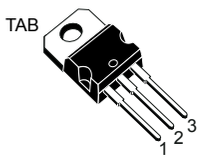
chanhvinh.com

life.augmented

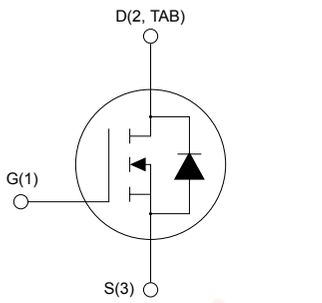
# STP150N10F7AG

Datasheet

## Automotive N-channel 100 V, 4.2 mΩ typ., 110 A, STripFET F7 Power MOSFET in a TO-220 package




TO-220




## Features

| Order code | $V_{DS}$ | $R_{DS(on)}$ max. | $I_D$ |
|---|---|---|---|
| STP150N10F7AG | 100 V | 4.2 mΩ | 110 A |

- Designed for automotive application
- Standard level $V_{GS(TH)}$
- 175°C junction temperature
- 100% avalanche rated

## Applications

- Switching applications

## Description

This N-channel Power MOSFET utilizes STripFET F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

STPOWER

| Product status link |
|---|
| STP150N10F7AG |

| Product summary | |
|---|---|
| **Order code** | STP150N10F7AG |
| **Marking** | 150N10F7AG |
| **Package** | TO-220 |
| **Packing** | Tube |

chanhvinh.com



# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-source voltage | 100 | V |
| $V_{GS}$ | Gate-source voltage | ±20 | V |
| $I_D$[(1)] | Drain current (continuous) at $T_C$ = 25 °C | 110 | A |
| | Drain current (continuous) at $T_C$ = 100 °C | | |
| $I_{DM}$[(2)] | Drain current (pulsed) | 440 | A |
| $P_{TOT}$ | Total power dissipation at $T_C$ = 25 °C | 250 | W |
| $I_{AV}$ | Single pulse avalanche current (pulse width limited by maximum junction temperature) | 30 | A |
| $E_{AS}$ | Single pulse avalanche energy ($T_J$ = 25 °C, $I_D$ = $I_{AV}$, $V_{DD}$ = 25 V) | 650 | mJ |
| $T_J$ | Operating junction temperature range | -55 to 175 | °C |
| $T_{stg}$ | Storage temperature range | | |

1. *Current limited by package.*
2. *Pulse width limited by safe operating area.*

**Table 2. Thermal data**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{thJC}$ | Thermal resistance, junction-to-case | 0.6 | °C/W |
| $R_{thJB}$[(1)] | Thermal resistance, junction-to-board | 62.5 | °C/W |

1. *When mounted on 1 inch² FR-4, 2 Oz copper board.*

chanhvinh.com



## 2 Electrical characteristics

($T_{CASE}$ = 25 °C unless otherwise specified)

**Table 3. On/off-state**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $V_{GS}$ = 0 V, $I_D$ = 250 µA | 100 | | | V |
| $I_{DSS}$ | Zero gate voltage drain current | $V_{GS}$ = 0 V, $V_{DS}$ = max ratings | | | 1 | µA |
| $I_{GSS}$ | Gate body leakage current | $V_{DS}$ = 0 V, $V_{GS}$ = ±20 V | | | 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 2.5 | 3.5 | 4.5 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS}$ = 10 V, $I_D$ = 55 A | | 3.6 | 4.2 | mΩ |

**Table 4. Dynamic**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input capacitance | $V_{DS}$ = 50 V, f = 1 MHz, $V_{GS}$ = 0 V | - | 9000 | - | pF |
| $C_{oss}$ | Output capacitance | | | 2000 | | pF |
| $C_{rss}$ | Reverse transfer capacitance | | | 80 | | pF |
| $Q_g$ | Total gate charge | $V_{DD}$ = 50 V, $I_D$ = 110 A, $V_{GS}$ = 10 V (see Figure 13. Test circuit for gate charge behavior) | - | 127 | - | nC |
| $Q_{gs}$ | Gate-source charge | | - | 56 | - | nC |
| $Q_{gd}$ | Gate-drain charge | | - | 32 | - | nC |

**Table 5. Switching times**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD}$ = 50 V, $I_D$ = 55 A, $R_G$ = 4.7 mΩ, $V_{GS}$= 10 V (see Figure 12. Test circuit for resistive load switching times and Figure 16. Unclamped inductive waveform) | - | 37 | - | ns |
| $t_r$ | Rise time | | - | 54 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 68 | - | ns |
| $t_f$ | Fall time | | - | 33 | - | ns |

chanhvinh.com



**Table 6. Source-drain diode**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{SD}$ (1) | Forward on voltage | $I_{SD}$ = 110 A, $V_{GS}$ = 0 | - | | 1.2 | V |
| $t_{rr}$ | Reverse recovery time | $I_{SD}$ = 110 A, di/dt = 100 A/µs, $V_{DD}$ = 80 V, $T_j$ = 25°C (see Figure 14. Test circuit for inductive load switching and diode recovery times) | - | 60 | - | ns |
| $Q_{rr}$ | Reverse recovery charge | | - | 83 | - | nC |
| $I_{RRM}$ | Reverse recovery current | | - | 2.75 | - | A |

1. *Pulsed: pulse duration = 300 µs, duty cycle 1.5%.*

chanhvinh.com



## 2.1 Electrical characteristics (curves)

**Figure 1. Safe operating area**

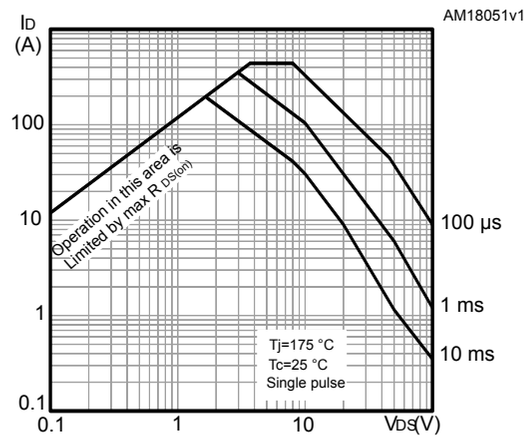



**Figure 2. Thermal impedance**

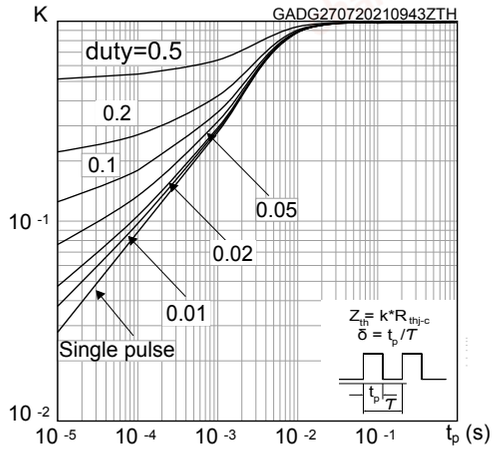



**Figure 3. Typical output characteristics**

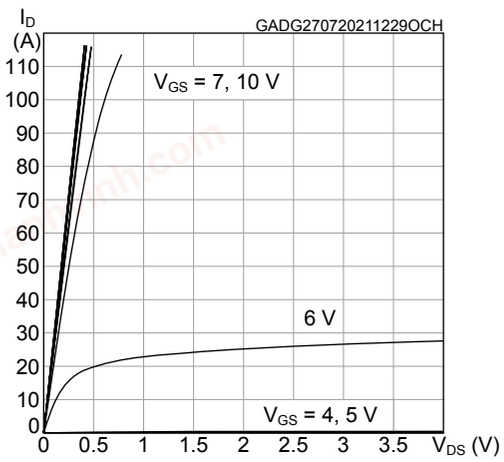



**Figure 4. Typical transfer characteristics**

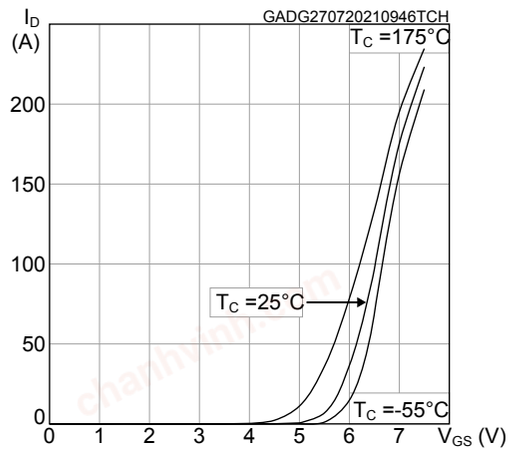



**Figure 5. Typical gate charge characteristics**

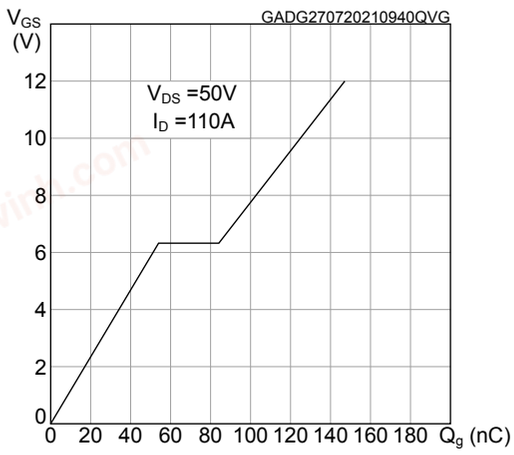
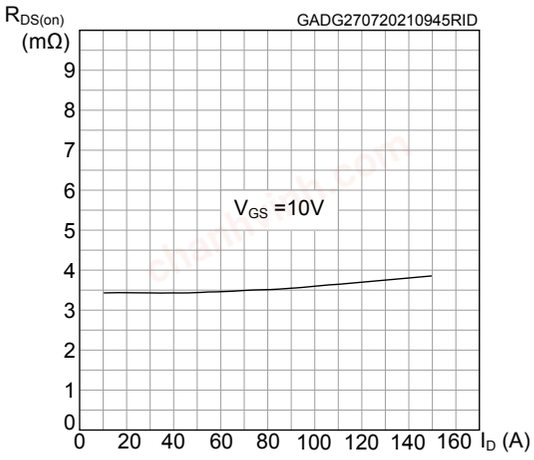



**Figure 6. Typical drain-source on-resistance**



chanhvinh.com



**Figure 7. Typical capacitance characteristics**

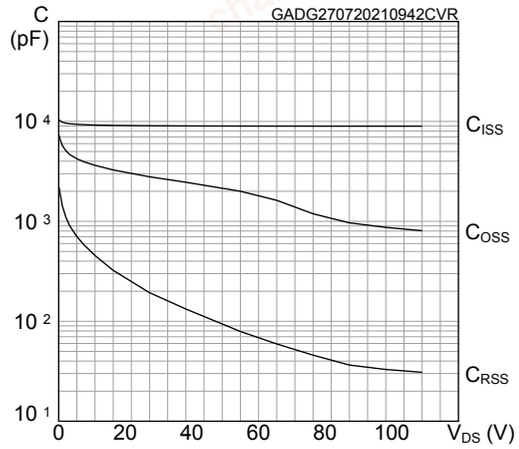



**Figure 8. Normalized gate threshold voltage vs temperature**

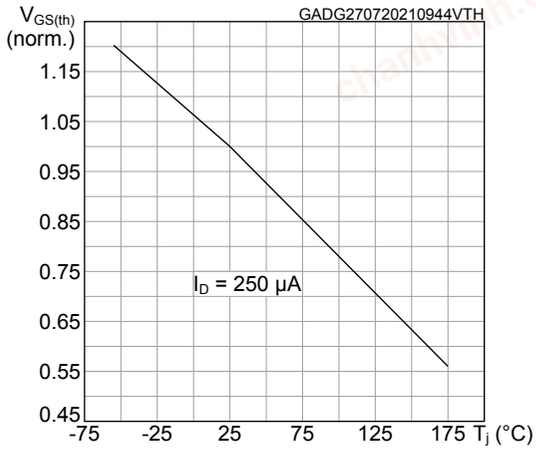



**Figure 9. Normalized on-resistance vs temperature**

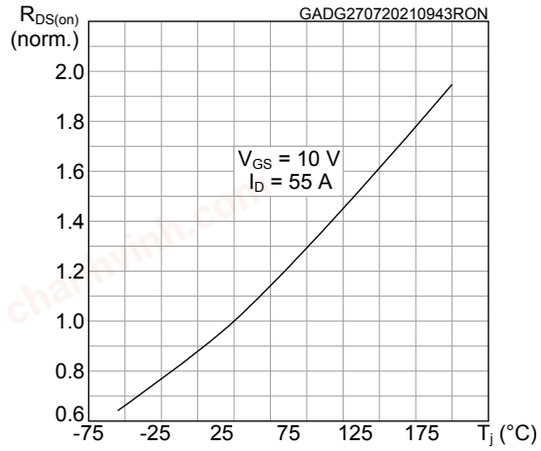



**Figure 10. Normalized $V_{(BR)DSS}$ vs temperature**

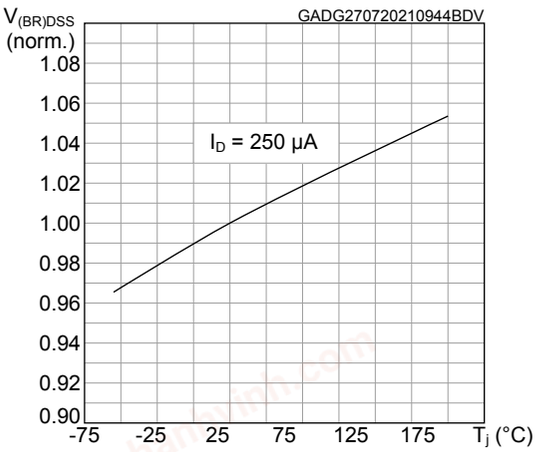
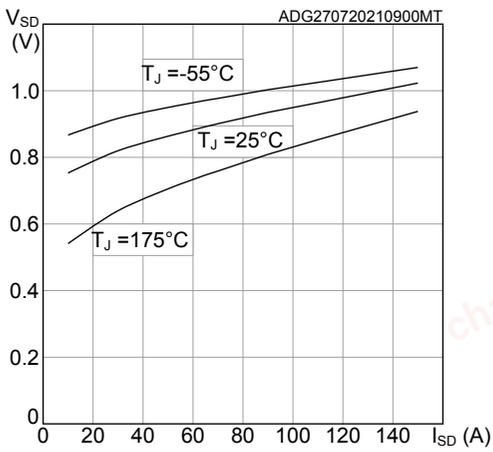



**Figure 11. Source-drain diode forward characteristics**



chanhvinh.com



# 3 Test circuits

**Figure 12. Test circuit for resistive load switching times**

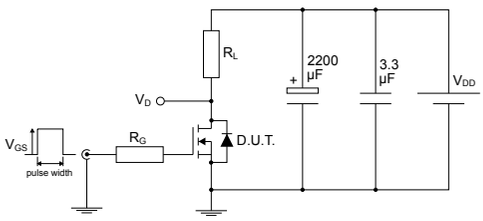



**Figure 13. Test circuit for gate charge behavior**

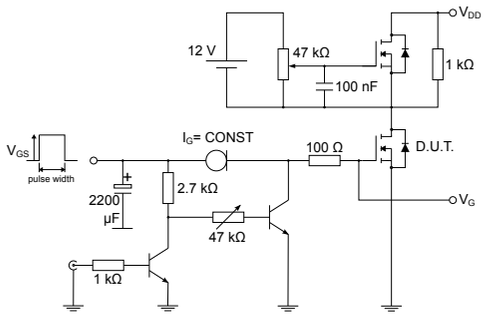



**Figure 14. Test circuit for inductive load switching and diode recovery times**

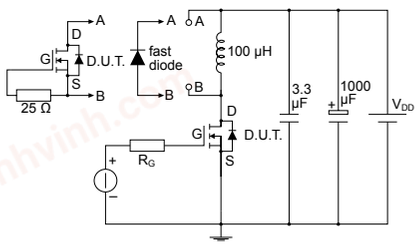



**Figure 15. Unclamped inductive load test circuit**

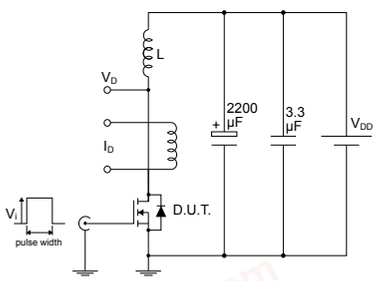



**Figure 16. Unclamped inductive waveform**

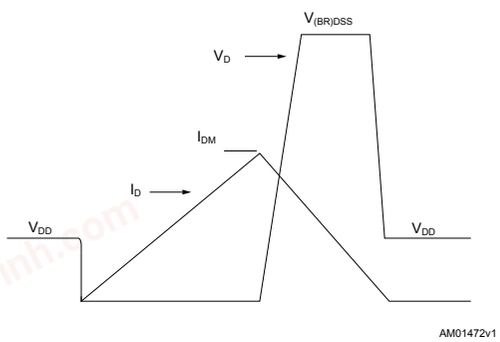
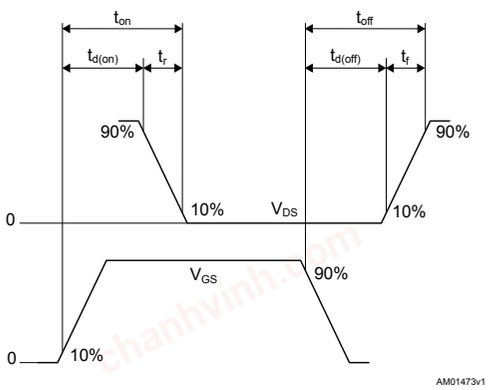



**Figure 17. Switching time waveform**



chanhvinh.com

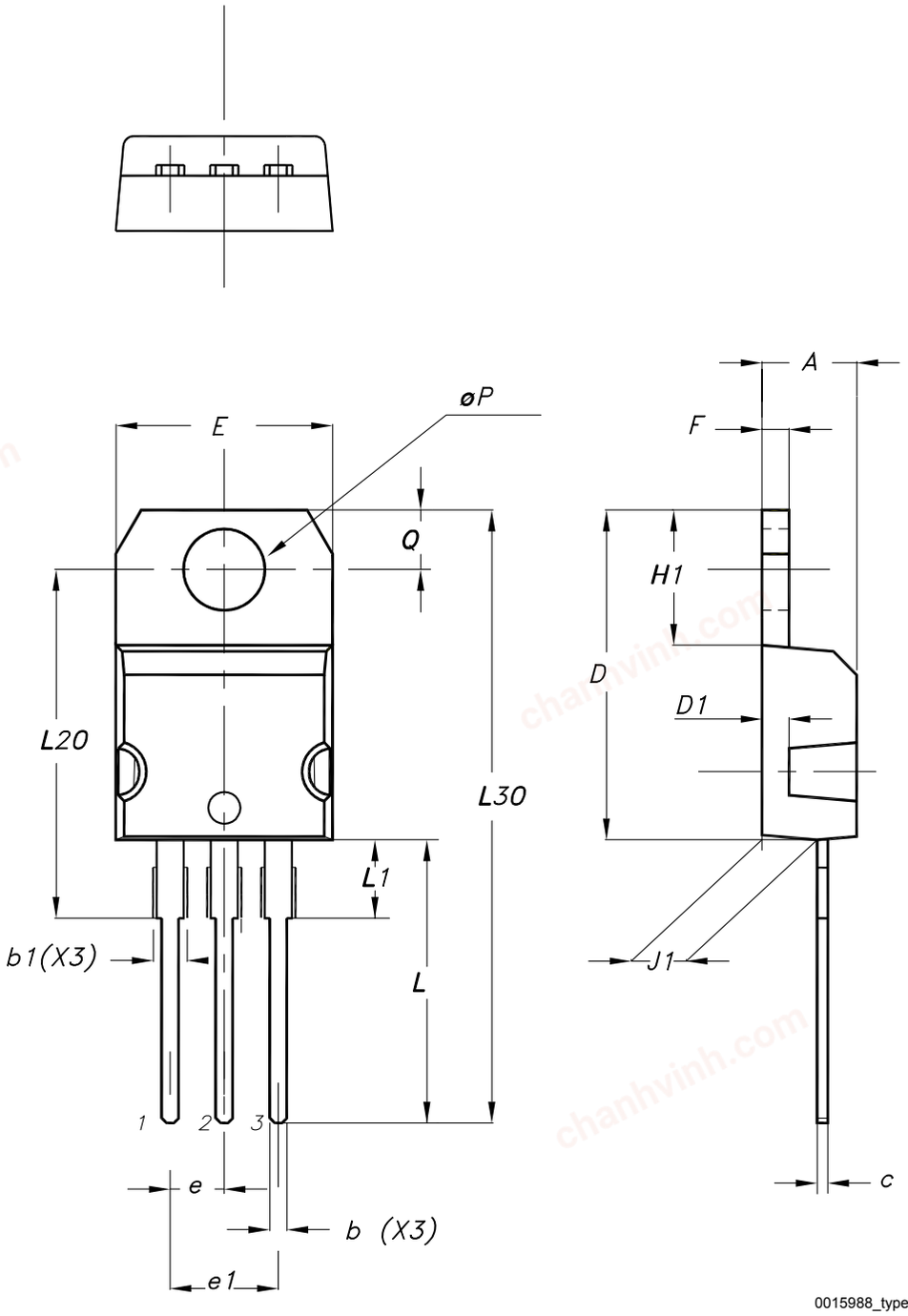


# 4 Package information

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.

## 4.1 TO-220 type A package information

Figure 18. **TO-220 type A package outline**




0015988_typeA_Rev_23

chanhvinh.com



Table 7. **TO-220 type A package mechanical data**

| Dim. | mm | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 |
| b | 0.61 | | 0.88 |
| b1 | 1.14 | | 1.55 |
| c | 0.48 | | 0.70 |
| D | 15.25 | | 15.75 |
| D1 | | 1.27 | |
| E | 10.00 | | 10.40 |
| e | 2.40 | | 2.70 |
| e1 | 4.95 | | 5.15 |
| F | 1.23 | | 1.32 |
| H1 | 6.20 | | 6.60 |
| J1 | 2.40 | | 2.72 |
| L | 13.00 | | 14.00 |
| L1 | 3.50 | | 3.93 |
| L20 | | 16.40 | |
| L30 | | 28.90 | |
| øP | 3.75 | | 3.85 |
| Q | 2.65 | | 2.95 |
| Slug flatness | | 0.03 | 0.10 |

chanhvinh.com



## Revision history

Table 8. **Document revision history**

| Date | Version | Changes |
|---|---|---|
| 27-Jul-2021 | 1 | First release |

chanhvinh.com



# Contents

1 **Electrical ratings** . . . . . 2
2 **Electrical characteristics** . . . . . 3
2.1 Electrical characteristics (curves) . . . . . 5
3 **Test circuits** . . . . . 7
4 **Package information** . . . . . 8
4.1 TO-220 type A package information . . . . . 8
**Revision history** . . . . . 10

chanhvinh.com



**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