# IMPORTANT NOTICE

**10 December 2015**

## 1. Global joint venture starts operations as WeEn Semiconductors

Dear customer,

As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

In this document where the previous NXP references remain, please use the new links as shown below.

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Thank you for your cooperation and understanding,

WeEn Semiconductors

# TYN16X-600CT

## SCR

Rev. 1 — 20 March 2012 Product data sheet

## 1. Product profile

### 1.1 General description

Planar passivated Silicon Controlled Rectifier (SCR) in a SOT186A (TO-220F) "full pack" plastic package intended for use in applications requiring high thermal cycling performance and high junction temperature capability ($T_{j(max)}$ = 150 °C).

### 1.2 Features and benefits

- High junction operating temperature capability
- High thermal cycling performance
- High voltage capability
- Planar passivated for voltage ruggedness and reliability

### 1.3 Applications

- Ignition circuits
- Motor control
- Protection circuits e.g. SMPS inrush current
- Voltage regulation

### 1.4 Quick reference data

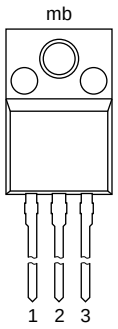
**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{DRM}$ | repetitive peak off-state voltage | | - | - | 600 | V |
| $V_{RRM}$ | repetitive peak reverse voltage | | - | - | 600 | V |
| $I_{TSM}$ | non-repetitive peak on-state current | half sine wave; $T_{j(init)}$ = 25 °C; $t_p$ = 10 ms; see Figure 4; see Figure 5 | - | - | 180 | A |
| | | half sine wave; $T_{j(init)}$ = 25 °C; $t_p$ = 8.3 ms | - | - | 198 | A |
| $T_j$ | junction temperature | | - | - | 150 | °C |
| $I_{T(AV)}$ | average on-state current | half sine wave; $T_h \leq$ 81 °C; see Figure 3 | - | - | 10.2 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_h \leq$ 81 °C; see Figure 1; see Figure 2 | - | - | 16 | A |
| **Static characteristics** | | | | | | |
| $I_{GT}$ | gate trigger current | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; see Figure 7 | - | - | 15 | mA |
| **Dynamic characteristics** | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 402 V; $T_j$ = 150 °C; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; gate open circuit | 500 | - | - | V/µs |

## 2. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K | cathode | | |
| 2 | A | anode | | |
| 3 | G | gate | | |
| mb | n.c. | mounting base; isolated | | |




SOT186A (TO-220F)


## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| TYN16X-600CT | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack" | SOT186A |

## 4. Limiting values

**Table 4. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{DRM}$ | repetitive peak off-state voltage | | - | 600 | V |
| $V_{RRM}$ | repetitive peak reverse voltage | | - | 600 | V |
| $I_{T(AV)}$ | average on-state current | half sine wave; $T_h \leq 81$ °C; see Figure 3 | - | 10.2 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_h \leq 81$ °C; see Figure 1; see Figure 2 | - | 16 | A |
| $I_{TSM}$ | non-repetitive peak on-state current | half sine wave; $T_{j(init)} = 25$ °C; $t_p = 10$ ms; see Figure 4; see Figure 5 | - | 180 | A |
| | | half sine wave; $T_{j(init)} = 25$ °C; $t_p = 8.3$ ms | - | 198 | A |
| $I^2t$ | $I^2t$ for fusing | $t_p = 10$ ms; sine-wave pulse | - | 162 | $A^2s$ |
| $dI_T/dt$ | rate of rise of on-state current | $I_T = 40$ A; $I_G = 200$ mA; $dI_G/dt = 200$ mA/µs | - | 50 | A/µs |
| $I_{GM}$ | peak gate current | | - | 4 | A |
| $V_{RGM}$ | peak reverse gate voltage | | - | 5 | V |
| $P_{GM}$ | peak gate power | | - | 10 | W |
| $P_{G(AV)}$ | average gate power | over any 20 ms period | - | 1 | W |
| $T_{stg}$ | storage temperature | | -40 | 150 | °C |
| $T_j$ | junction temperature | | - | 150 | °C |

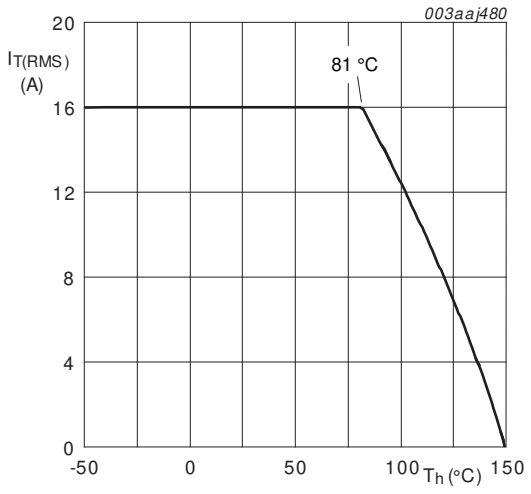



**Fig 1. RMS on-state current as a function of heatsink temperature; maximum values**

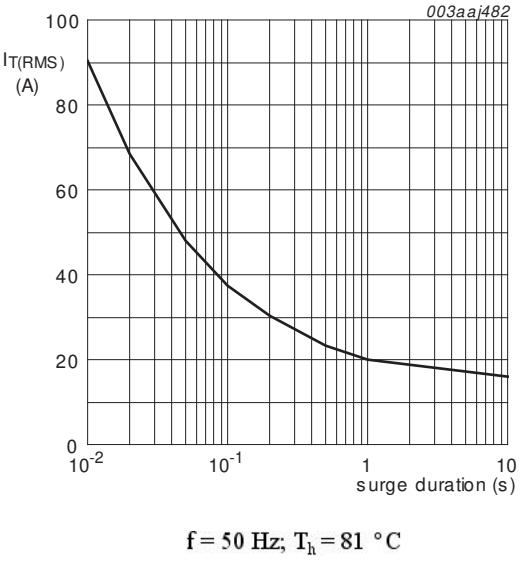
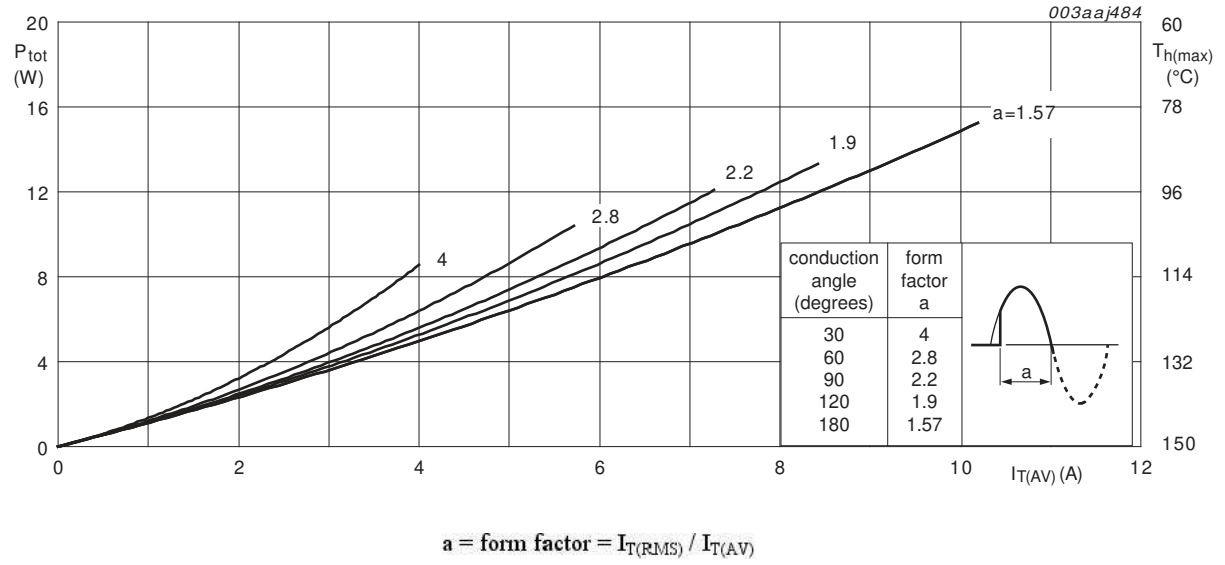
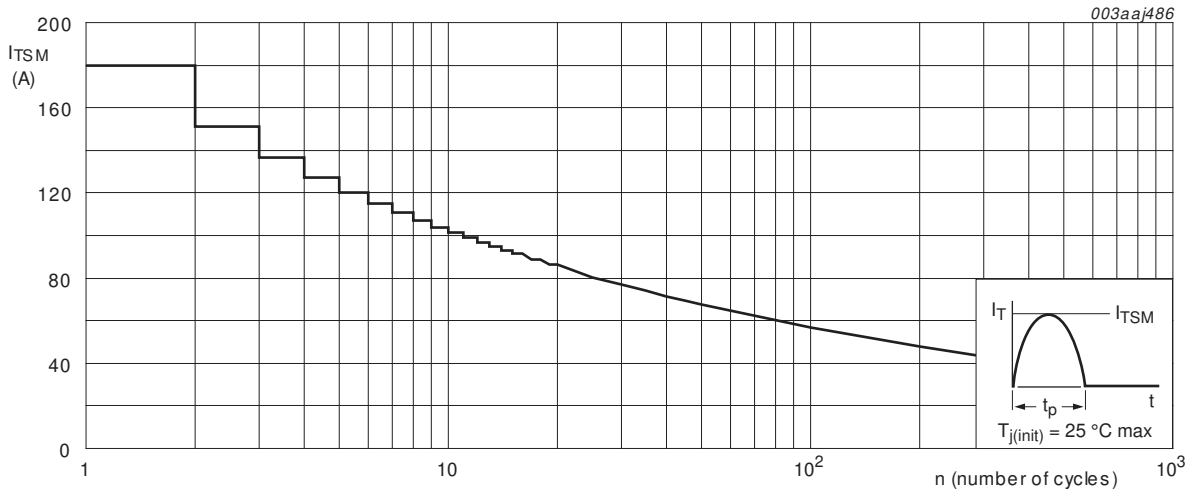



**Fig 2. RMS on-state current as a function of surge duration; maximum values**



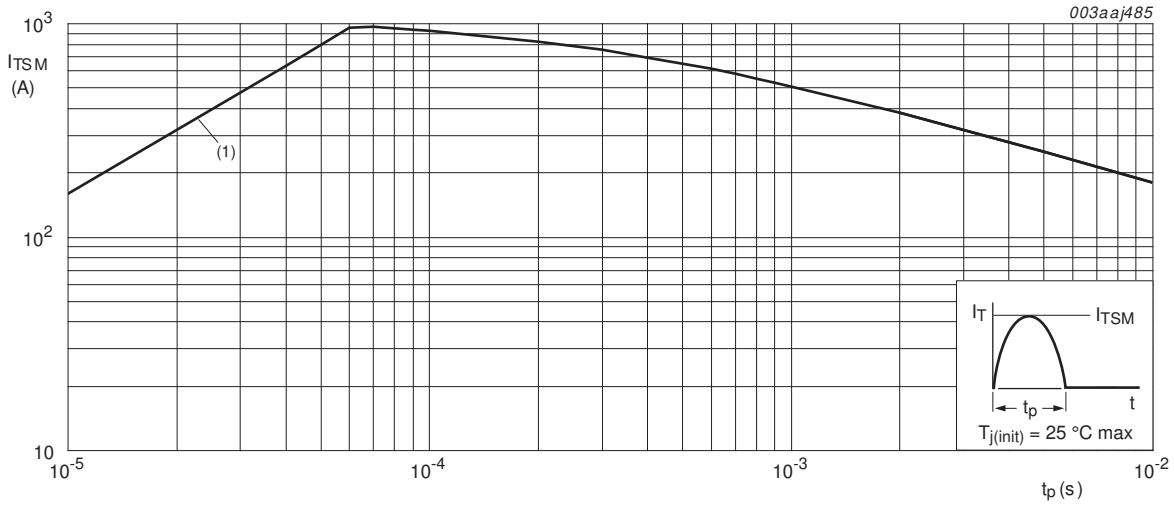

$a = \text{form factor} = I_{T(RMS)} / I_{T(AV)}$

**Fig 3. Total power dissipation as a function of average on-state current; maximum values**




$f = 50\ \text{Hz}$

**Fig 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values**



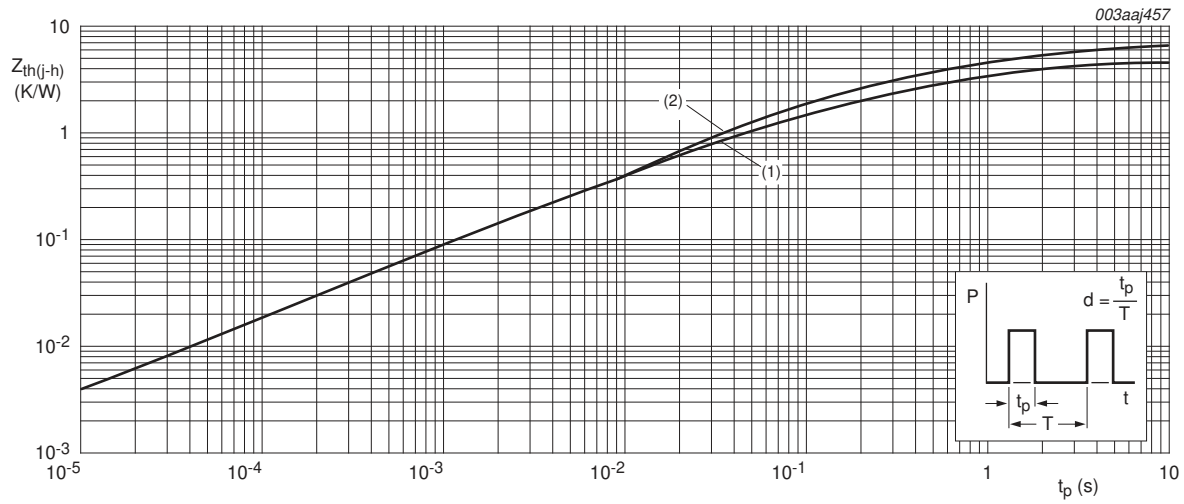

$t_p \leq 10$ ms; (1) $dI_T / dt$ limit

**Fig 5. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values**

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $R_{th(j-h)}$ | thermal resistance from junction to heatsink | full or half cycle; with heatsink compound; see Figure 6 | - | - | 4.5 | K/W |
| | | full or half cycle; without heatsink compound; see Figure 6 | - | - | 6.5 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 55 | - | K/W |




(1) with heatsink compound

(2) without heatsink compound

**Fig 6. Transient thermal impedance from junction to heatsink as a function of pulse width**

## 6. Isolation characteristics

**Table 6. Isolation characteristics**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{isol(RMS)}$ | RMS isolation voltage | from all terminals to external heatsink; sinusoidal waveform; clean and dust free ; 50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; $T_h$ = 25 °C | - | - | 2500 | V |
| $C_{isol}$ | isolation capacitance | from anode to external heatsink ; f = 1 MHz; $T_h$ = 25 °C | - | 10 | - | pF |

# 7. Characteristics

**Table 7. Characteristics**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| $I_{GT}$ | gate trigger current | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; see Figure 7 | - | - | 15 | mA |
| $I_L$ | latching current | $V_D$ = 12 V; $I_G$ = 0.1 A; $T_j$ = 25 °C; see Figure 8 | - | - | 60 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; see Figure 9 | - | - | 40 | mA |
| $V_T$ | on-state voltage | $I_T$ = 32 A; $T_j$ = 25 °C; see Figure 10 | - | 1.2 | 1.6 | V |
| $V_{GT}$ | gate trigger voltage | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; see Figure 11 | - | 0.7 | 1.3 | V |
| | | $V_D$ = 400 V; $I_T$ = 0.1 A; $T_j$ = 150 °C; see Figure 11 | 0.2 | 0.4 | - | V |
| $I_D$ | off-state current | $V_D$ = 600 V; $T_j$ = 150 °C | - | 0.2 | 1 | mA |
| $I_R$ | reverse current | $T_j$ = 150 °C; $V_R$ = 600 V | - | 0.2 | 1 | mA |
| **Dynamic characteristics** | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 402 V; $T_j$ = 150 °C; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; gate open circuit | 500 | - | - | V/µs |

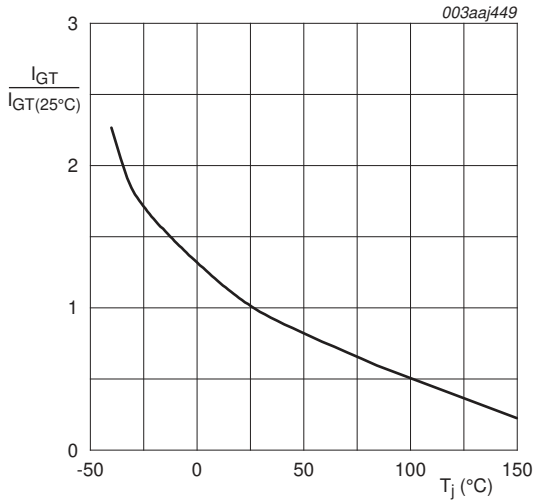



**Fig 7. Normalized gate trigger current as a function of junction temperature**

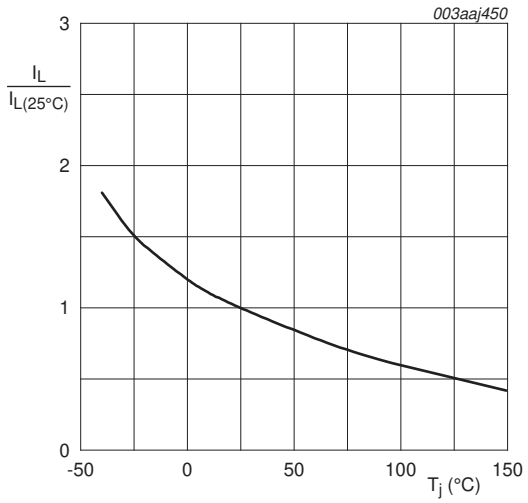



**Fig 8. Normalized latching current as a function of junction temperature**

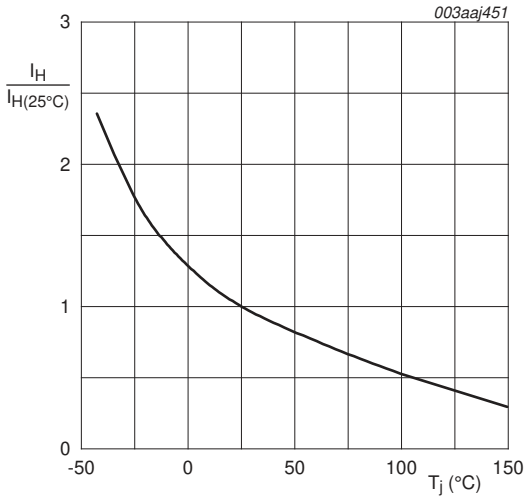
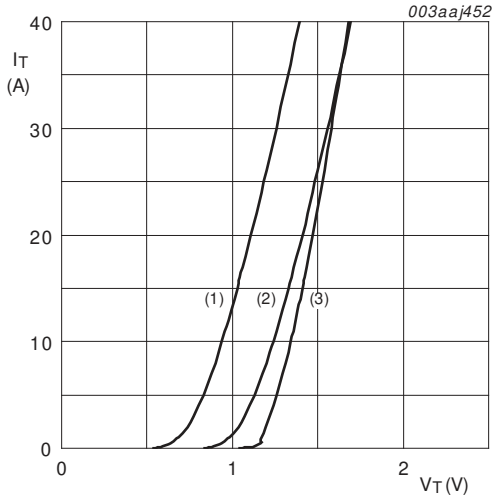



**Fig 9. Normalized holding current as a function of junction temperature**




$V_o$ = 1.08 V; $R_s$ = 0.0165 Ω

(1) $T_j$ = 150 °C; typical values

(2) $T_j$ = 150 °C; maximum values

(3) $T_j$ = 25 °C; maximum values

**Fig 10. On-state current as a function of on-state voltage**

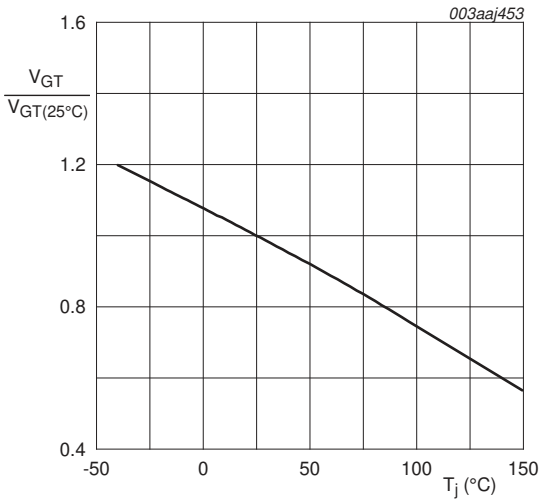
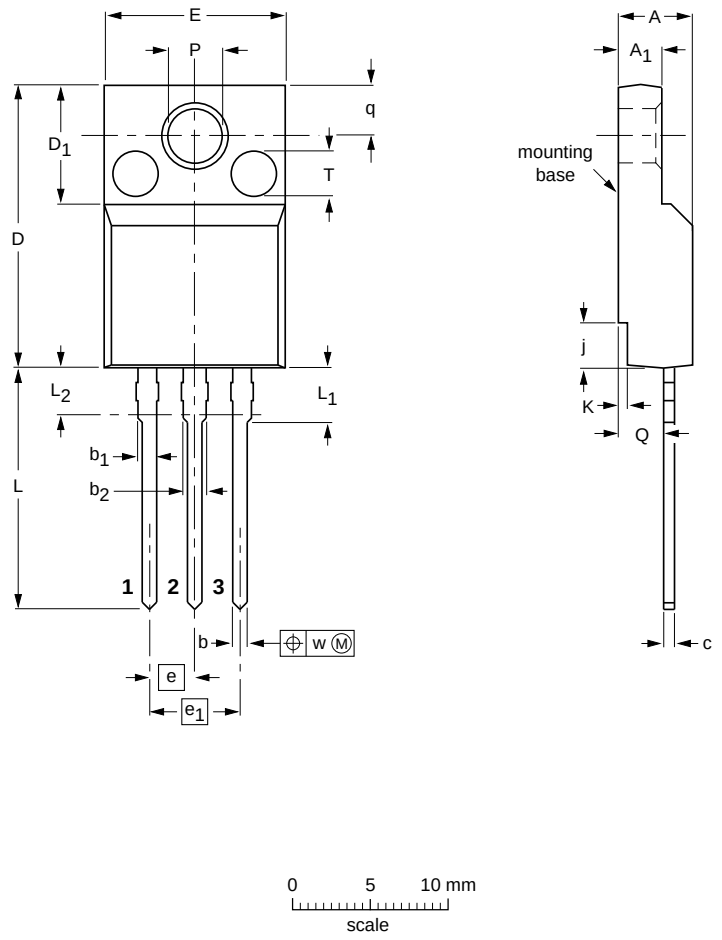



**Fig 11. Normalized gate trigger voltage as a function of junction temperature**

# 8. Package outline

**Plastic single-ended package; isolated heatsink mounted;**
**1 mounting hole; 3-lead TO-220 'full pack'**

**SOT186A**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | $A_1$ | b | $b_1$ | $b_2$ | c | D | $D_1$ | E | e | $e_1$ | j | K | L | $L_1$ | $L_2$ (1) max. | P | Q | q | T (2) | w |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 4.6<br>4.0 | 2.9<br>2.5 | 0.9<br>0.7 | 1.1<br>0.9 | 1.4<br>1.0 | 0.7<br>0.4 | 15.8<br>15.2 | 6.5<br>6.3 | 10.3<br>9.7 | 2.54 | 5.08 | 2.7<br>1.7 | 0.6<br>0.4 | 14.4<br>13.5 | 3.30<br>2.79 | 3 | 3.2<br>3.0 | 2.6<br>2.3 | 3.0<br>2.6 | 2.5 | 0.4 |

**Notes**

1. Terminal dimensions within this zone are uncontrolled.
2. Both recesses are ∅ 2.5 × 0.8 max. depth

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT186A | | 3-lead TO-220F | | | | ~~02-04-09~~<br>06-02-14 |

**Fig 12. Package outline SOT186A (TO-220F)**

# 9. Revision history

**Table 8. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| TYN16X-600CT v.1 | 20120320 | Product data sheet | - | - |

# 10. Legal information

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| Document status[1] [2] | Product status[3] | Definition |
|---|---|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

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## 12. Contents





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Date of release: 20 March 2012
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