

# FQA8N100C

## 1000V N-Channel MOSFET

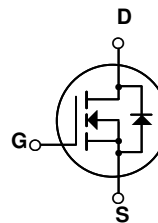
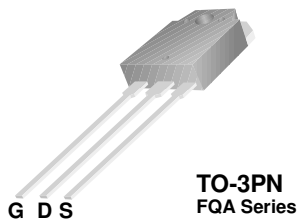
### Features

- 8A, 1000V,  $R_{DS(on)} = 1.45\Omega$  @  $V_{GS} = 10V$
- Low gate charge (typical 53 nC)
- Low  $C_{rss}$  (typical 16 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

### Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficient switched mode power supplies.



### Absolute Maximum Ratings

| Symbol         | Parameter                                                                    | FQA8N100C   | Unit                |
|----------------|------------------------------------------------------------------------------|-------------|---------------------|
| $V_{DSS}$      | Drain-Source Voltage                                                         | 1000        | V                   |
| $I_D$          | Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ )                      | 8           | A                   |
|                | - Continuous ( $T_C = 100^\circ\text{C}$ )                                   | 5           | A                   |
| $I_{DM}$       | Drain Current - Pulsed (Note 1)                                              | 32          | A                   |
| $V_{GSS}$      | Gate-Source voltage                                                          | $\pm 30$    | V                   |
| $E_{AS}$       | Single Pulsed Avalanche Energy (Note 2)                                      | 850         | mJ                  |
| $I_{AR}$       | Avalanche Current (Note 1)                                                   | 8           | A                   |
| $E_{AR}$       | Repetitive Avalanche Energy (Note 1)                                         | 22.5        | mJ                  |
| dv/dt          | Peak Diode Recovery dv/dt (Note 3)                                           | 4.0         | V/ns                |
| $P_D$          | Power Dissipation ( $T_C = 25^\circ\text{C}$ )                               | 225         | W                   |
|                | - Derate above $25^\circ\text{C}$                                            | 1.79        | W/ $^\circ\text{C}$ |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                                      | -55 to +150 | $^\circ\text{C}$    |
| $T_L$          | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds | 300         | $^\circ\text{C}$    |

### Thermal Characteristics

| Symbol          | Parameter                               | Min. | Max. | Unit               |
|-----------------|-----------------------------------------|------|------|--------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case    | --   | 0.56 | $^\circ\text{C/W}$ |
| $R_{\theta CS}$ | Thermal Resistance, Case-to-Sink        | 0.24 | --   | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | --   | 40   | $^\circ\text{C/W}$ |

## Package Marking and Ordering Information

| Device Marking | Device    | Package | Reel Size | Tape Width | Quantity |
|----------------|-----------|---------|-----------|------------|----------|
| FQA8N100C      | FQA8N100C | TO-3PN  | --        | --         | 30       |

## Electrical Characteristics T<sub>C</sub> = 25°C unless otherwise noted

| Symbol                                                 | Parameter                                             | Conditions                                                                                      | Min. | Typ. | Max       | Units    |
|--------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------------------|------|------|-----------|----------|
| Off Characteristics                                    |                                                       |                                                                                                 |      |      |           |          |
| BV <sub>DSS</sub>                                      | Drain-Source Breakdown Voltage                        | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                                    | 1000 | --   | --        | V        |
| ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>                   | Breakdown Voltage Temperature Coefficient             | I <sub>D</sub> = 250μA, Referenced to 25°C                                                      | --   | 1.4  | --        | V/°C     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                       | V <sub>DS</sub> = 1000V, V <sub>GS</sub> = 0V<br>V <sub>DS</sub> = 800V, T <sub>C</sub> = 125°C | --   | --   | 10<br>100 | μA<br>μA |
| I <sub>GSSF</sub>                                      | Gate-Body Leakage Current, Forward                    | V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V                                                     | --   | --   | 100       | nA       |
| I <sub>GSSR</sub>                                      | Gate-Body Leakage Current, Reverse                    | V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V                                                    | --   | --   | -100      | nA       |
| On Characteristics                                     |                                                       |                                                                                                 |      |      |           |          |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                      | 3.0  | --   | 5.0       | V        |
| R <sub>DS(on)</sub>                                    | Static Drain-Source On-Resistance                     | V <sub>GS</sub> = 10V, I <sub>D</sub> = 4A                                                      | --   | 1.2  | 1.45      | Ω        |
| g <sub>FS</sub>                                        | Forward Transconductance                              | V <sub>DS</sub> = 50V, I <sub>D</sub> = 4A (Note 4)                                             | --   | 8.0  | --        | S        |
| Dynamic Characteristics                                |                                                       |                                                                                                 |      |      |           |          |
| C <sub>iss</sub>                                       | Input Capacitance                                     | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                      | --   | 2475 | 3220      | pF       |
| C <sub>oss</sub>                                       | Output Capacitance                                    |                                                                                                 | --   | 195  | 255       | pF       |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                          |                                                                                                 | --   | 16   | 24        | pF       |
| Switching Characteristics                              |                                                       |                                                                                                 |      |      |           |          |
| t <sub>d(on)</sub>                                     | Turn-On Delay Time                                    | V <sub>DD</sub> = 500V, I <sub>D</sub> = 8A<br>R <sub>G</sub> = 25Ω<br><br>(Note 4, 5)          | --   | 50   | 110       | ns       |
| t <sub>r</sub>                                         | Turn-On Rise Time                                     |                                                                                                 | --   | 95   | 200       | ns       |
| t <sub>d(off)</sub>                                    | Turn-Off Delay Time                                   |                                                                                                 | --   | 122  | 254       | ns       |
| t <sub>f</sub>                                         | Turn-Off Fall Time                                    |                                                                                                 | --   | 80   | 170       | ns       |
| Q <sub>g</sub>                                         | Total Gate Charge                                     | V <sub>DS</sub> = 800V, I <sub>D</sub> = 8A<br>V <sub>GS</sub> = 10V<br><br>(Note 4, 5)         | --   | 53   | 70        | nC       |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                    |                                                                                                 | --   | 13   | --        | nC       |
| Q <sub>gd</sub>                                        | Gate-Drain Charge                                     |                                                                                                 | --   | 23   | --        | nC       |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                       |                                                                                                 |      |      |           |          |
| I <sub>S</sub>                                         | Maximum Continuous Drain-Source Diode Forward Current |                                                                                                 | --   | --   | 8         | A        |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain-Source Diode Forward Current     |                                                                                                 | --   | --   | 32        | A        |
| V <sub>SD</sub>                                        | Drain-Source Diode Forward Voltage                    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 8A                                                       | --   | --   | 1.4       | V        |
| t <sub>rr</sub>                                        | Reverse Recovery Time                                 | V <sub>GS</sub> = 0V, I <sub>S</sub> = 8A<br>dI <sub>F</sub> /dt = 100A/μs (Note 4)             | --   | 620  | --        | ns       |
| Q <sub>rr</sub>                                        | Reverse Recovery Charge                               |                                                                                                 | --   | 5.2  | --        | μC       |

### NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 25mH, I<sub>AS</sub> = 8A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω, Starting T<sub>J</sub> = 25°C
3. I<sub>SD</sub> ≤ 8A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

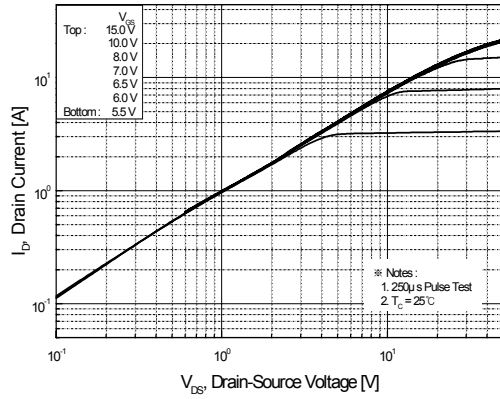


Figure 2. Transfer Characteristics

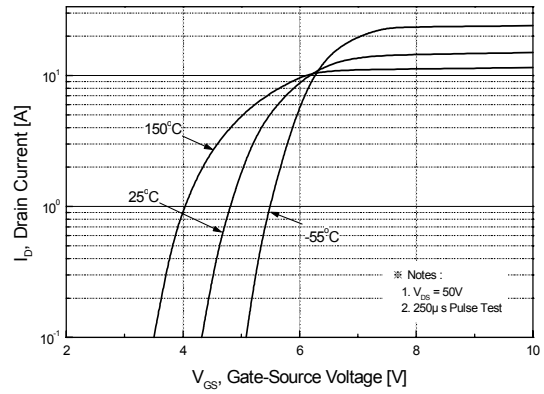


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

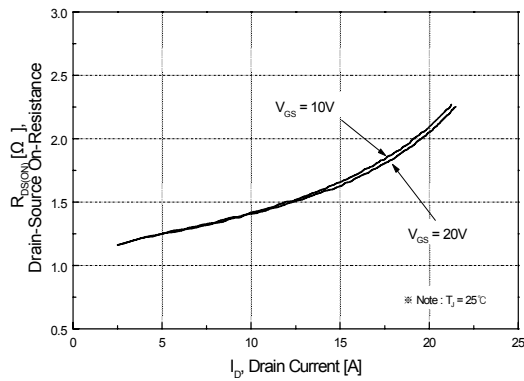


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

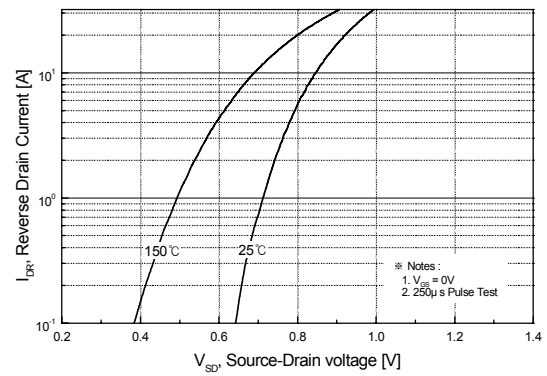


Figure 5. Capacitance Characteristics

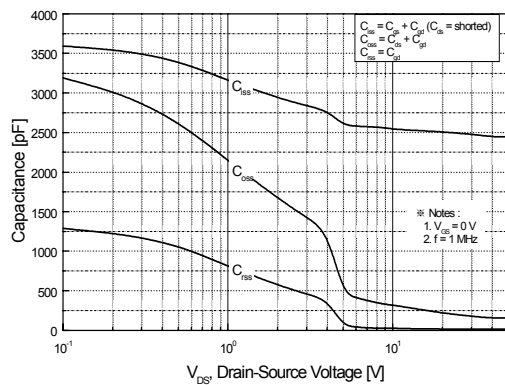
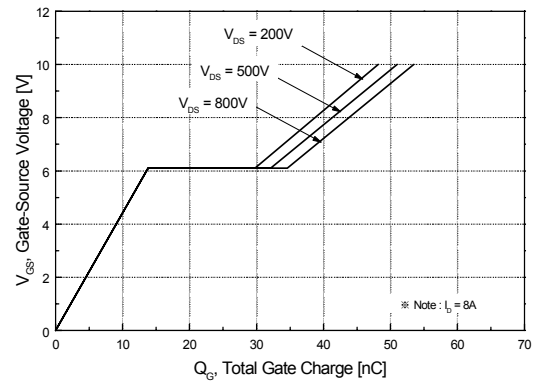
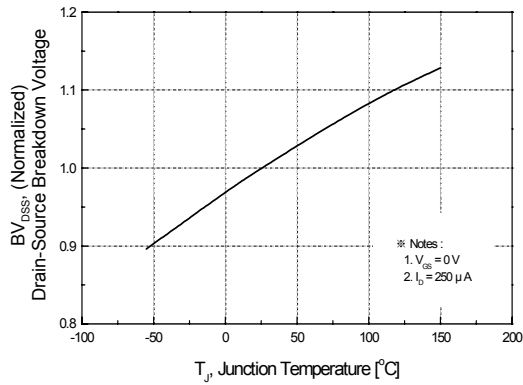


Figure 6. Gate Charge Characteristics

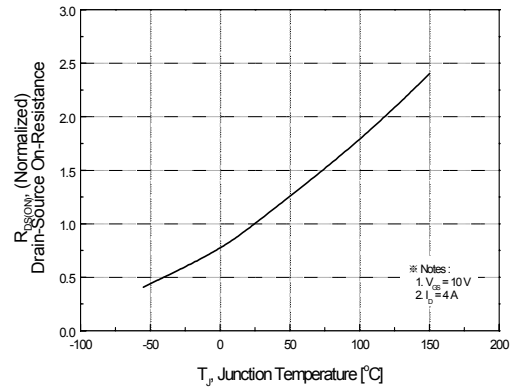


## Typical Performance Characteristics (Continued)

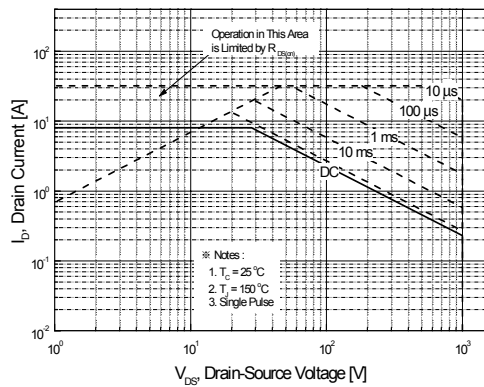
**Figure 7. Breakdown Voltage Variation vs. Temperature**



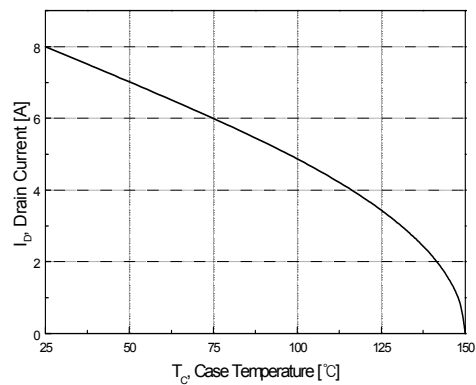
**Figure 8. On-Resistance Variation vs. Temperature**



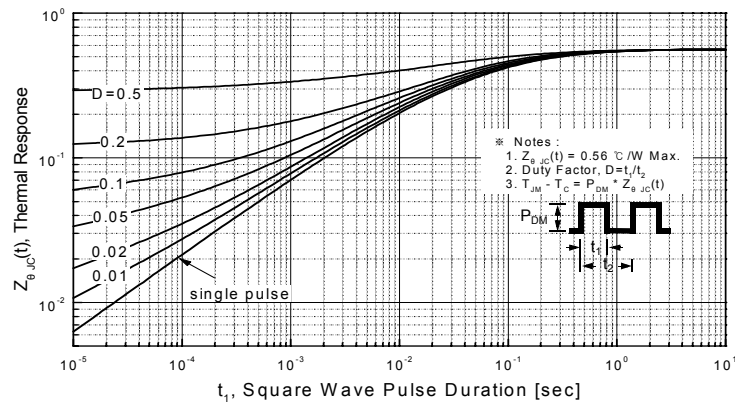
**Figure 9. Maximum Safe Operating Area**



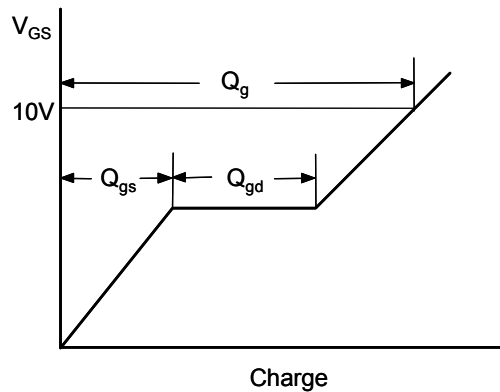
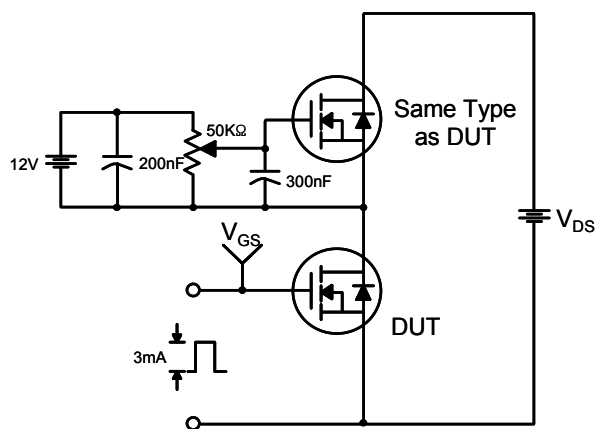
**Figure 10. Maximum Drain Current vs. Case Temperature**



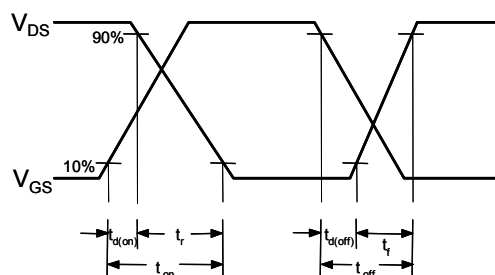
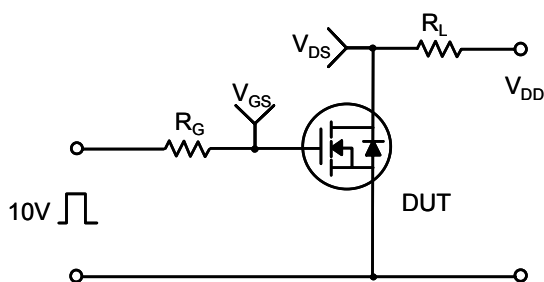
**Figure 11. Transient Thermal Response Curve**



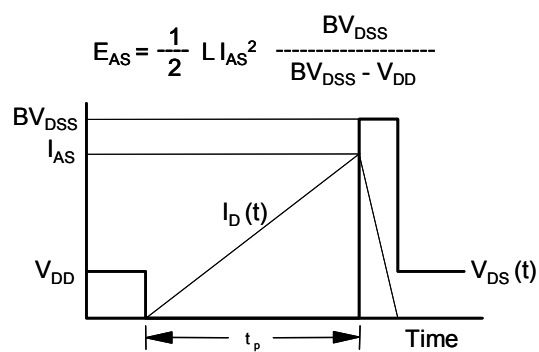
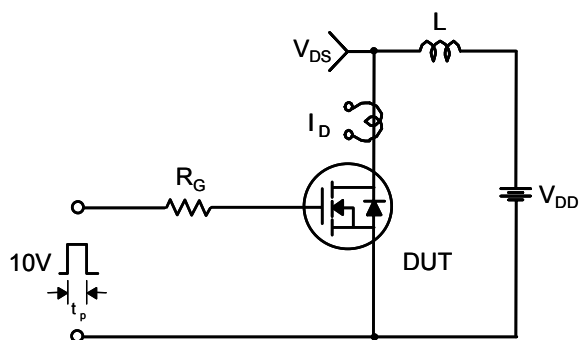
Gate Charge Test Circuit &amp; Waveform



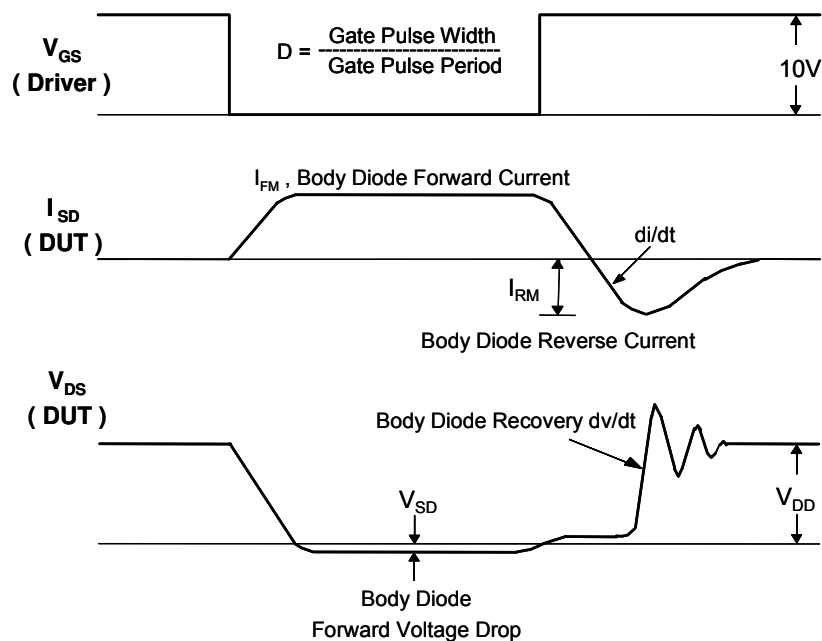
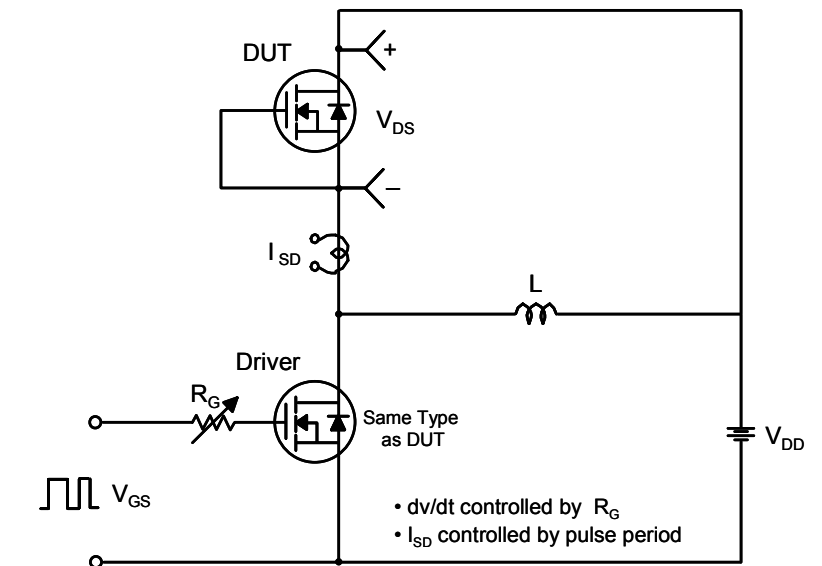
Resistive Switching Test Circuit &amp; Waveforms



Unclamped Inductive Switching Test Circuit &amp; Waveforms



## Peak Diode Recovery dv/dt Test Circuit &amp; Waveforms





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| Datasheet Identification | Product Status         | Definition                                                                                                                                                                                                            |
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