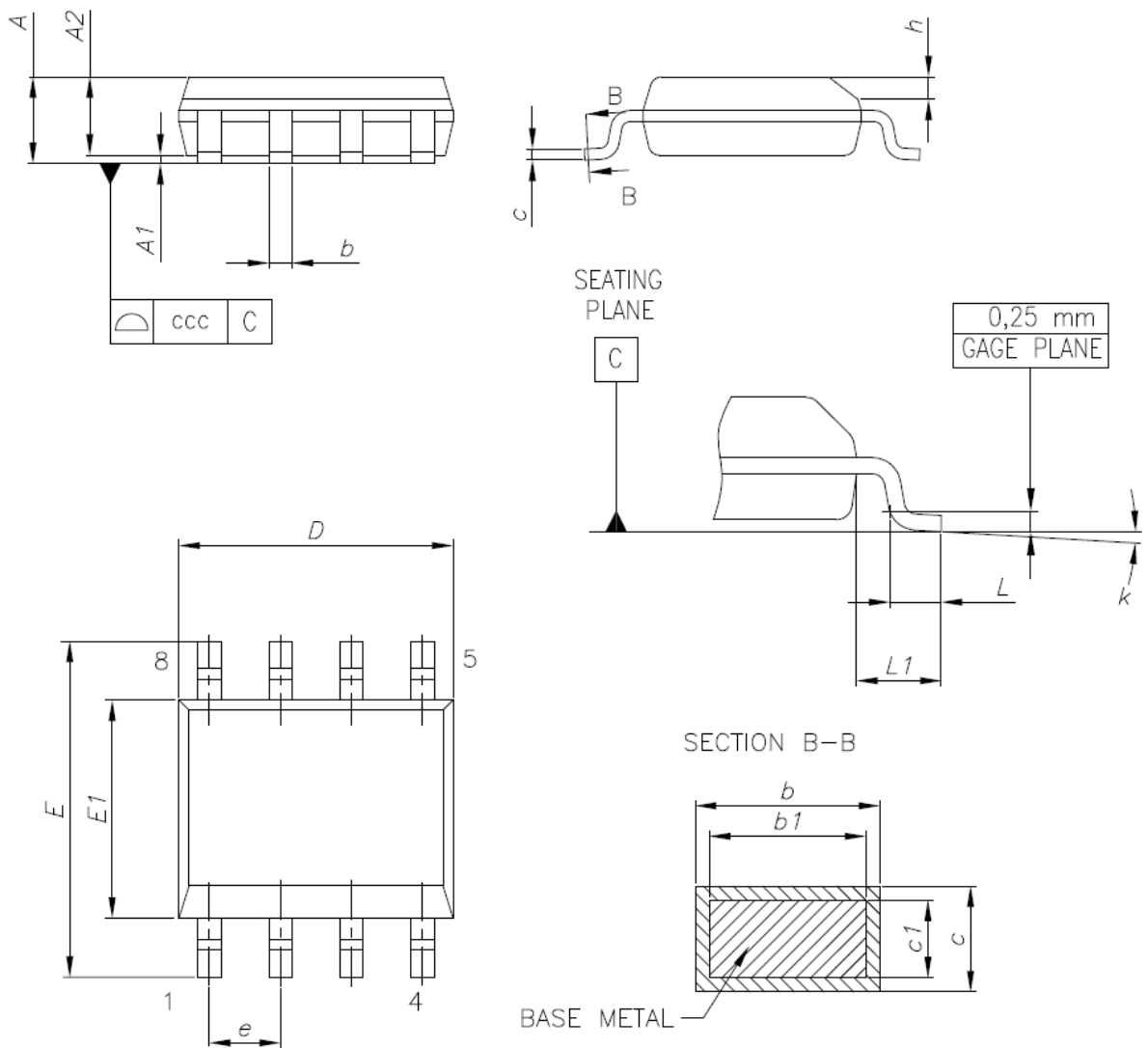
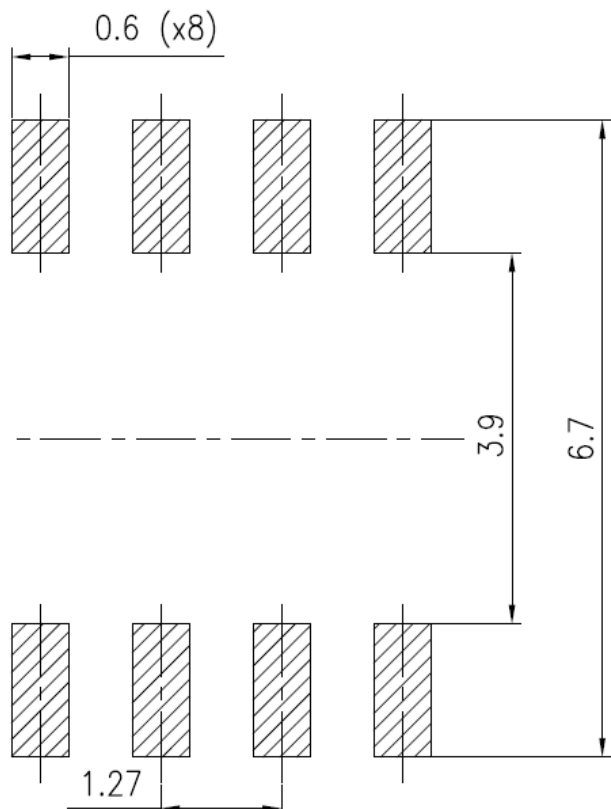




Table 6. SO-8 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			1.75
A1	0.10		0.25
A2	1.25		
b	0.31		0.51
b1	0.28		0.48
c	0.10		0.25
c1	0.10		0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e		1.27	
h	0.25		0.50
L	0.40		1.27
L1		1.04	
L2		0.25	
k	0°		8°
ccc			0.10

Figure 8. SO-8 recommended footprint (dimensions are in mm)



## 7.2 SO-8 packing information

Figure 9. SO-8 tape and reel dimensions

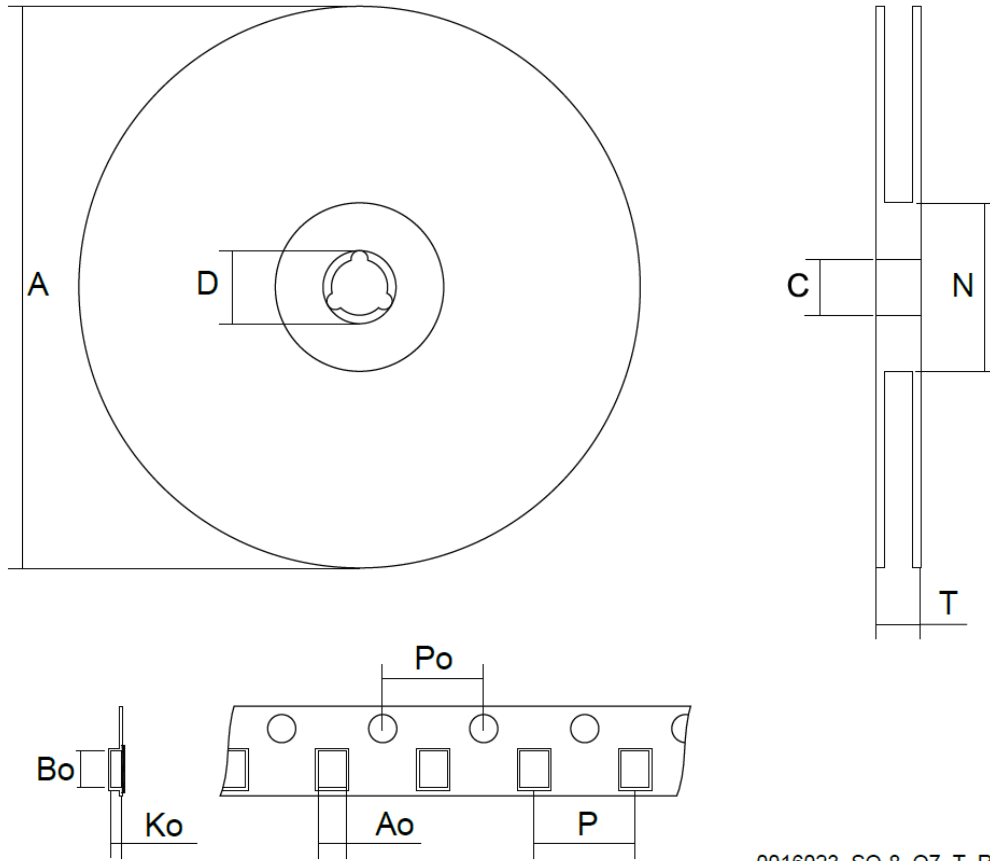


Figure 10. Tape orientation

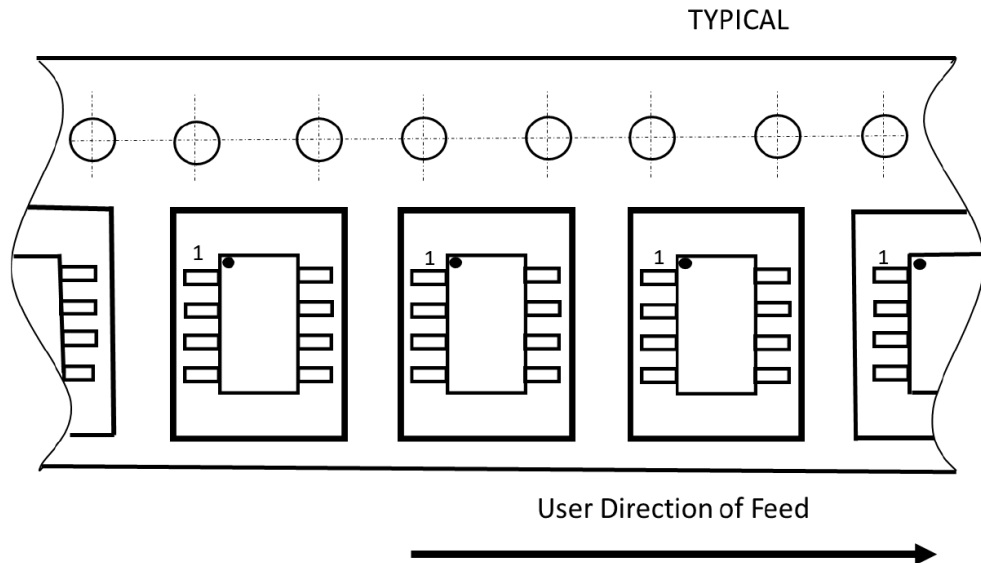


Table 7. SO-8 tape and reel mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			330
C	12.8		13.2
D	20.2		
N	60		
T			22.4
Ao	6.5	-	6.7
Bo	5.4		5.6
Ko	2.0		2.2
Po	3.9		4.1
P	7.9		8.1

## 8 Ordering information

**Table 8. Ordering information**

Order code	Package	Packing
TDE1707BFP	SO-8	Tube
TDE1707BFPT		Tape and reel
TDE1707CFP		Tube
TDE1707CFPT		Tape and reel

## Revision history

**Table 9. Document revision history**

Date	Version	Changes
03-Dec-2021	1	Initial release.

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