



# 40V N-Channel MOSFETs

### General Description

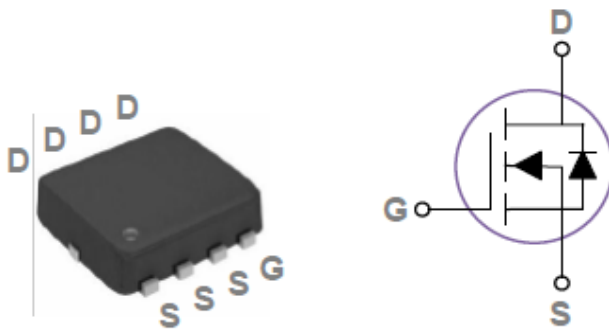
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications

| BVDSS | RDSON | ID  |
|-------|-------|-----|
| 40V   | 9mΩ   | 35A |

### Features

- 40V, 35A, RDS(ON)=9mΩ@VGS=10V
- Improved dv/dt capability
- Fast switching
- Green Device Available

### PPAK3x3 Pin Configuration



### Applications

- Networking
- Load Switch
- LED applications
- Hand-Held Device

### Absolute Maximum Ratings Tc=25°C unless otherwise noted

| Symbol           | Parameter   | Rating     | Units |
|------------------|---|------------|-------|
| V <sub>DS</sub>  | Drain-Source Voltage                                    | 40         | V     |
| V <sub>GS</sub>  | Gate-Source Voltage                                     | ±20        | V     |
| I <sub>D</sub>   | Drain Current – Continuous (TC=25°C) (Chip Limitation)  | 35         | A     |
|                  | Drain Current – Continuous (TC=100°C) (Chip Limitation) | 20         | A     |
| I <sub>DM</sub>  | Drain Current – Pulsed1                                 | 135        | A     |
| P <sub>D</sub>   | Power Dissipation (TC=25°C)                             | 40         | W     |
|                  | Power Dissipation – Derate above 25°C                   | 0.45       | W/°C  |
| T <sub>STG</sub> | Storage Temperature Range                               | -50 to 150 | °C    |
| T <sub>J</sub>   | Operating Junction Temperature Range                    | -50 to 150 | °C    |

### Thermal Characteristics

| Symbol           | Parameter                              | Typ. | Max. | Unit |
|------------------|--|------|------|------|
| R <sub>θJA</sub> | Thermal Resistance Junction to ambient | ---  | 65   | °C/W |
| R <sub>θJC</sub> | Thermal Resistance Junction to Case    | ---  | 3.5  | °C/W |



**Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

Off Characteristics

| Symbol                              | Parameter                                 | Conditions   | Min. | Typ. | Max. | Unit |
|-------------------------------------|---|--|------|------|------|------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage            | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA                       | 40   | ---  | ---  | V    |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient | Reference to 25°C, I <sub>D</sub> =1mA                           | ---  | 0.04 | ---  | V/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current              | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C  | ---  | ---  | 1    | uA   |
|                                     |   | V <sub>DS</sub> =32V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C | ---  | ---  | 10   | uA   |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current               | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                       | ---  | ---  | ±100 | nA   |

On Characteristics

|                      |   |  |     |     |     |       |
|----------------------|---|--|-----|-----|-----|-------|
| R <sub>DS(ON)</sub>  | Static Drain-Source On-Resistance           | V <sub>GS</sub> =10V, I <sub>D</sub> =8A                 | --- | 7.5 | 9   | mΩ    |
|                      |   | V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A                | --- | 11  | 14  | mΩ    |
| V <sub>GS(th)</sub>  | Gate Threshold Voltage                      | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA | 1.2 | --- | 2.5 | V     |
| ΔV <sub>GS(th)</sub> | V <sub>GS(th)</sub> Temperature Coefficient |  | --- | -5  | --- | mV/°C |
| g <sub>fs</sub>      | Forward Transconductance                    | V <sub>DS</sub> =10V, I <sub>D</sub> =2A                 | --- | 15  | --- | S     |

Dynamic and switching Characteristics

|                     |                                    |  |     |      |      |    |
|---------------------|------------------------------------|--|-----|------|------|----|
| Q <sub>g</sub>      | Total Gate Charge <sup>2,3</sup>   | V <sub>DS</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =8A                         | --- | 20   | 30   | nC |
| Q <sub>gs</sub>     | Gate-Source Charge <sup>2,3</sup>  |  | --- | 3.0  | 4.5  |    |
| Q <sub>gd</sub>     | Gate-Drain Charge <sup>2,3</sup>   |  | --- | 5.5  | 8    |    |
| T <sub>d(on)</sub>  | Turn-On Delay Time <sup>2,3</sup>  | V <sub>DD</sub> =15V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω<br>I <sub>D</sub> =1A | --- | 13.5 | 25   | ns |
| T <sub>r</sub>      | Rise Time <sup>2,3</sup>           |  | --- | 2.5  | 6    |    |
| T <sub>d(off)</sub> | Turn-Off Delay Time <sup>2,3</sup> |  | --- | 75   | 135  |    |
| T <sub>f</sub>      | Fall Time <sup>2,3</sup>           |  | --- | 5.0  | 13   |    |
| C <sub>iss</sub>    | Input Capacitance                  | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, F=1MHz                                      | --- | ---  | 2300 | pF |
| C <sub>oss</sub>    | Output Capacitance                 |  | --- | ---  | 260  |    |
| C <sub>rss</sub>    | Reverse Transfer Capacitance       |  | --- | ---  | 120  |    |
| R <sub>g</sub>      | Gate resistance                    | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz                                       | --- | 2.2  | ---  | Ω  |

Drain-Source Diode Characteristics and Maximum Ratings

| Symbol          | Parameter                            | Conditions  | Min. | Typ. | Max. | Unit |
|-----------------|--------------------------------------|---|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current            | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current             | ---  | ---  | 30   | A    |
| I <sub>SM</sub> | Pulsed Source Current                |   | ---  | ---  | 70   | A    |
| V <sub>SD</sub> | Diode Forward Voltage                | V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C | ---  | ---  | 1    | V    |
| trr             | Reverse Recovery Time <sup>3</sup>   | V <sub>GS</sub> =0V, I <sub>S</sub> =1A, di/dt=100A/μs        | ---  | 18   | ---  | ns   |
| Qrr             | Reverse Recovery Charge <sup>3</sup> | T <sub>J</sub> =25°C  | ---  | 3.0  | ---  | nC   |

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
3. Essentially independent of operating temperature.



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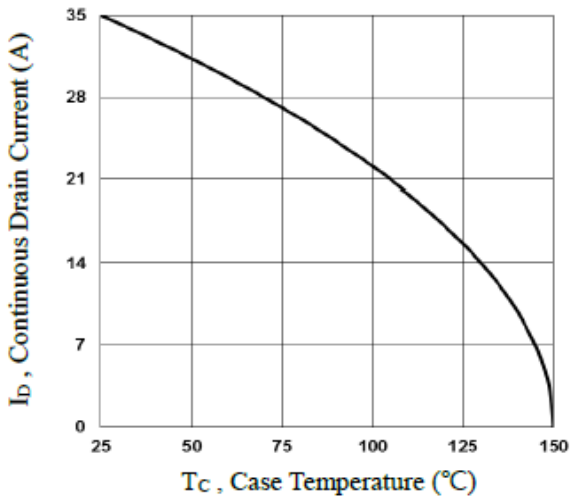


Fig.1 Continuous Drain Current vs.  $T_C$

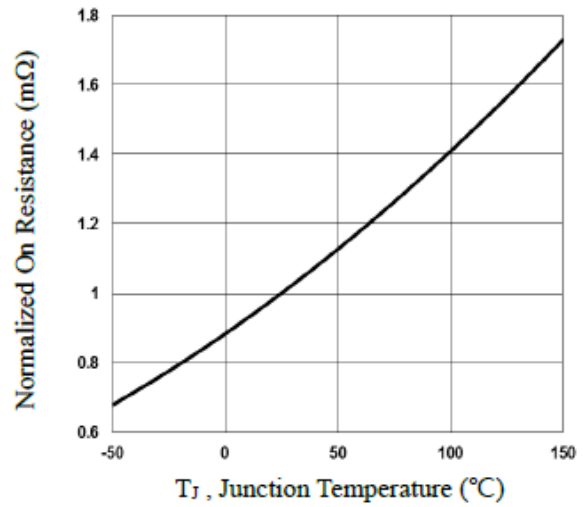


Fig.2 Normalized  $R_{DS(ON)}$  vs.  $T_J$

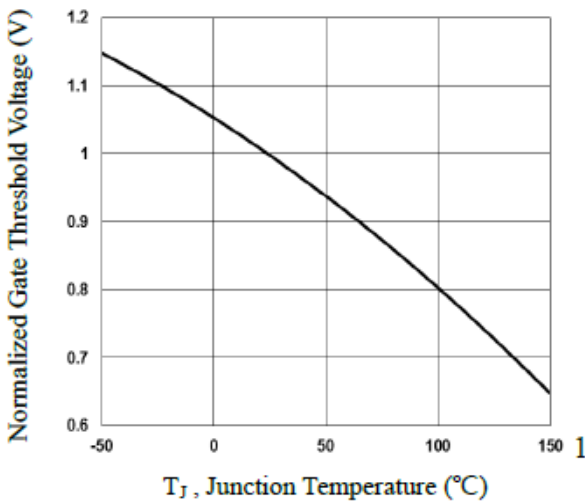


Fig.3 Normalized  $V_{th}$  vs.  $T_J$

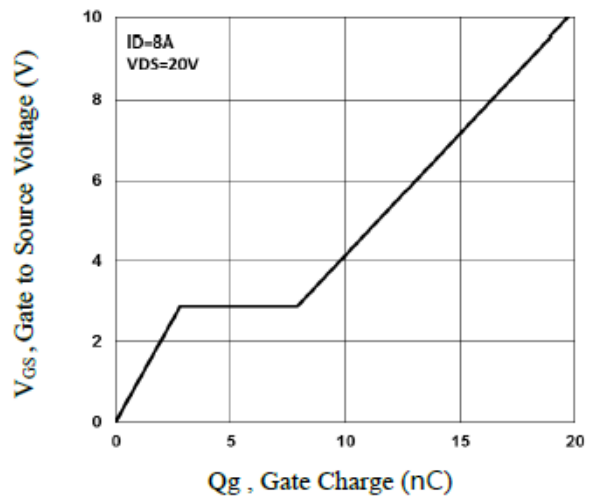


Fig.4 Gate Charge Characteristics

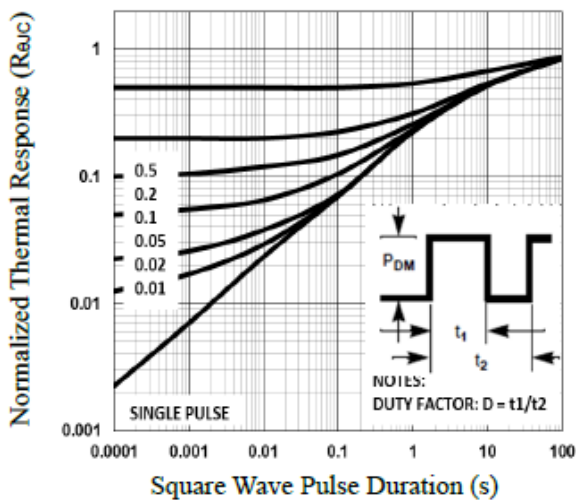


Fig.5 Normalized Transient Impedance

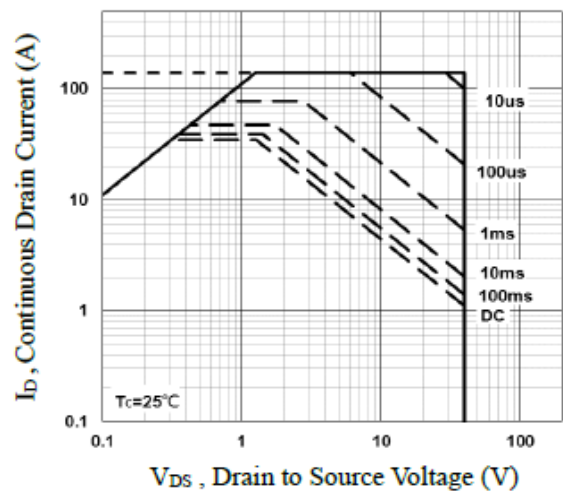


Fig.6 Maximum Safe Operation Area

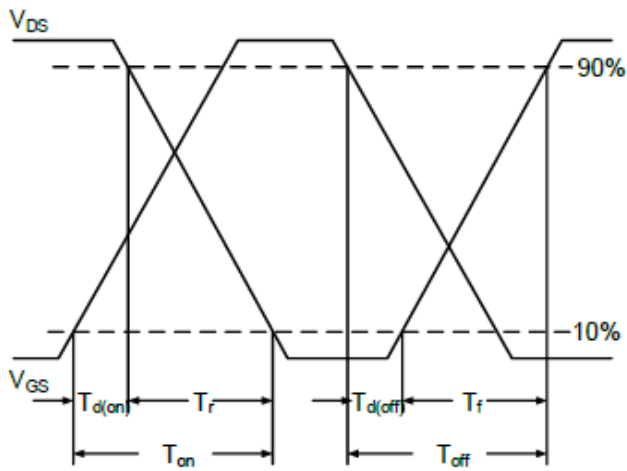


Fig.7 Switching Time Waveform

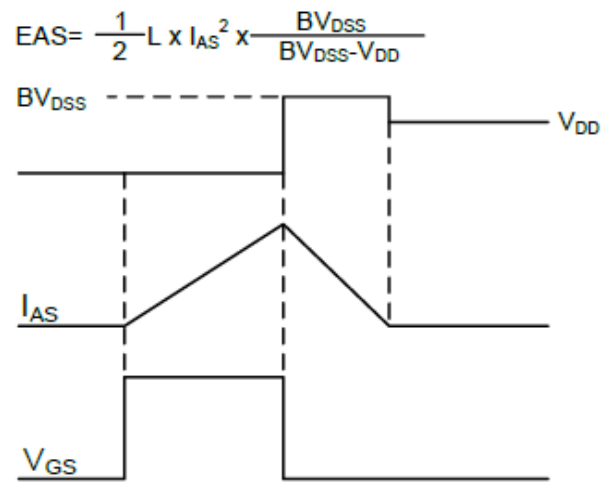
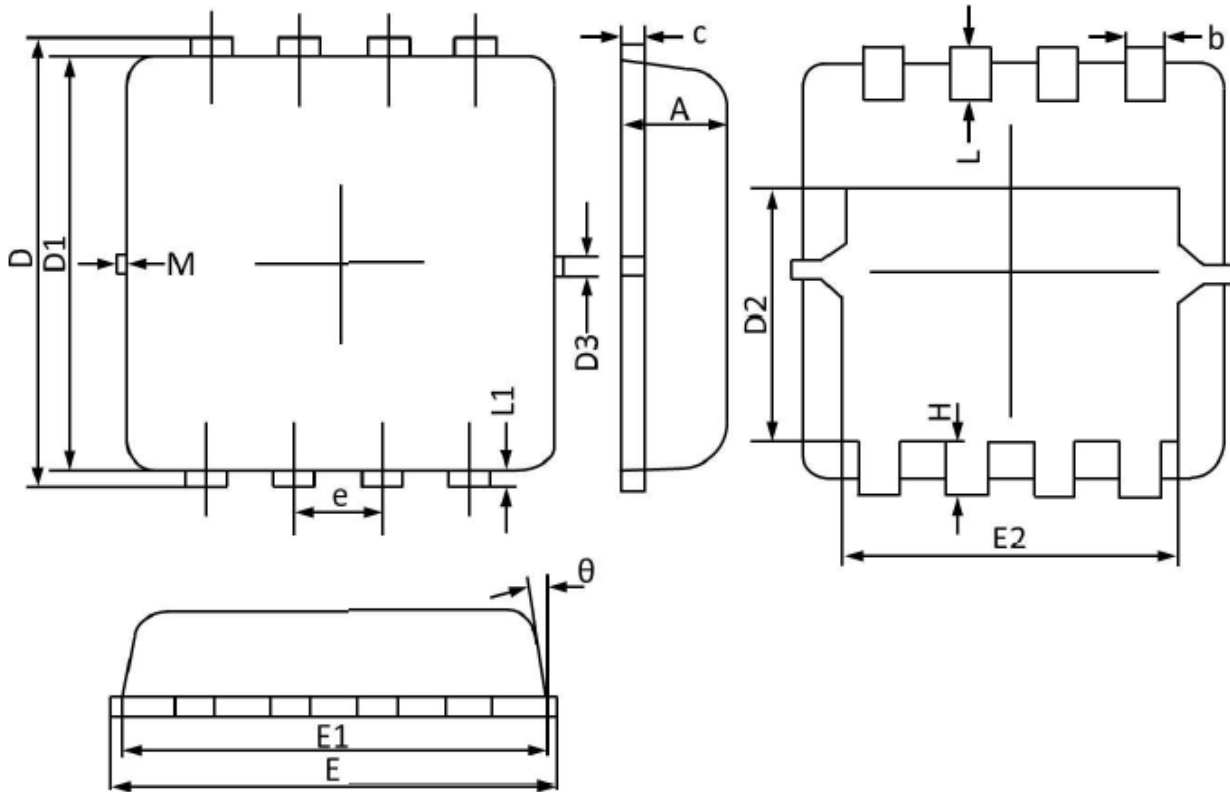


Fig.8 EAS Waveform



PPAK3X3 PACKAGE INFORMATION



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 0.700                     | 0.800 | 0.028                | 0.031 |
| b      | 0.250                     | 0.350 | 0.010                | 0.013 |
| c      | 0.100                     | 0.250 | 0.004                | 0.009 |
| D      | 3.250                     | 3.450 | 0.128                | 0.135 |
| D1     | 3.000                     | 3.200 | 0.119                | 0.125 |
| D2     | 1.780                     | 1.980 | 0.070                | 0.077 |
| D3     | 0.130 REF                 |       | 0.005 REF            |       |
| E      | 3.200                     | 3.400 | 0.126                | 0.133 |
| E1     | 3.000                     | 3.200 | 0.119                | 0.125 |
| E2     | 2.390                     | 2.590 | 0.094                | 0.102 |
| e      | 0.650 BSC                 |       | 0.026 BSC            |       |
| H      | 0.300                     | 0.500 | 0.011                | 0.019 |
| L      | 0.300                     | 0.500 | 0.011                | 0.019 |
| L1     | 0.130 REF                 |       | 0.005 REF            |       |
| theta  | 0°                        | 12°   | 0°                   | 12°   |
| M      | 0.150 REF                 |       | 0.006 REF            |       |



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