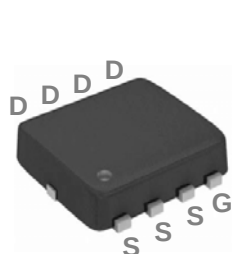
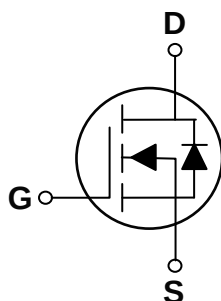


## 20V N-Channel MOSFETs

### 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.

### PPAK3x3 Pin Configuration



| BVDSS | RDSON | ID  |
|-------|-------|-----|
| 20V   | 3.5mΩ | 80A |

### Features

- 20V,80A,  $R_{DS(ON)} = 3.5m\Omega @ V_{GS} = 10V$
- Improved  $dv/dt$  capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available

### Applications

- MB / VGA / Vcore
- POL Applications
- SMPS 2<sup>nd</sup> SR

### Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$ unless otherwise noted)

| Symbol    | Parameter                                                              | Rating     | Units               |
|-----------|------------------------------------------------------------------------|------------|---------------------|
| $V_{DS}$  | Drain-Source Voltage                                                   | 20         | V                   |
| $V_{GS}$  | Gate-Source Voltage                                                    | $\pm 12$   | V                   |
| $I_D$     | Drain Current – Continuous (Chip Limitation, $T_c=25^\circ\text{C}$ )  | 80         | A                   |
|           | Drain Current – Continuous (Chip Limitation, $T_c=100^\circ\text{C}$ ) | 51         | A                   |
| $I_{DM}$  | Drain Current – Pulsed <sup>1</sup>                                    | 320        | A                   |
| $P_D$     | Power Dissipation ( $T_c=25^\circ\text{C}$ )                           | 66         | W                   |
|           | Power Dissipation – Derate above $25^\circ\text{C}$                    | 0.53       | W/ $^\circ\text{C}$ |
| $T_{STG}$ | Storage Temperature Range                                              | -55 to 175 | $^\circ\text{C}$    |
| $T_J$     | Operating Junction Temperature Range                                   | -55 to 175 | $^\circ\text{C}$    |

### Thermal Characteristics

| Symbol          | Parameter                              | Typ. | Max. | Unit                      |
|-----------------|----------------------------------------|------|------|---------------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | ---  | 62   | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case    | ---  | 2    | $^\circ\text{C}/\text{W}$ |



# FTK2604DFN33

## 20V N-Channel MOSFETs

Electrical Characteristics ( $T_J=25^{\circ}\text{C}$ , unless otherwise noted)

### Static State Characteristics

| Symbol       | Parameter                                      | Conditions                                             | Min. | Typ. | Max.      | Unit       |
|--------------|------------------------------------------------|--------------------------------------------------------|------|------|-----------|------------|
| $BV_{DS}$    | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                           | 20   | ---  | ---       | V          |
| $I_{DSS}$    | Drain-Source Leakage Current                   | $V_{DS}=20V$ , $V_{GS}=0V$ , $T_J=25^{\circ}\text{C}$  | ---  | ---  | 1         | $\mu A$    |
|              |                                                | $V_{DS}=16V$ , $V_{GS}=0V$ , $T_J=125^{\circ}\text{C}$ | ---  | ---  | 10        | $\mu A$    |
| $I_{GSS}$    | Gate-Source Leakage Current                    | $V_{GS}=\pm 12V$ , $V_{DS}=0V$                         | ---  | ---  | $\pm 100$ | nA         |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=4.5V$ , $I_D=15A$                              | ---  | 2.8  | 3.5       | m $\Omega$ |
|              |                                                | $V_{GS}=2.5V$ , $I_D=10A$                              | ---  | 3.5  | 4.5       | m $\Omega$ |
|              |                                                | $V_{GS}=1.8V$ , $I_D=6A$                               |      | 5    | 7         | m $\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                       | 0.3  | 0.65 | 1         | V          |
| $g_{fs}$     | Forward Transconductance                       | $V_{DS}=5V$ , $I_D=5A$                                 | ---  | 35   | ---       | S          |

### Dynamic Characteristics

|              |                              |                                                            |     |      |      |          |
|--------------|------------------------------|------------------------------------------------------------|-----|------|------|----------|
| $Q_g$        | Total Gate Charge            | $V_{DS}=10V$ , $V_{GS}=4.5V$ , $I_D=5A$                    | --- | 52   | 100  | nC       |
| $Q_{gs}$     | Gate-Source Charge           |                                                            | --- | 6.6  | 12   |          |
| $Q_{gd}$     | Gate-Drain Charge            |                                                            | --- | 13.8 | 28   |          |
| $T_{d(on)}$  | Turn-On Delay Time           | $V_{DD}=10V$ , $V_{GS}=4.5V$ , $R_G=3.3\Omega$<br>$I_D=1A$ | --- | 20.2 | 40   | ns       |
| $T_r$        | Rise Time                    |                                                            | --- | 31.2 | 60   |          |
| $T_{d(off)}$ | Turn-Off Delay Time          |                                                            | --- | 68.5 | 120  |          |
| $T_f$        | Fall Time                    |                                                            | --- | 21.2 | 42   |          |
| $C_{iss}$    | Input Capacitance            | $V_{DS}=10V$ , $V_{GS}=0V$ , $F=1\text{MHz}$               | --- | 3870 | 5500 | pF       |
| $C_{oss}$    | Output Capacitance           |                                                            | --- | 580  | 850  |          |
| $C_{rss}$    | Reverse Transfer Capacitance |                                                            | --- | 340  | 600  |          |
| $R_g$        | Gate resistance              | $V_{GS}=0V$ , $V_{DS}=0V$ , $F=1\text{MHz}$                | --- | 1.3  | 2.6  | $\Omega$ |

### Drain-Source Diode Characteristics

| Symbol   | Parameter                          | Conditions                                        | Min. | Typ. | Max. | Unit |
|----------|------------------------------------|---------------------------------------------------|------|------|------|------|
| $I_S$    | Continuous Source Current          | $V_G=V_D=0V$ , Force Current                      | ---  | ---  | 80   | A    |
| $I_{SM}$ | Pulsed Source Current <sup>2</sup> |                                                   | ---  | ---  | 160  | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup> | $V_{GS}=0V$ , $I_S=1A$ , $T_J=25^{\circ}\text{C}$ | ---  | ---  | 1    | V    |
| $t_{rr}$ | Reverse Recovery Time              | $V_{GS}=0V$ , $I_S=1A$ , $di/dt=100A/\mu s$       | ---  | ---  | ---  | ns   |
| $Q_{rr}$ | Reverse Recovery Charge            | $T_J=25^{\circ}\text{C}$                          | ---  | ---  | ---  | nC   |

Note :

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

## 20V N-Channel MOSFETs

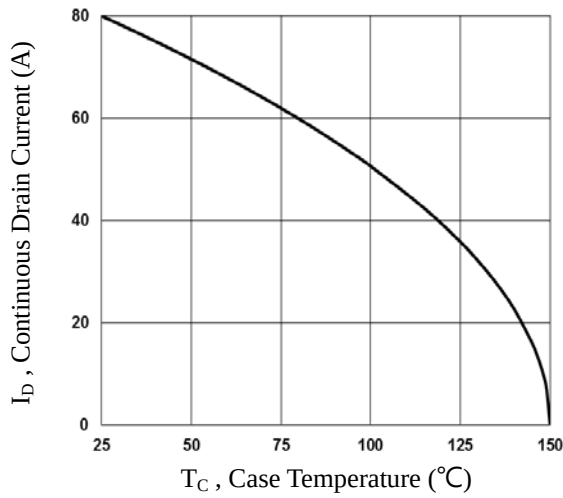


Fig.1 Continuous Drain Current vs.  $T_C$

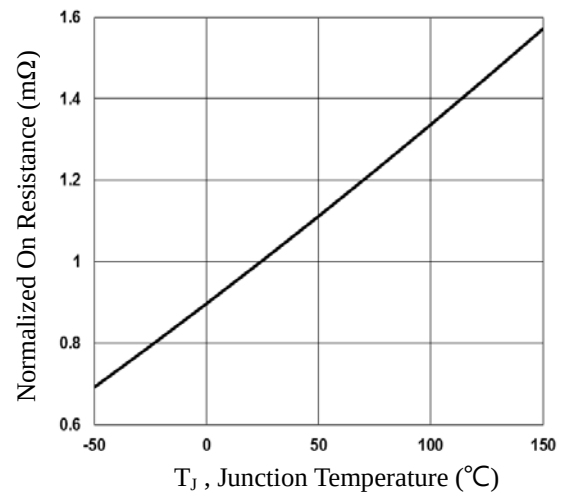


Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$

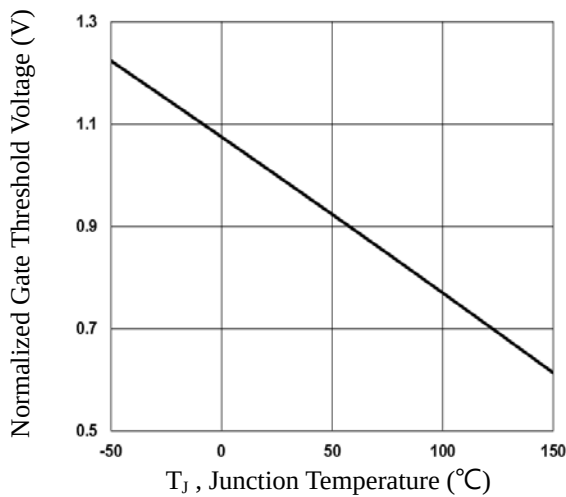


Fig.3 Normalized  $V_{th}$  vs.  $T_J$

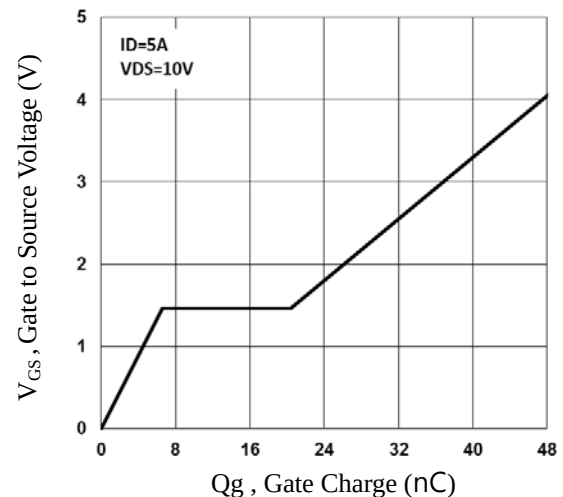


Fig.4 Gate Charge Waveform

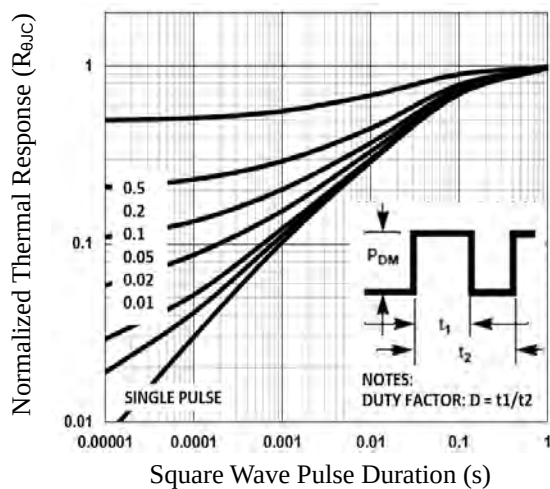


Fig.5 Normalized Transient Impedance

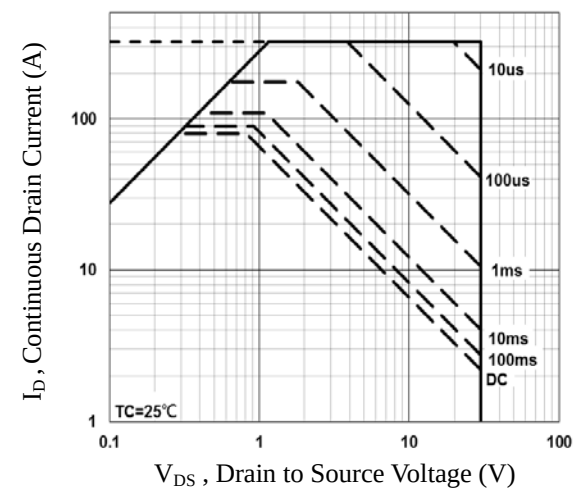


Fig.6 Maximum Safe Operation Area

## 20V N-Channel MOSFETs

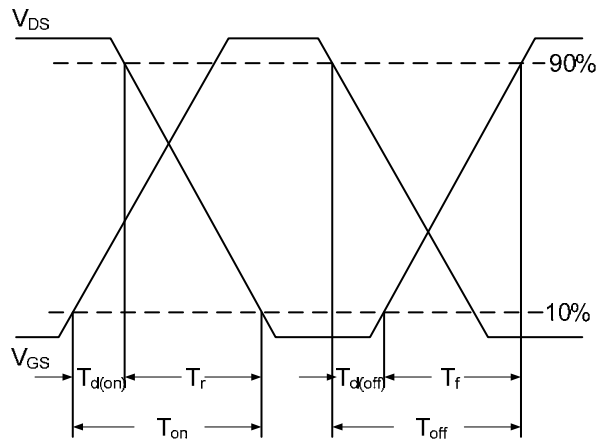


Fig.7 Switching Time Waveform

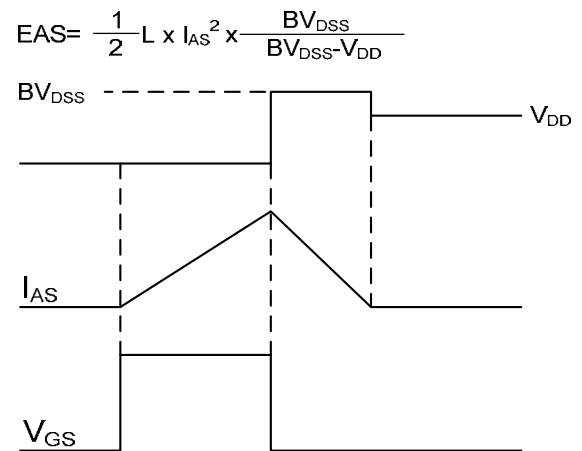
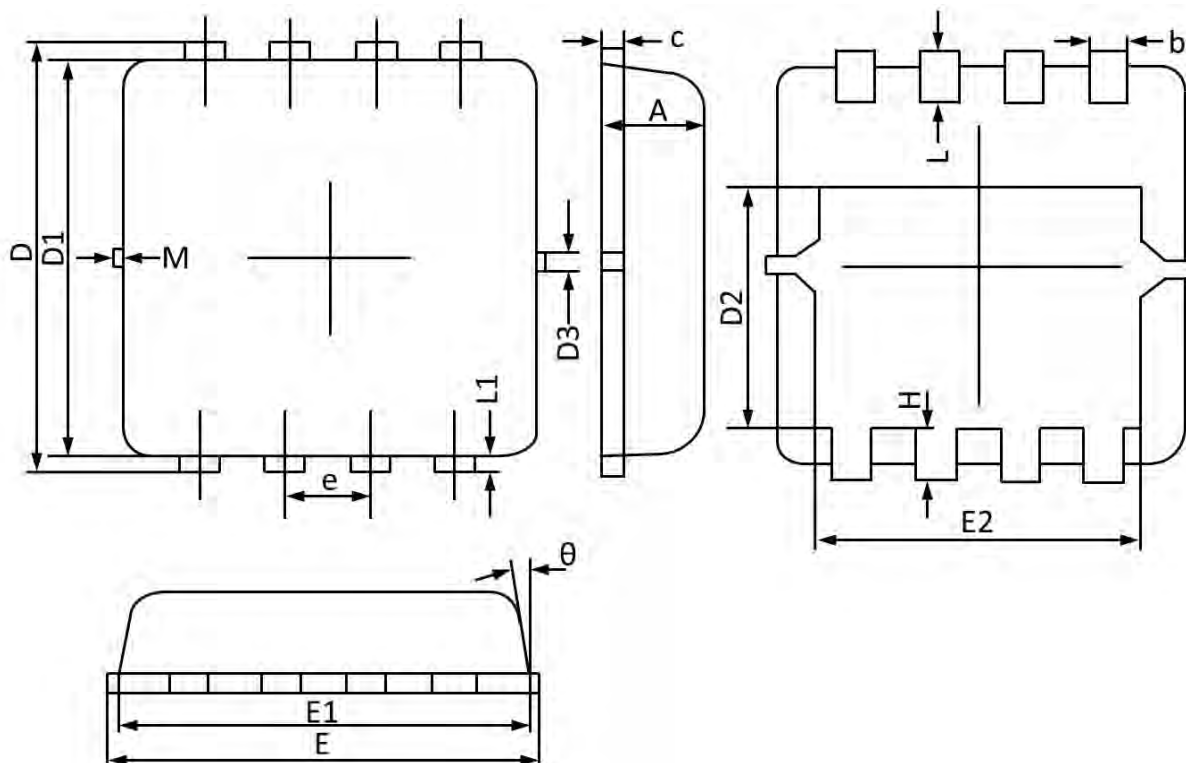


Fig.8 EAS Waveform

## 20V N-Channel MOSFETs

### 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            |       |