# N-Channel Power MOSFET

20V, 3.9A, 65mΩ

## FEATURES

- Low $R_{DS(ON)}$ to minimize conductive losses
- Low gate charge for fast power switching
- Compliant to RoHS directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

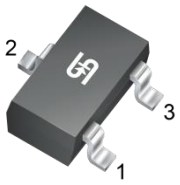
| KEY PERFORMANCE PARAMETERS | | | |
|---|---|---|---|
| **PARAMETER** | | **VALUE** | **UNIT** |
| $V_{DS}$ | | 20 | V |
| $R_{DS(on)}$ (max) | $V_{GS}$ = 4.5V | 65 | mΩ |
| | $V_{GS}$ = 2.5V | 95 | |
| $Q_g$ | | 7.8 | nC |

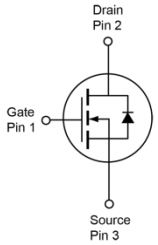
## APPLICATIONS

- Load switch
- Backlights

Pb-Free RoHS COMPLIANT HALOGEN FREE

**SOT-23**




**Note:** MSL 3 (Moisture Sensitivity Level) per J-STD-020

| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise noted) | | | | |
|---|---|---|---|---|
| **PARAMETER** | | **SYMBOL** | **LIMIT** | **UNIT** |
| Drain-Source Voltage | | $V_{DS}$ | 20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±8 | V |
| Continuous Drain Current (Note 1) | $T_C$ = 25°C | $I_D$ | 3.9 | A |
| | $T_A$ = 25°C | | 3.2 | |
| Pulsed Drain Current | | $I_{DM}$ | 15.6 | A |
| Total Power Dissipation | $T_C$ = 25°C | $P_D$ | 1.5 | W |
| | $T_C$ = 125°C | | 0.3 | |
| Total Power Dissipation | $T_A$ = 25°C | $P_D$ | 1 | W |
| | $T_A$ = 125°C | | 0.2 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | - 55 to +150 | °C |

| THERMAL PERFORMANCE | | | |
|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **LIMIT** | **UNIT** |
| Junction to Case Thermal Resistance | $R_{\Theta JC}$ | 84 | °C/W |
| Junction to Ambient Thermal Resistance | $R_{\Theta JA}$ | 124 | °C/W |

**Thermal Performance Note:** $R_{\Theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistances. The case-thermal reference is defined at the solder mounting surface of the drain pins. $R_{\Theta JA}$ is guaranteed by design while $R_{\Theta CA}$ is determined by the user's board design.

| ELECTRICAL SPECIFICATIONS ($T_A$ = 25°C unless otherwise noted) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **CONDITIONS** | **SYMBOL** | **MIN** | **TYP** | **MAX** | **UNIT** |
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250μA | $BV_{DSS}$ | 20 | -- | -- | V |
| Gate Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250μA | $V_{GS(TH)}$ | 0.65 | 0.9 | 1.2 | V |
| Gate-Source Leakage Current | $V_{GS}$ = ±8V, $V_{DS}$ = 0V | $I_{GSS}$ | -- | -- | ±100 | nA |
| Drain-Source Leakage Current | $V_{GS}$ = 0V, $V_{DS}$ = 20V | $I_{DSS}$ | -- | -- | 1 | μA |
| | $V_{GS}$ = 0V, $V_{DS}$ = 20V<br>$T_J$ = 125°C | | -- | -- | 100 | |
| Drain-Source On-State Resistance (Note 2) | $V_{GS}$ = 4.5V, $I_D$ = 3.2A | $R_{DS(on)}$ | -- | 34 | 65 | mΩ |
| | $V_{GS}$ = 2.5V, $I_D$ = 3.2A | | -- | 45 | 95 | |
| Forward Transconductance (Note 2) | $V_{DS}$ = 5V, $I_D$ = 3.2A | $g_{fs}$ | -- | 19 | -- | S |
| **Dynamic** (Note 3) | | | | | | |
| Total Gate Charge | $V_{GS}$ = 4.5V, $V_{DS}$ = 10V, $I_D$ = 3.2A | $Q_g$ | -- | 7.8 | -- | nC |
| Total Gate Charge | $V_{GS}$ = 2.5V, $V_{DS}$ = 10V, $I_D$ = 3.2A | $Q_g$ | -- | 5 | -- | |
| Gate-Source Charge | | $Q_{gs}$ | -- | 1 | -- | |
| Gate-Drain Charge | | $Q_{gd}$ | -- | 2.5 | -- | |
| Input Capacitance | $V_{GS}$ = 0V, $V_{DS}$ = 10V<br>f = 1.0MHz | $C_{iss}$ | -- | 587 | -- | pF |
| Output Capacitance | | $C_{oss}$ | -- | 94 | -- | |
| Reverse Transfer Capacitance | | $C_{rss}$ | -- | 64 | -- | |
| Gate Resistance | f = 1.0MHz, open drain | $R_g$ | -- | 1.6 | -- | Ω |
| **Switching** (Note 3) | | | | | | |
| Turn-On Delay Time | $V_{GS}$ = 4.5V, $V_{DS}$ = 10V, $I_D$ = 3.2A, $R_G$ = 2Ω, | $t_{d(on)}$ | -- | 5.4 | -- | ns |
| Turn-On Rise Time | | $t_r$ | -- | 26.4 | -- | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 16.4 | -- | |
| Turn-Off Fall Time | | $t_f$ | -- | 15.8 | -- | |
| **Source-Drain Diode** | | | | | | |
| Forward Voltage (Note 2) | $V_{GS}$ = 0V, $I_S$ = 3.2A | $V_{SD}$ | -- | -- | 1.2 | V |
| Reverse Recovery Time | $I_S$ = 3.2A , dI/dt = 100A/μs | $t_{rr}$ | -- | 19 | -- | ns |
| Reverse Recovery Charge | | $Q_{rr}$ | -- | 8 | -- | nC |

**Notes:**

1. Silicon limited current only.
2. Pulse test: Pulse Width ≤ 300μs, duty cycle ≤ 2%.
3. Switching time is essentially independent of operating temperature.

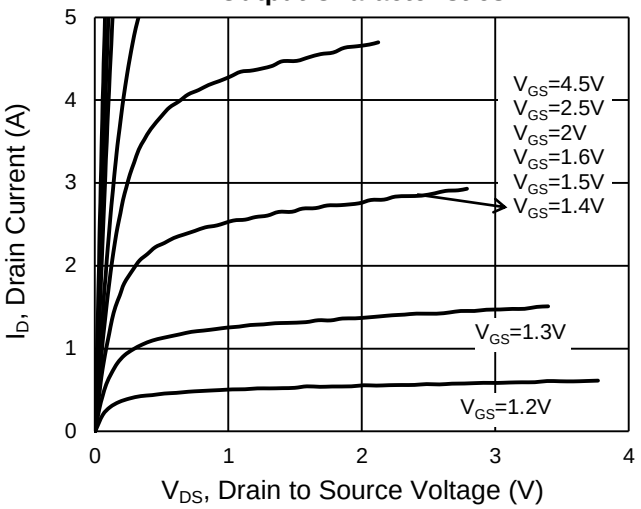
## ORDERING INFORMATION

| PART NO. | PACKAGE | PACKING |
|---|---|---|
| TSM2302CX RFG | SOT-23 | 3,000pcs / 7” Reel |

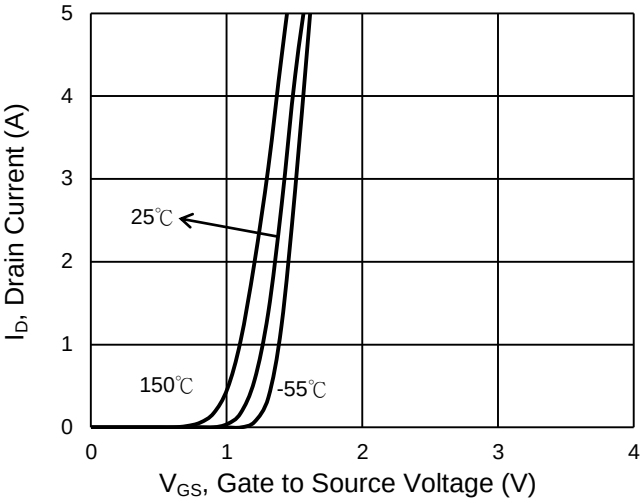
## CHARACTERISTICS CURVES

($T_A$ = 25°C unless otherwise noted)

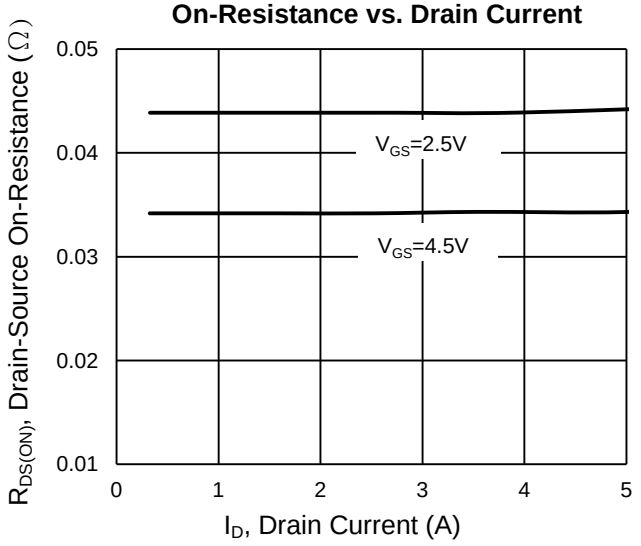
**Output Characteristics**



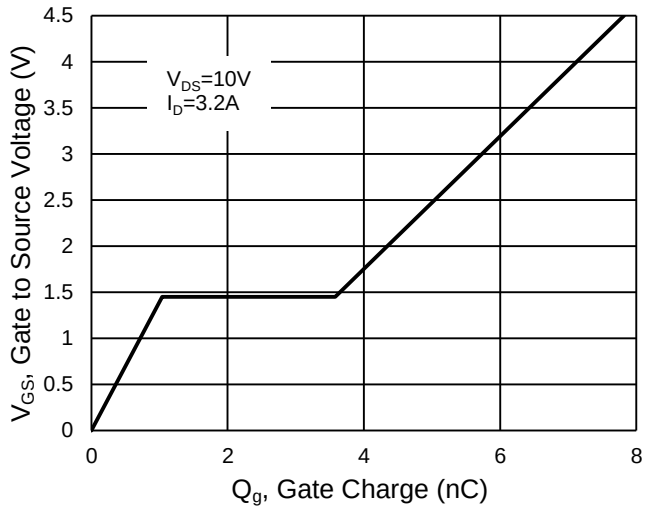

**Transfer Characteristics**



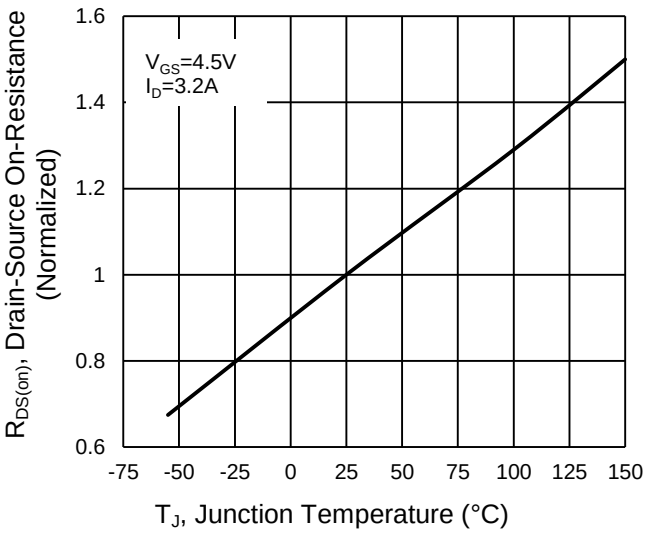

**On-Resistance vs. Drain Current**



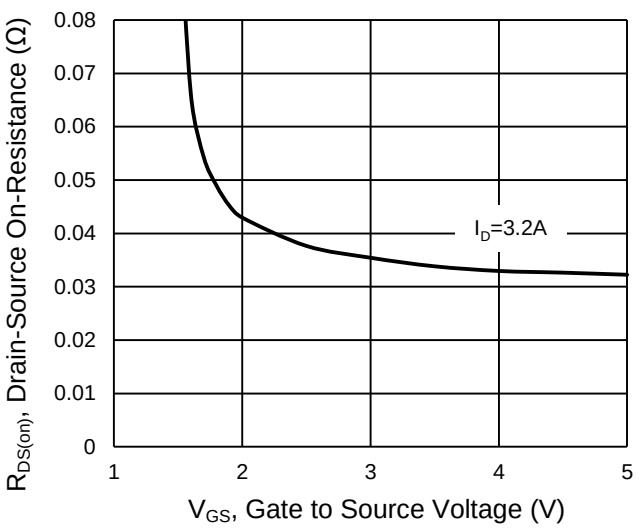

**Gate-Source Voltage vs. Gate Charge**




**On-Resistance vs. Junction Temperature**



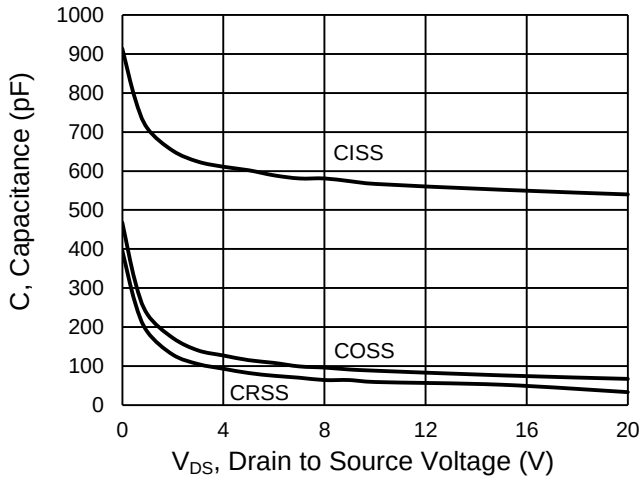

**On-Resistance vs. Gate-Source Voltage**



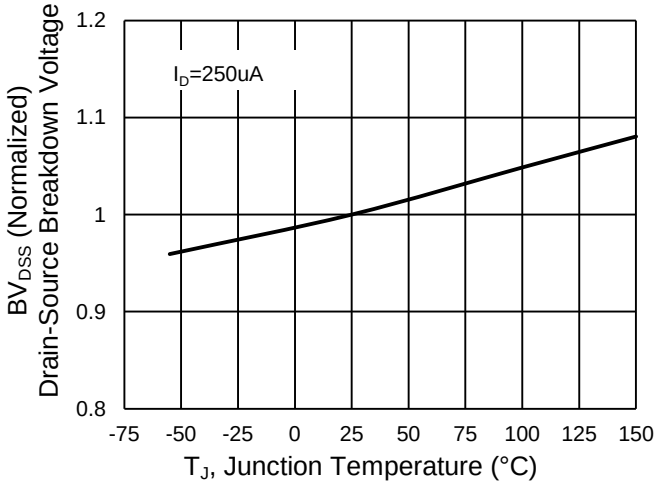
## CHARACTERISTICS CURVES

($T_A$ = 25°C unless otherwise noted)

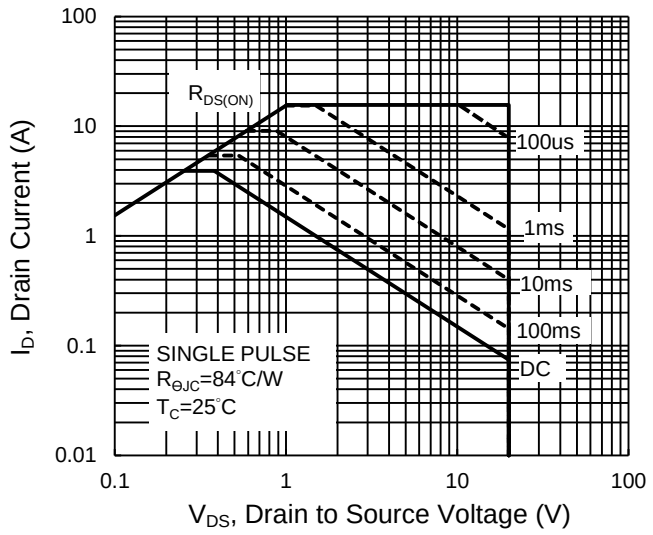
**Capacitance vs. Drain-Source Voltage**



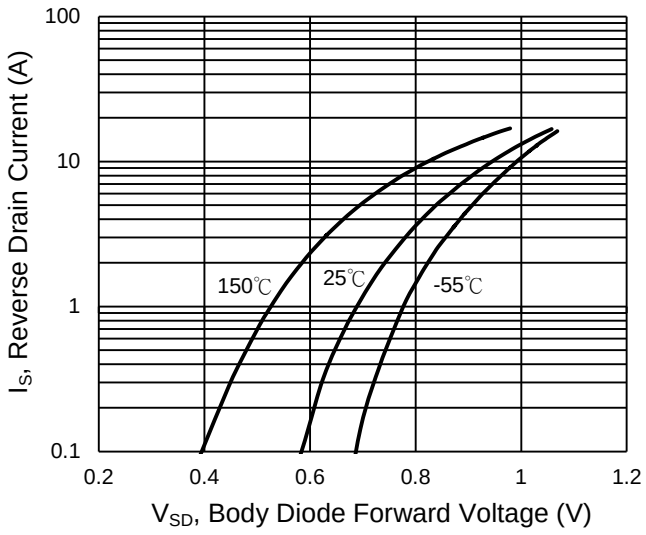

**$BV_{DSS}$ vs. Junction Temperature**



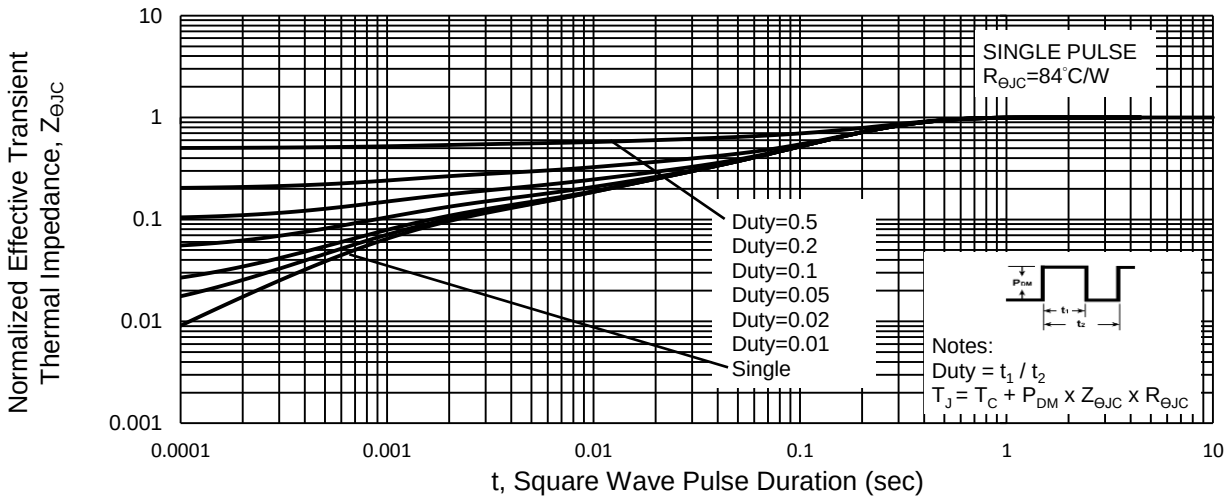

**Maximum Safe Operating Area, Junction-to-Case**




**Source-Drain Diode Forward Current vs. Voltage**

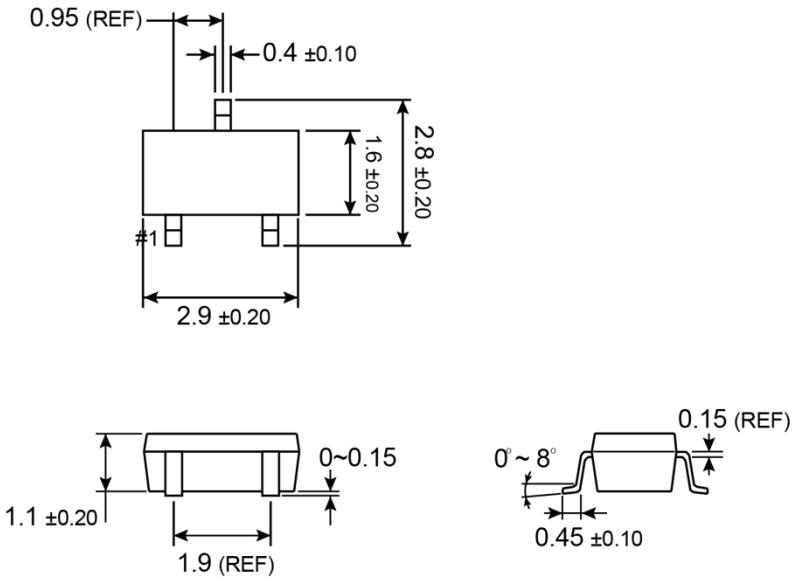



**Normalized Thermal Transient Impedance, Junction-to-Case**

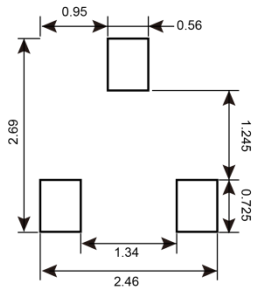


## PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

**SOT-23**




## SUGGESTED PAD LAYOUT (Unit: Millimeters)




## MARKING DIAGRAM


**2** = Device Code
**Y** = Year Code
**M** = Month Code

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **O** | =Jan | **P** | =Feb | **Q** | =Mar | **R** | =Apr |
| **S** | =May | **T** | =Jun | **U** | =Jul | **V** | =Aug |
| **W** | =Sep | **X** | =Oct | **Y** | =Nov | **Z** | =Dec |

**L** = Lot Code

## Notice

Specifications of the products displayed herein are subject to change without notice. TSC or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, to any intellectual property rights is granted by this document. Except as provided in TSC's terms and conditions of sale for such products, TSC assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of TSC products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify TSC for any damages resulting from such improper use or sale.

# X-ON Electronics

Largest Supplier of Electrical and Electronic Components

***Click to view similar products for*** MOSFET ***category:***

***Click to view products by*** Taiwan Semiconductor ***manufacturer:***

Other Similar products are found below :

614233C 648584F IRFD120 JANTX2N5237 2N7000 FCA20N60_F109 FDZ595PZ 2SK2545(Q,T) 405094E 423220D TPCC8103,L1Q(CM MIC4420CM-TR VN1206L 614234A 715780A NTNS3166NZT5G SSM6J414TU,LF(T 751625C IPS70R2K0CEAKMA1 BUK954R8-60E DMN3404LQ-7 NTE6400 SQJ402EP-T1-GE3 2SK2614(TE16L1,Q) 2N7002KW-FAI DMN1017UCP3-7 EFC2J004NUZTDG ECH8691-TL-W FCAB21350L1 P85W28HP2F-7071 DMN1053UCP4-7 NTE221 NTE2384 NTE2903 NTE2941 NTE2945 NTE2946 NTE2960 NTE2967 NTE2969 NTE2976 NTE455 NTE6400A NTE2910 NTE2916 NTE2956 NTE2911 TK10A80W,S4X(S SSM6P69NU,LF DMP22D4UFO-7B