

# XP224N06013R-G

ETR11078-001

N-channel MOSFET 20V, 0.6A

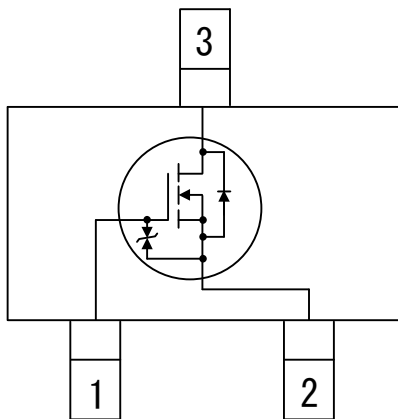
## FEATURES

**On-State Resistance** :  $R_{DS(on)}=0.7\Omega@V_{GS}=4.5V$   
**Driving voltage** : 1.8V  
**Environmentally Friendly** : EU RoHS Compliant, Pb Free

## APPLICATIONS

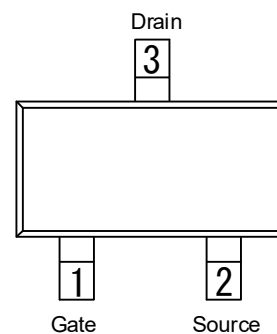
- Switching

## EQUIVALENT CIRCUIT



## PIN CONFIGURATION

- SOT-323-3A



## PRODUCT NAME

| PRODUCT NAME     | PACKAGE    | ORDER UNIT      |
|------------------|------------|-----------------|
| XP224N06013R-G * | SOT-323-3A | 3,000 pcs/ Reel |

\* The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant

## ABSOLUTE MAXIMUM RATINGS

Ta=25°C

| PARAMETER                                 | SYMBOL    | RATINGS | UNITS |
|---|-----------|---------|-------|
| Drain-Source Voltage                      | $V_{DSS}$ | 20      | V     |
| Gate-Source Voltage                       | $V_{GSS}$ | ±8      | V     |
| Drain Current (DC)                        | $I_D$     | 0.6     | A     |
| Drain Current (Pulse) <sup>(*)</sup>      | $I_{DP}$  | 1.2     | A     |
| Channel Power Dissipation <sup>(**)</sup> | $P_d$     | 0.35    | W     |
| Junction Temperature                      | $T_J$     | 150     | °C    |
| Storage Temperature                       | $T_{stg}$ | -55~150 | °C    |

<sup>(\*)</sup>  $PW \leq 10\mu s, \text{duty cycle} \leq 1\%$

<sup>(\*\*)</sup> When implemented on a PCB defined by JESD51-7

## ■ ELECTRICAL CHARACTERISTICS

Ta=25°C

| PARAMETER                      | SYMBOL        | TEST CONDITIONS                             | MIN. | TYP. | MAX.     | UNITS    |
|--------------------------------|---------------|---|------|------|----------|----------|
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D= 100\mu A, V_{GS}=0V$                  | 20   | -    | -        | V        |
| Drain-Source Leakage Current   | $I_{DSS}$     | $V_{DS}= 20V, V_{GS}= 0V$                   | -    | -    | 1        | $\mu A$  |
| Gate-Source Leakage Current    | $I_{GSS}$     | $V_{GS}= \pm 8V, V_{DS}= 0V$                | -    | -    | $\pm 10$ | $\mu A$  |
| Gate Threshold Voltage         | $V_{GS(off)}$ | $I_D= 250\mu A, V_{DS}= V_{GS}$             | 0.4  | 0.7  | 1.1      | V        |
| Drain-Source On Resistance     | $R_{DS(on)}$  | $V_{GS}= 4.5V, I_D= 300mA$                  | -    | 0.25 | 0.7      | $\Omega$ |
|                                |               | $V_{GS}= 2.5V, I_D= 300mA$                  | -    | 0.38 | 0.85     | $\Omega$ |
|                                |               | $V_{GS}= 1.8V, I_D= 300mA$                  | -    | 0.65 | 1.3      | $\Omega$ |
| Input Capacitance              | $C_{iss}$     | $V_{DS}= 10V, V_{GS}= 0V$<br>$f=1MHz$       | -    | 60   | -        | pF       |
| Output Capacitance             | $C_{oss}$     |   | -    | 12   | -        | pF       |
| Reverse Transfer Capacitance   | $C_{rss}$     |   | -    | 7    | -        | pF       |
| Turn-on Delay Time             | $t_{d(on)}$   | $V_{DD}= 10V, I_D= 300mA$<br>$V_{GS}= 4.5V$ | -    | 9    | -        | ns       |
| Rise Time                      | $t_r$         |   | -    | 8    | -        | ns       |
| Turn-off Delay Time            | $t_{d(off)}$  |   | -    | 30   | -        | ns       |
| Fall Time                      | $t_f$         |   | -    | 14   | -        | ns       |
| Total Gate Charge              | $Q_g$         | $V_{DS}= 10V, I_D= 300mA$<br>$V_{GS}= 6V$   | -    | 0.8  | -        | nC       |
| Gate-Source Charge             | $Q_{gs}$      |   | -    | 0.08 | -        | nC       |
| Gate-Drain Charge              | $Q_{gd}$      |   | -    | 0.2  | -        | nC       |
| Diode Forward Voltage          | $V_{SD}$      | $I_S= 300mA, V_{GS}= 0V$                    | -    | 0.8  | 1.2      | V        |

## ■ NOTES ON USE

1. Please use this IC within the absolute maximum ratings.

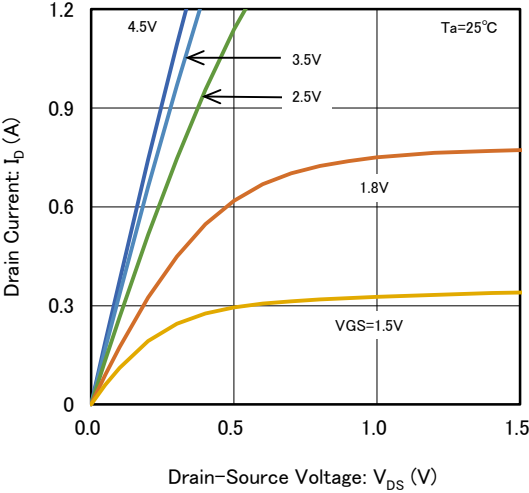
Even within the ratings, in case of high load use continuously such as high temperature, high voltage, high current and thermal stress may cause reliability degradation of the IC.

2. Torex places an importance on improving our products and their reliability.

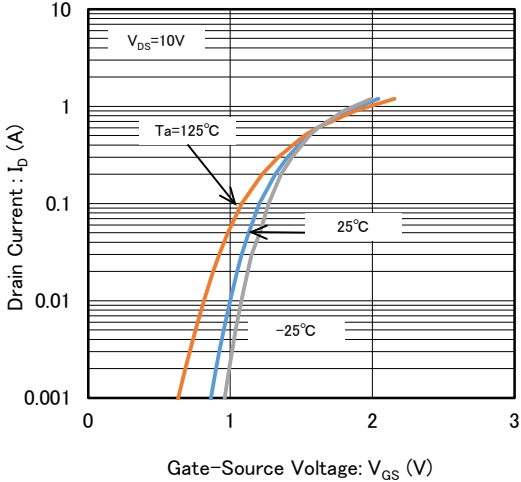
We request that users incorporate fail-safe designs and post-aging protection treatment when using Torex products in their systems.

# TYPICAL PERFORMANCE CHARACTERISTICS

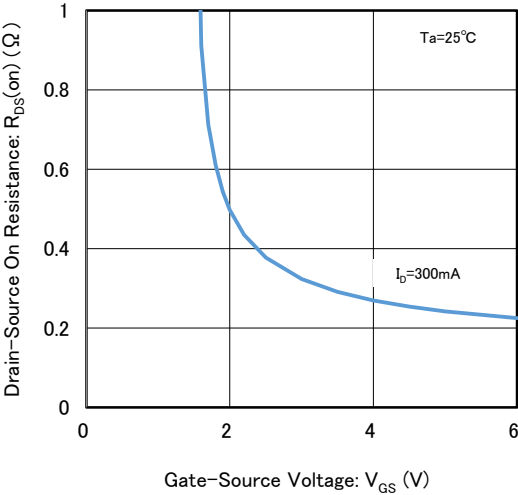
(1) Drain Current vs. Drain-Source Voltage



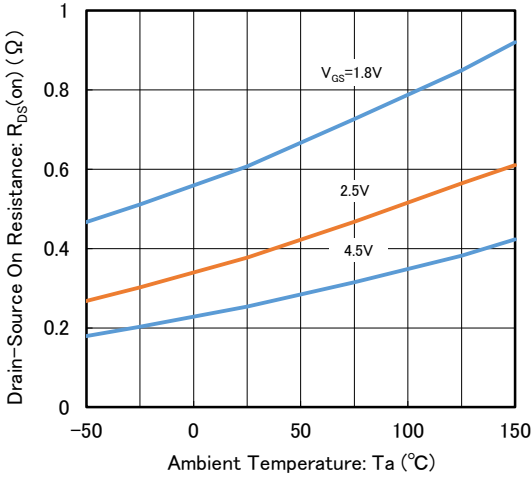
(2) Drain Current vs. Gate-Source Voltage



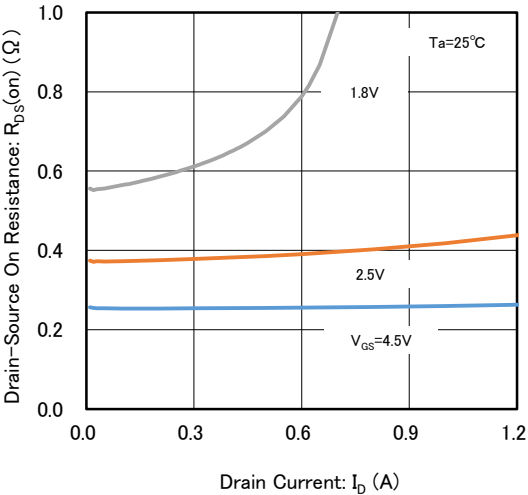
(3) Drain-Source On Resistance vs. Gate-Source Voltage



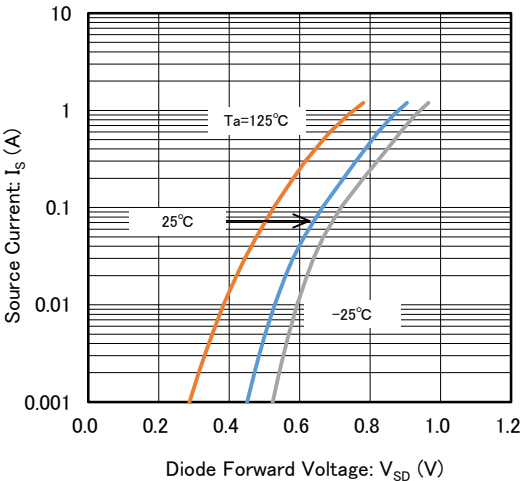
(4) Drain-Source On Resistance vs. Ambient Temperature



(5) Drain-Source On Resistance vs. Drain Current

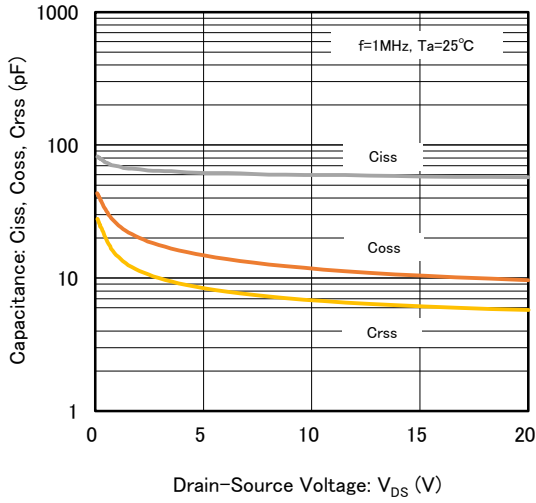


(6) Source Current vs. Diode Forward Voltage

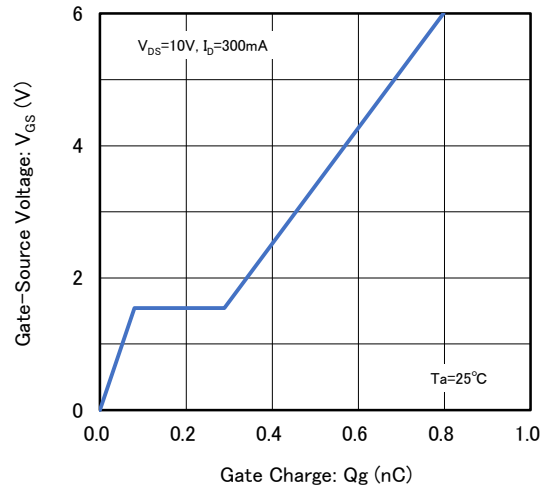


## TYPICAL PERFORMANCE CHARACTERISTICS

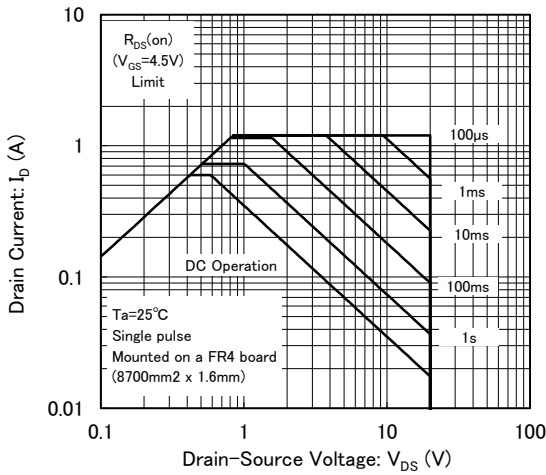
(7) Ciss, Coss, Crss vs. Drain-Source Voltage



(8) Gate-Source Voltage vs. Gate Charge



(9) Area of Safe Operation



## ■ PACKAGING INFORMATION

For the latest package information go to, [www.torexsemi.com/technical-support/packages](http://www.torexsemi.com/technical-support/packages)

| PACKAGE    | OUTLINE / LAND PATTERN         | THERMAL CHARACTERISTICS |  |
|------------|--------------------------------|-------------------------|--|
| SOT-323-3A | <a href="#">SOT-323-3A PKG</a> | JESD51-7 Board          | <a href="#">SOT-323-3A Power Dissipation</a> |

## ■ MARKING RULE

### ● SOT-323-3A

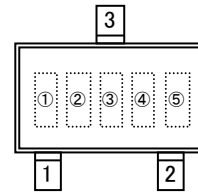
①,②,③ represents product series

| シンボル |   |   | 品名表記例          |
|------|---|---|----------------|
| ①    | ② | ③ |                |
| 2    | 4 | N | XP224N0601**-G |

④,⑤ represents production lot number

01 to 09, 0A to 0Z, 11 to 9Z, A1 to A9, AA to AZ, B1 to ZZ repeated  
(G, I, J, O, Q, W excluded) \*No character inversion used

SOT-323-3A



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