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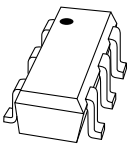


# PMGD780SN

## Dual N-channel μTrenchMOS standard level FET

Rev. 02 — 19 April 2010 Product data sheet

## 1. Product profile

### 1.1 General description

Dual N-channel enhancement mode field-effect transistor in a small SOT363 (SC-88) Surface-Mounted Device (SMD) plastic package using TrenchMOS technology.

### 1.2 Features and benefits

- Surface-mounted package
- Standard level threshold voltage
- Low on-state resistance
- Footprint 40 % smaller than SOT23
- Fast switching
- Dual device

### 1.3 Applications

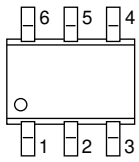
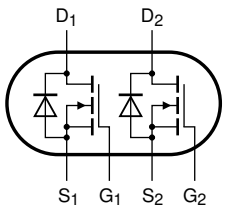
- Driver circuits
- Switching in portable appliances

### 1.4 Quick reference data

- $V_{DS} \leq 60$ V
- $P_{tot} \leq 0.41$ W
- $I_D \leq 0.49$ A
- $R_{DSon} \leq 920$ mΩ

## 2. Pinning information

Table 1. Pinning - SOT363 (SC-88), simplified outline and symbol

| Pin | Description | Simplified outline | Graphic symbol |
|---|---|---|---|
| 1 | source1 (S1) |   SOT363 (SC-88) |   msd901 |
| 2 | gate1 (G1) | | |
| 3 | drain2 (D2) | | |
| 4 | source2 (S2) | | |
| 5 | gate2 (G2) | | |
| 6 | drain1 (D1) | | |

## 3. Ordering information

**Table 2. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PMGD780SN | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |

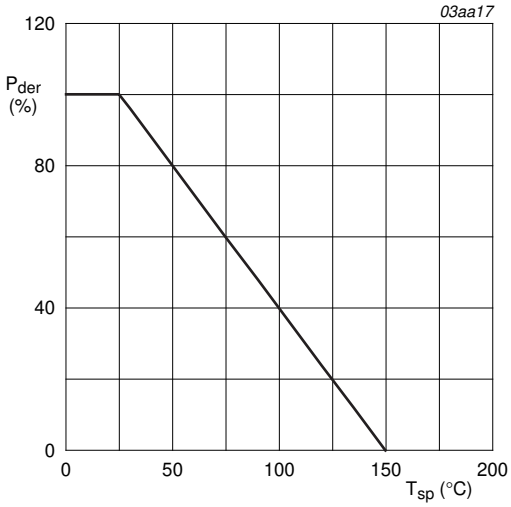
## 4. Limiting values

**Table 3. Limiting values**

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

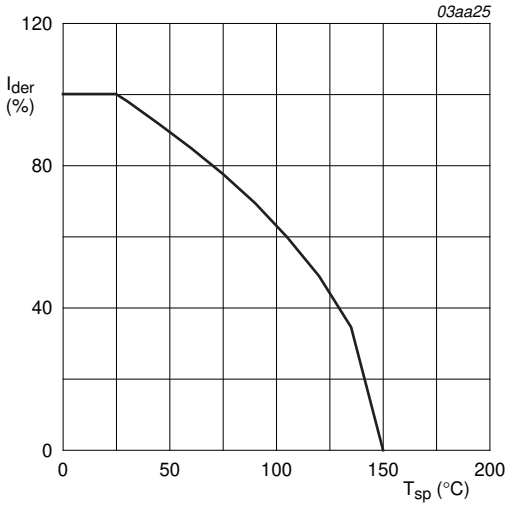
| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage | 25 °C ≤ $T_j$ ≤ 150 °C | | - | 60 | V |
| $V_{DGR}$ | drain-gate voltage | 25 °C ≤ $T_j$ ≤ 150 °C; $R_{GS}$ = 20 kΩ | | - | 60 | V |
| $V_{GS}$ | gate-source voltage | | | - | ±20 | V |
| $I_D$ | drain current | $T_{sp}$ = 25 °C; $V_{GS}$ = 10 V; Figure 2 and 3 | [1] | - | 0.49 | A |
| | | $T_{sp}$ = 100 °C; $V_{GS}$ = 10 V; Figure 2 | [1] | - | 0.31 | A |
| $I_{DM}$ | peak drain current | $T_{sp}$ = 25 °C; pulsed; $t_p$ ≤ 10 μs; Figure 3 | [1] | - | 0.99 | A |
| $P_{tot}$ | total power dissipation | $T_{sp}$ = 25 °C; Figure 1 | | - | 0.41 | W |
| $T_{stg}$ | storage temperature | | | −55 | +150 | °C |
| $T_j$ | junction temperature | | | −55 | +150 | °C |
| **Source-drain diode** | | | | | | |
| $I_S$ | source current | $T_{sp}$ = 25 °C | [1] | - | 0.34 | A |
| $I_{SM}$ | peak source current | $T_{sp}$ = 25 °C; pulsed; $t_p$ ≤ 10 μs | [1] | - | 0.69 | A |

[1] Single device conducting.



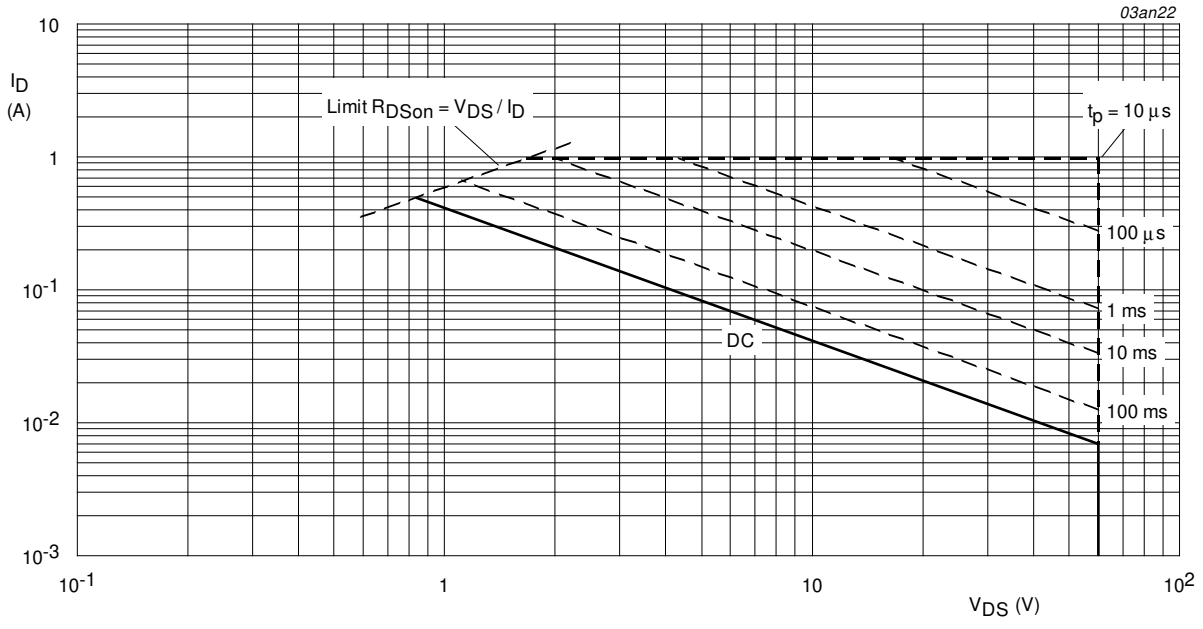

$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

**Fig 1. Normalized total power dissipation as a function of solder point temperature**




$$I_{der} = \frac{I_D}{I_{D(25^{\circ}C)}} \times 100\%$$

**Fig 2. Normalized continuous drain current as a function of solder point temperature**




$T_{sp}$ = 25 °C; $I_{DM}$ is single pulse; $V_{GS}$ = 10 V

**Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage**

## 5. Thermal characteristics

**Table 4. Thermal characteristics**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | Figure 4 | - | - | 300 | K/W |

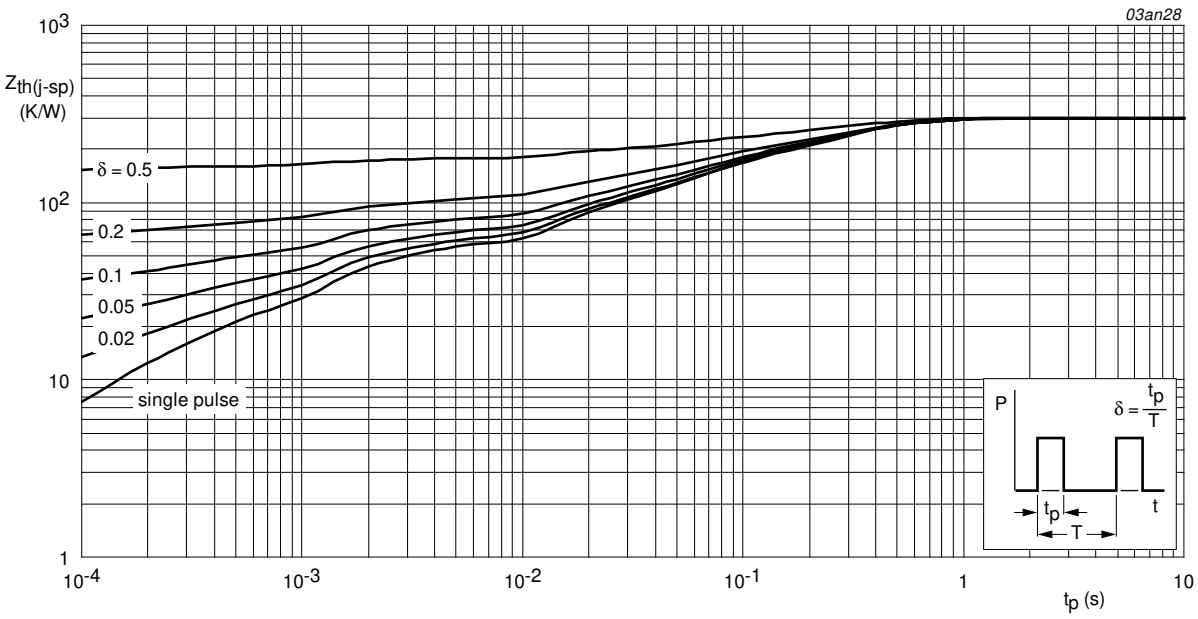


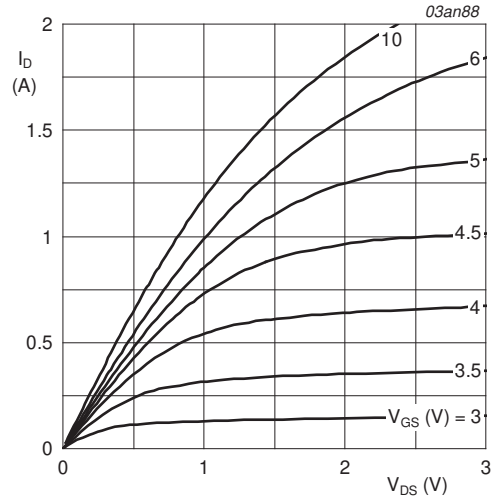

**Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration**

## 6. Characteristics

**Table 5. Characteristics**

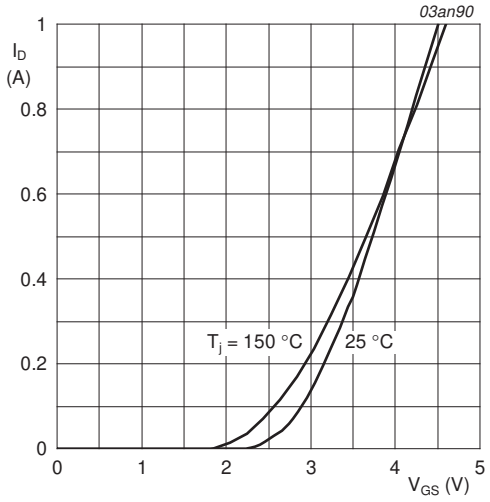
*$T_j$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D$ = 250 μA; $V_{GS}$ = 0 V | | | | |
| | | $T_j$ = 25 °C | 60 | - | - | V |
| | | $T_j$ = −55 °C | 55 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $I_D$ = 0.25 mA; $V_{DS}$ = $V_{GS}$; Figure 9 | | | | |
| | | $T_j$ = 25 °C | 1 | 2 | 2.5 | V |
| | | $T_j$ = 150 °C | 0.6 | – | – | V |
| | | $T_j$ = −55 °C | – | – | 3.5 | V |
| $I_{DSS}$ | drain leakage current | $V_{DS}$ = 60 V; $V_{GS}$ = 0 V | | | | |
| | | $T_j$ = 25 °C | - | 0.05 | 1 | μA |
| | | $T_j$ = 150 °C | - | - | 100 | μA |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = ±20 V; $V_{DS}$ = 0 V | - | 10 | 100 | nA |
| $R_{DSon}$ | drain-source on-state resistance | $V_{GS}$ = 10 V; $I_D$ = 0.3 A; Figure 7 and 8 | | | | |
| | | $T_j$ = 25 °C | - | 780 | 920 | mΩ |
| | | $T_j$ = 150 °C | - | 1445 | 1700 | mΩ |
| | | $V_{GS}$ = 4.5 V; $I_D$ = 0.075 A; Figure 7 and 8 | - | 1100 | 1400 | mΩ |
| **Dynamic characteristics** | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $I_D$ = 1 A; $V_{DD}$ = 30 V; $V_{GS}$ = 10 V; Figure 13 | - | 1.05 | - | nC |
| $Q_{GS}$ | gate-source charge | | - | 0.2 | - | nC |
| $Q_{GD}$ | gate-drain charge | | - | 0.22 | - | nC |
| $C_{iss}$ | input capacitance | $V_{GS}$ = 0 V; $V_{DS}$ = 30 V; f = 1 MHz; Figure 11 | - | 23 | - | pF |
| $C_{oss}$ | output capacitance | | - | 5 | - | pF |
| $C_{rss}$ | reverse transfer capacitance | | - | 3.5 | - | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DD}$ = 30 V; $R_L$ = 30 Ω; $V_{GS}$ = 10 V; $R_G$ = 6 Ω | - | 2 | - | ns |
| $t_r$ | rise time | | - | 4 | - | ns |
| $t_{d(off)}$ | turn-off delay time | | - | 5 | - | ns |
| $t_f$ | fall time | | - | 2.2 | - | ns |
| **Source-drain diode** | | | | | | |
| $V_{SD}$ | source-drain voltage | $I_S$ = 0.3 A; $V_{GS}$ = 0 V; Figure 12 | - | 0.83 | 1.2 | V |



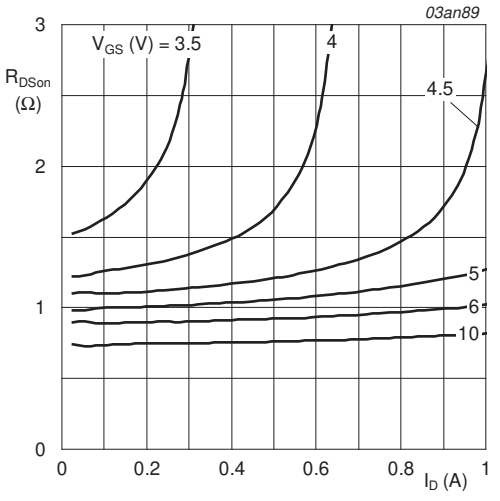

$T_j$ = 25 °C

**Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values**



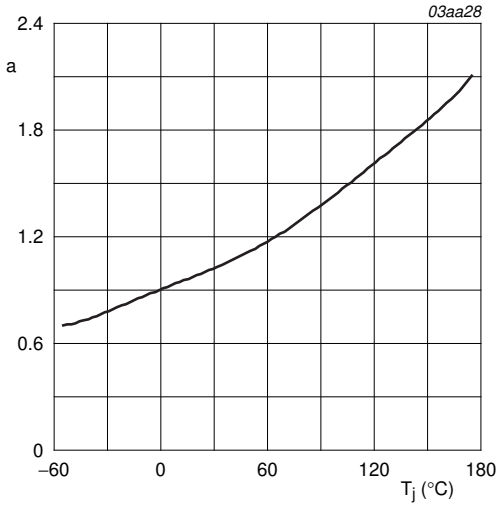

$T_j$ = 25 °C and 150 °C; $V_{DS} > I_D \times R_{DSon}$

**Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values**



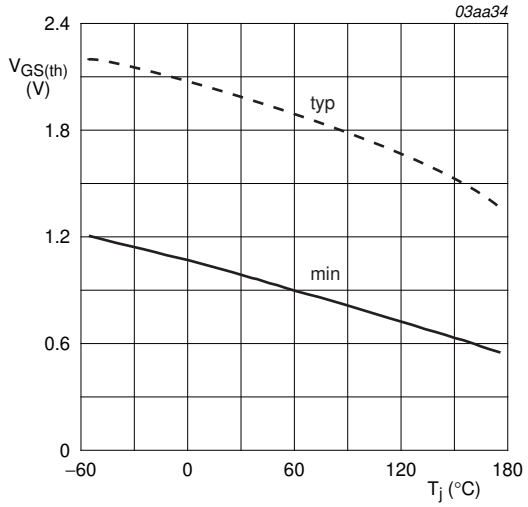

$T_j$ = 25 °C

**Fig 7. Drain-source on-state resistance as a function of drain current; typical values**



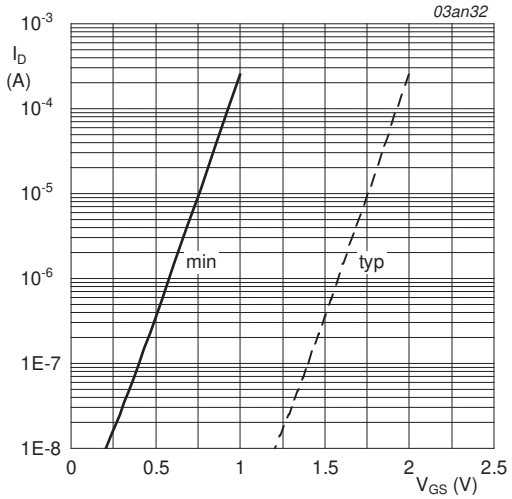

$$a = \frac{R_{DSon}}{R_{DSon(25\,^{\circ}C)}}$$

**Fig 8. Normalized drain-source on-state resistance as a function of junction temperature**



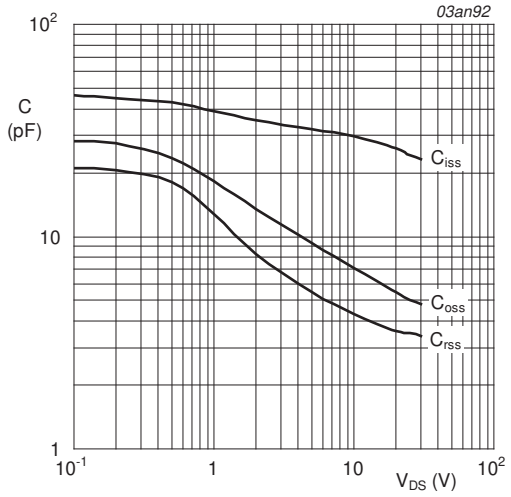

$I_D$ = 0.25 mA; $V_{DS}$ = $V_{GS}$

**Fig 9. Gate-source threshold voltage as a function of junction temperature**



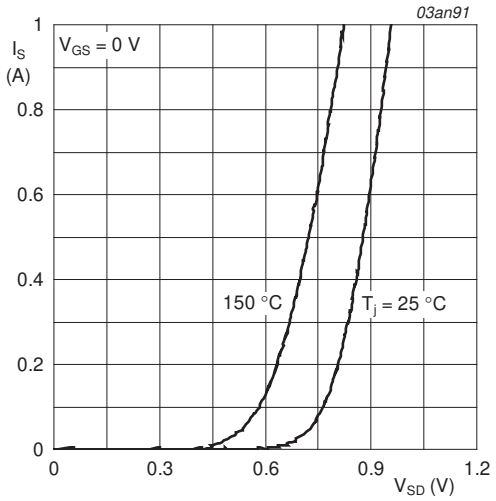

$T_j$ = 25 °C; $V_{DS}$ = 5 V

**Fig 10. Sub-threshold drain current as a function of gate-source voltage**



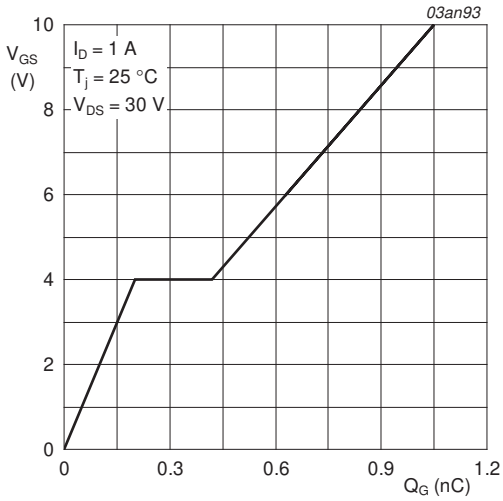

$V_{GS}$ = 0 V; f = 1 MHz

**Fig 11. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values**




$T_j$ = 25 °C and 150 °C; $V_{GS}$ = 0 V

**Fig 12. Source current as a function of source-drain voltage; typical values**

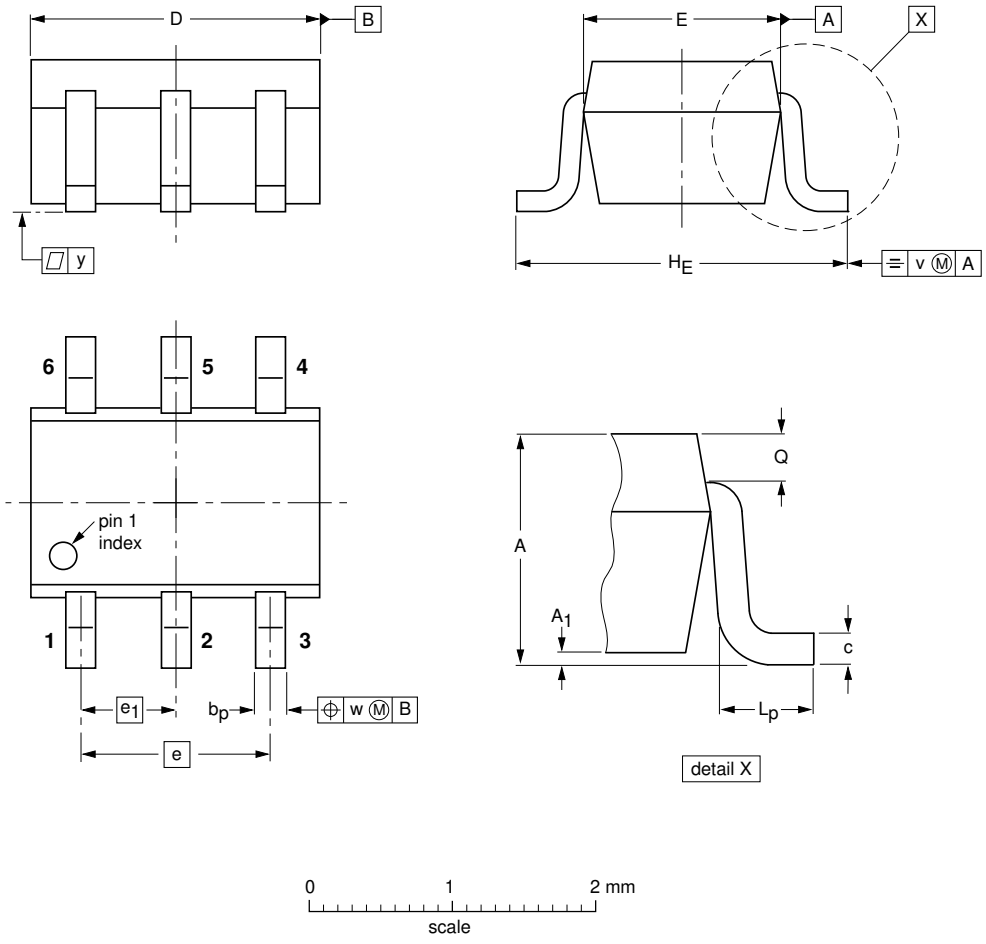



$I_D$ = 1 A; $V_{DD}$ = 30 V

**Fig 13. Gate-source voltage as a function of gate charge; typical values**

## 7. Package outline

**Plastic surface-mounted package; 6 leads** **SOT363**




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

| UNIT | A | $A_1$ max | $b_p$ | c | D | E | e | $e_1$ | $H_E$ | $L_p$ | Q | v | w | y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1<br>0.8 | 0.1 | 0.30<br>0.20 | 0.25<br>0.10 | 2.2<br>1.8 | 1.35<br>1.15 | 1.3 | 0.65 | 2.2<br>2.0 | 0.45<br>0.15 | 0.25<br>0.15 | 0.2 | 0.2 | 0.1 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT363 | | | SC-88 | | | ~~04-11-08~~<br>06-03-16 |

**Fig 14. Package outline SOT363 (SC-88)**

## 8. Soldering

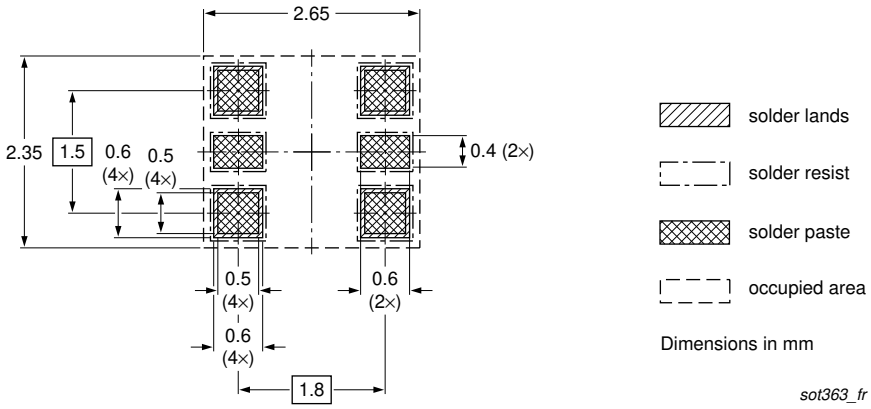



**Fig 15. Reflow soldering footprint SOT363 (SC-88)**

## 9. Revision history

**Table 6. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PMGD780SN_2 | 20100419 | Product data sheet | - | PMGD780SN_1 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Table 5 “Characteristics”: added $V_{GS(th)}$ maximum value at condition $T_j$ = 25 °C<br>• Section 10 “Legal information”: updated | | | |
| PMGD780SN_1 | 20040211 | Product data | - | - |

# 10. Legal information

## 10.1 Data sheet status

| 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.

[2] The term 'short data sheet' is explained in section "Definitions".

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## 12. Contents





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Date of release: 19 April 2010
Document identifier: PMGD780SN_2