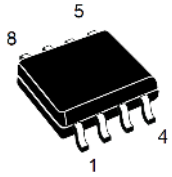
TDE1707

Datasheet

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

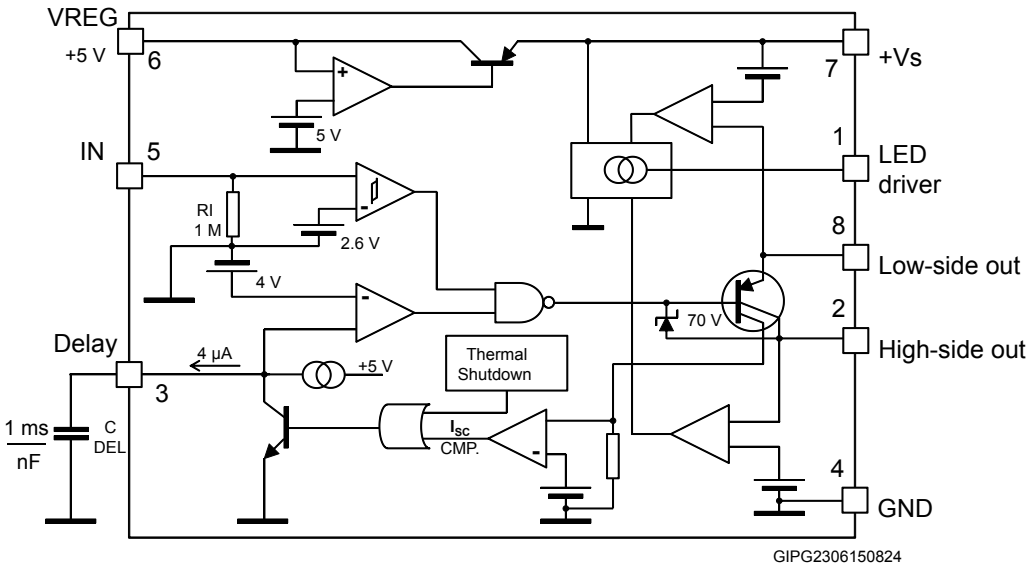
The TDE1707BFP and TDE1707CFP are 0.5 A integrated power switches with up to 48 V power supply capability. Two output configurations are possible. The former is the load to GND (high-side mode) and the latter is the load to V_S (low-side mode). This device is dedicated to proximity detectors; its internal +5 V supply can be used to supply external circuits (please refer to AN495 and AN1213 on www.st.com). 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 µs (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
SUSTAINABLE TECHNOLOGY

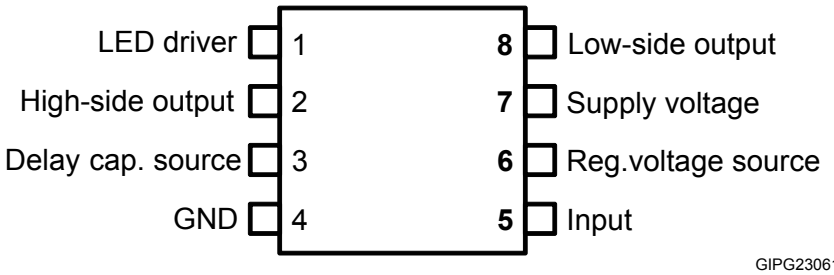
1 Block diagram

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_S	Supply voltage	50	V
	Supply reverse voltage	50	V
I_O	Output current	Internally limited	mA
V_{REG}	Regulated pin voltage	0 to 7	V
V_{delay}	Delay cap. source pin	0 to 5	V
V_O	Output voltage	55	V
V_{IN}	Input voltage	-10 to 50	V
T_{STG}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range	-25 to 85	°C
P_{tot}	Power dissipation	Internally limited	W
E_i	Energy inductive load	150	mJ

Table 3. Thermal data

Symbol	Parameter	Value (TDE1707BFP)	Value (TDE1707CFP)	Unit
$R_{th(JC)}$	Thermal resistance junction-case	15	15	°C/W
$R_{th(JA)}$	Thermal resistance junction-ambient	150	130	

4 Electrical characteristics

V_S = 24 V, T_J = -25 to +85 °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 V			1.5	mA
I_q 7	Quiescent current	I_{REG} = I_{LED} = 0 mA; V_I < 2 V; V_S = 6 V to 48 V			1.5	mA
I_O 8/2	Output current	V_S = 6 V to 32 V			500	mA
		V_S = 32 V to 48 V			300	mA
V_{SAT} 8/2	Output voltage $drop_{8-2}$	I_O = 500 mA		1.1	1.6	V
		I_O = 300 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 mA	55		70	V
I_{OLK} 8/2	Output leakage	V_I < 2 V; V_O = 0 to V_S (Pin 2)		100	300	µA
		V_I < 2 V; V_O = 0 to V_S (Pin 8)			100	
V_{ith} 5	Input voltage threshold		2		3	V
V_{ihys} 5	Input threshold hysteresis			300		mV
I_{lk} 5	Input current	V_I= 5 V		2	5	µA
V_{REG} 6	Regulated output voltage	I_{REG} < 5 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 V			6	mA
		V_S = 48 V			4	mA
I_{OLD} 1	Current source sink LED driver	Output ON (±)	2	3	4	mA
V_{OLD} 1	Voltage drop LED driver	I_{OS} = 2 mA (±)		1.2	1.6	V
O_{ldlk} 1	LED driver off leakage	V_I < 2 V; RL < 1 kΩ			10	µA
I_{dch} 3	Delay cap. charge current	T_J = 25 °C	2	4	6	µA
V_{dth} 3	Delay voltage trigger	T_J = 25 °C		4		V

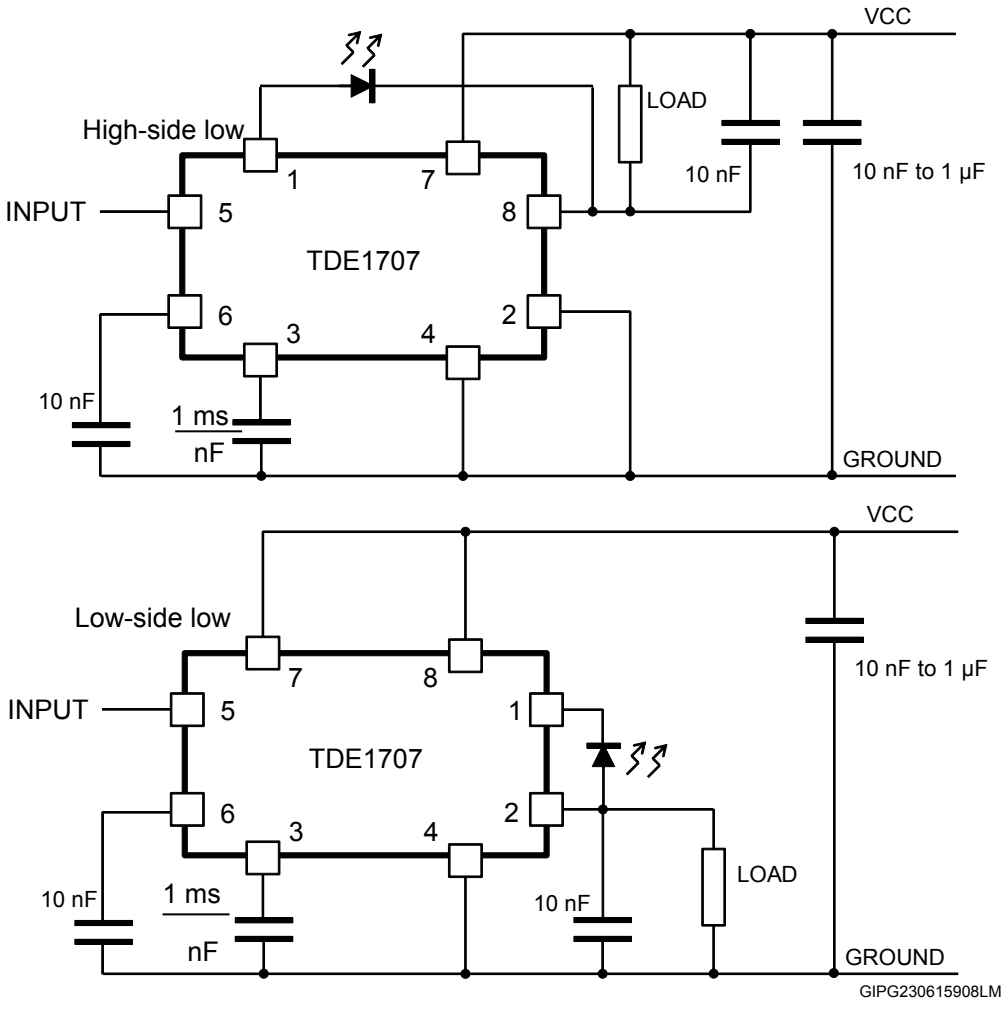
5 Application information

The LED driver reports the output status. It can source or sink current (I_{OLD} 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		µs
t_{off}	Propagation turn-off time	V_I = 5 to 0 V		15		µs
t_{don}	Delayed turn-on time / nF delay capacitor		0.65	1	2	ms
t_{dmin}	Minimum delayed t_{on}, delay capacitor = 0			25		µs

Figure 3. Application circuit



6 Thermal behavior

Figure 4. Input threshold voltage vs. temperature (V_S = 24 V)

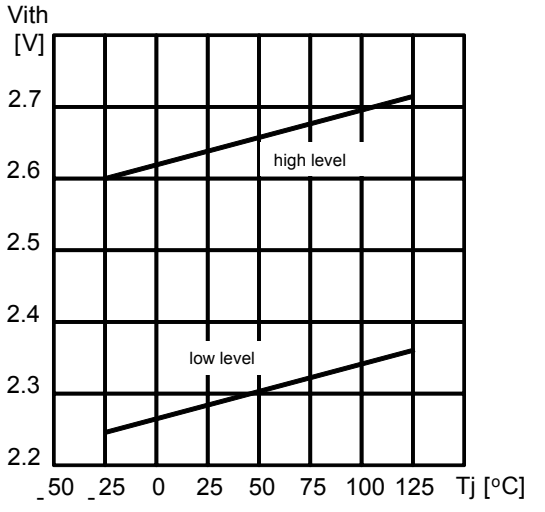


Figure 5. Saturation voltage vs. temperature (V_S = 24 V; I_O= 500 mA)

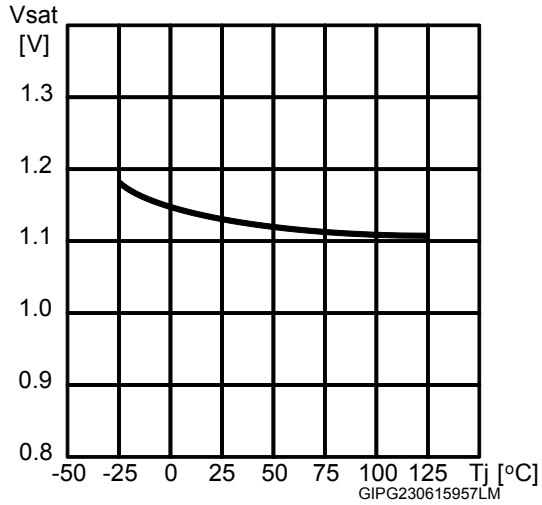
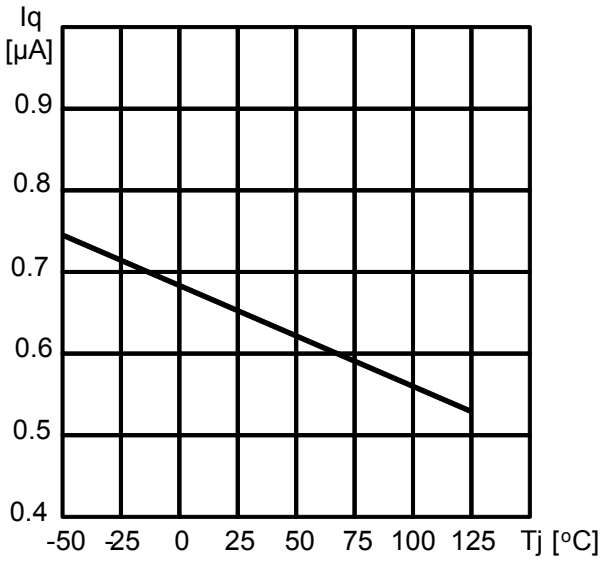


Figure 6. Quiescent current vs. temperature (V_S=24 V)



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. ECOPACK is an ST trademark.

7.1 SO-8 package information

Figure 7. SO-8 mechanical data

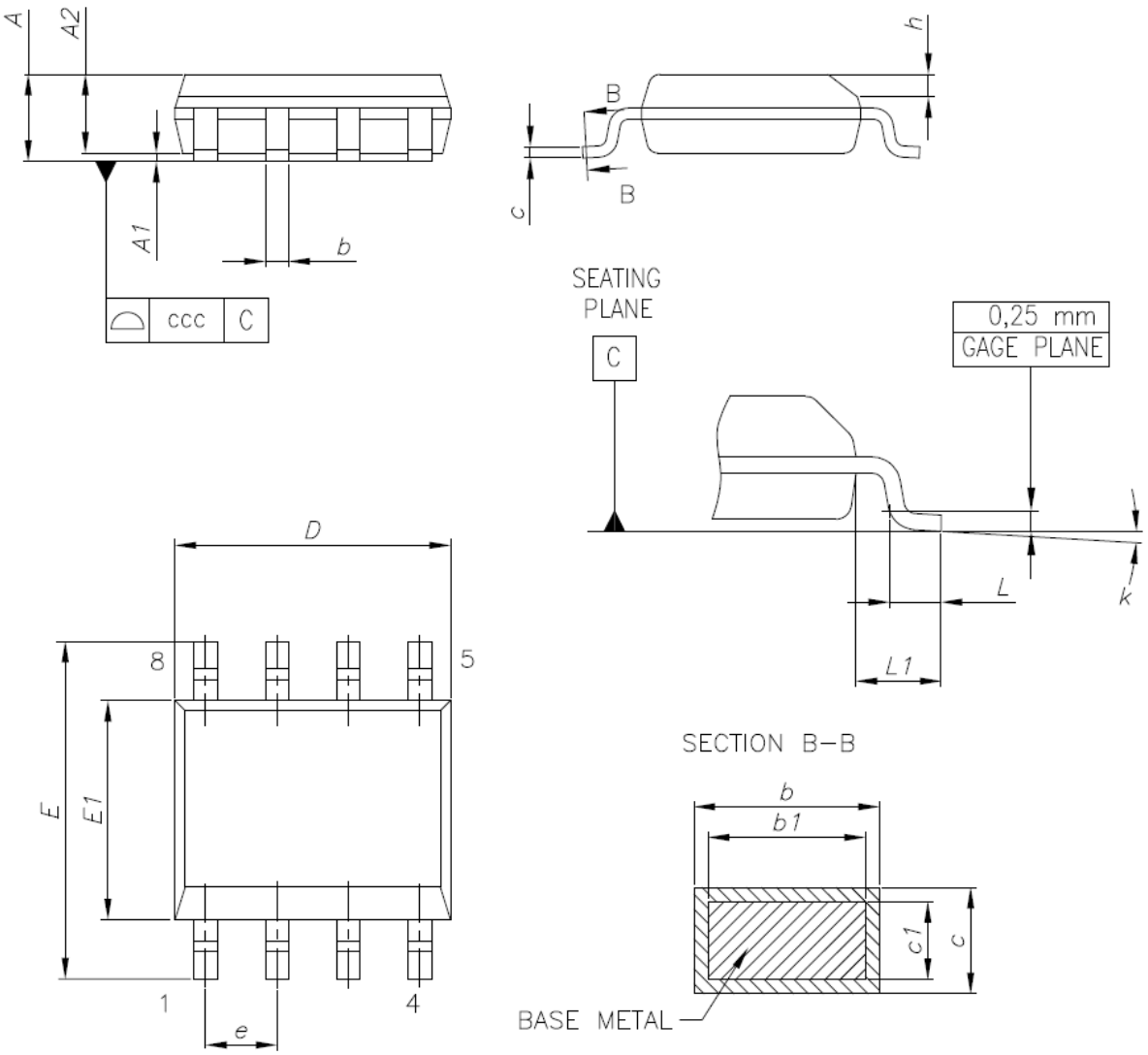
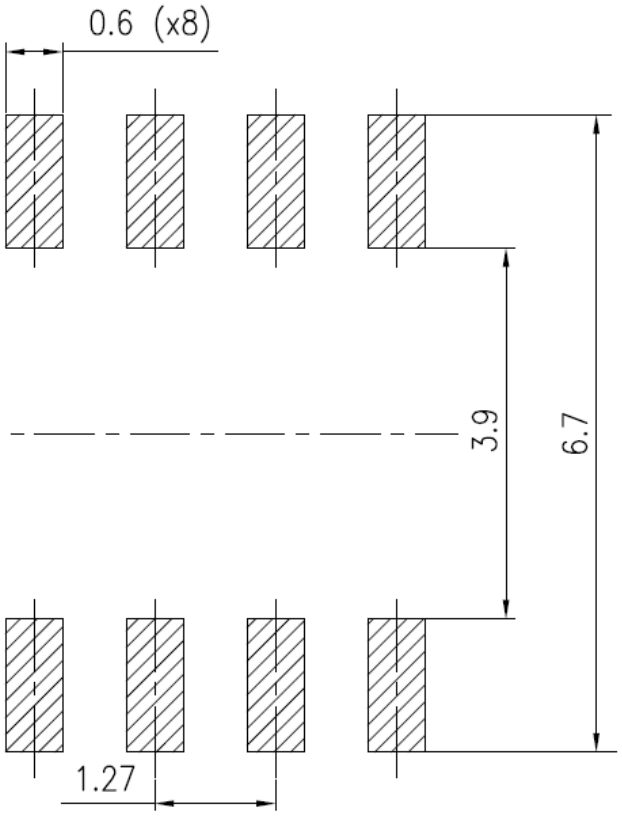


Table 6. **SO-8 mechanical data**

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**

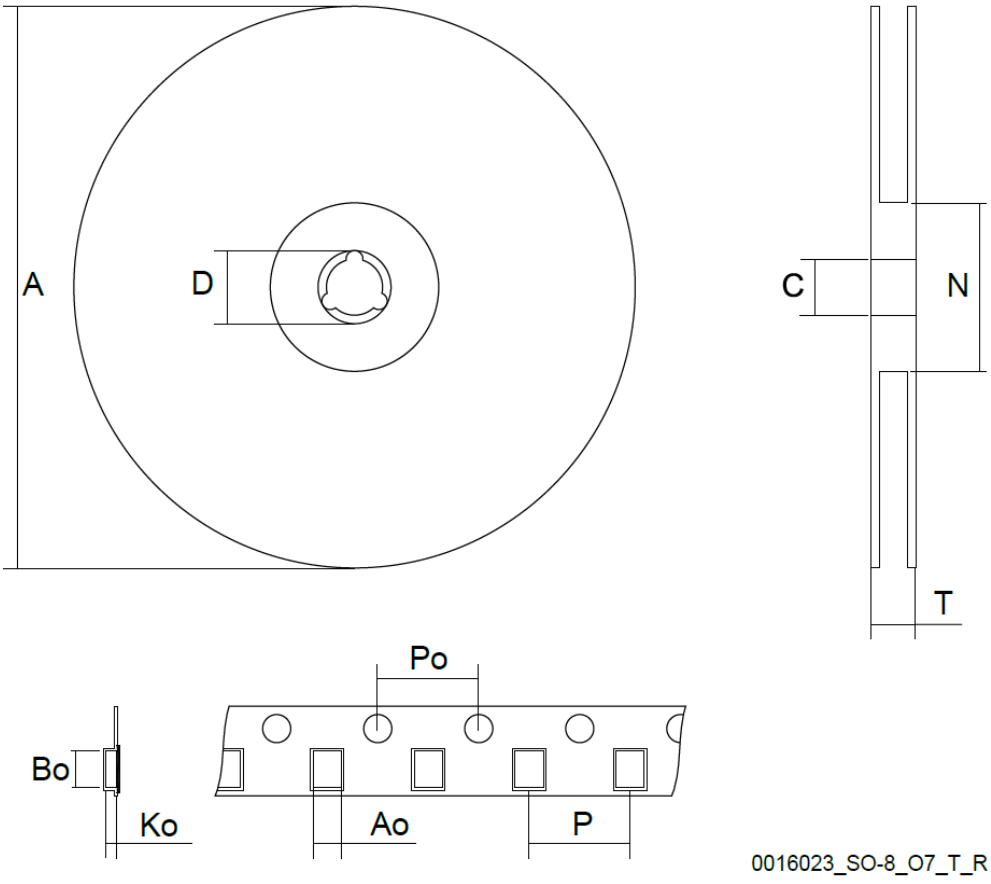


Figure 10. **Tape orientation**

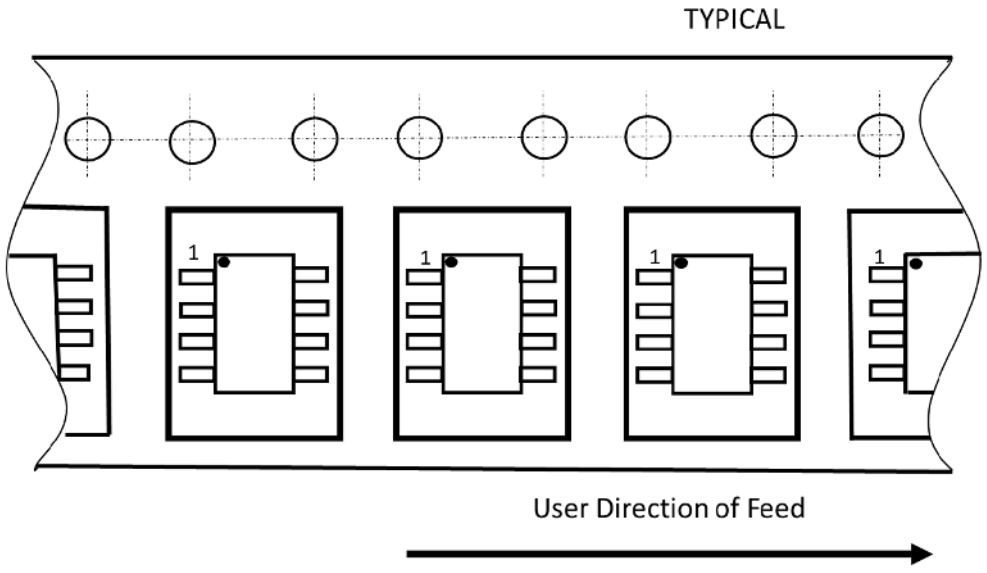


Table 7. **SO-8 tape and reel mechanical data**

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.

Contents

1 Block diagram 2
2 Pin configuration 3
3 Maximum ratings 4
4 Electrical characteristics 5
5 Application information 6
6 Thermal behavior 7
7 Package information 8
7.1 SO-8 package information 8
7.2 SO-8 packing information 10
8 Ordering information 12
Revision history 13

List of figures

Figure 1. Block diagram . . . 2
Figure 2. Pin connections (top view) . . . 3
Figure 3. Application circuit . . . 6
Figure 4. Input threshold voltage vs. temperature (V_S = 24 V) . . . 7
Figure 5. Saturation voltage vs. temperature (V_S = 24 V; I_O= 500 mA) . . . 7
Figure 6. Quiescent current vs. temperature (V_S=24 V) . . . 7
Figure 7. SO-8 mechanical data . . . 8
Figure 8. SO-8 recommended footprint (dimensions are in mm) . . . 9
Figure 9. SO-8 tape and reel dimensions . . . 10
Figure 10. Tape orientation . . . 10

List of tables

Table 1. Pin description . . . 3
Table 2. Absolute maximum ratings . . . 4
Table 3. Thermal data . . . 4
Table 4. Electrical characteristics . . . 5
Table 5. Dynamic characteristics . . . 6
Table 6. SO-8 mechanical data . . . 9
Table 7. SO-8 tape and reel mechanical data . . . 11
Table 8. Ordering information . . . 12
Table 9. Document revision history . . . 13

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, please refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2021 STMicroelectronics – All rights reserved