

## N-Channel 40-V (D-S) MOSFET

### GENERAL DESCRIPTION

The ME60N04 is the N-Channel logic enhancement mode power field effect transistors are produced using high cell density DMOS trench technology. This high density process is especially tailored to minimize on-state resistance. These devices are particularly suited for low voltage application such as LCD inverter, computer power management and DC to DC converter circuits which need low in-line power loss.

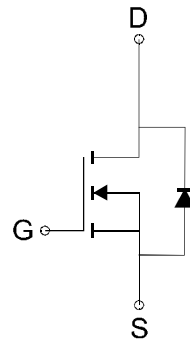
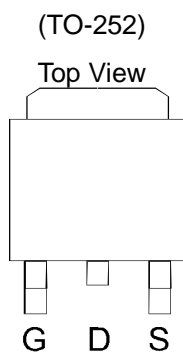
### FEATURES

- $R_{DS(ON)} \leq 12m\Omega @ V_{GS}=10V$
- $R_{DS(ON)} \leq 17m\Omega @ V_{GS}=4.5V$
- Super high density cell design for extremely low  $R_{DS(ON)}$
- Exceptional on-resistance and maximum DC current capability

### APPLICATIONS

- Power Management
- DC/DC Converter
- LCD TV & Monitor Display inverter
- CCFL inverter
- Secondary Synchronous Rectification

### PIN CONFIGURATION



N-Channel MOSFET

### Absolute Maximum Ratings ( $T_A=25^\circ C$ Unless Otherwise Noted)

| Parameter   | Symbol          | Steady           | Unit         |
|---|-----------------|------------------|--------------|
| Drain-Source Voltage  | $V_{DS}$        | 40               | V            |
| Gate-Source Voltage   | $V_{GS}$        | $\pm 20$         | V            |
| Continuous Drain Current<br>( $T_J=150^\circ C$ , limited by package) | $I_D$           | $T_C=25^\circ C$ | 20           |
|   |                 | $T_A=25^\circ C$ | 12           |
| Pulsed Drain Current  | $I_{DM}$        | 50               | A            |
| Avalanche Energy with Single Pulse(L=1mH)                             | EAS             | 40               | mJ           |
| Maximum Power Dissipation<br>(Note A)                                 | $P_D$           | $T_C=25^\circ C$ | 30           |
|   |                 | $T_A=25^\circ C$ | 3            |
| Operating Junction Temperature  | $T_J$           | -55 to 150       | $^\circ C$   |
| Thermal Resistance-Junction to Ambient(Note A)                        | $R_{\theta JA}$ | 42               | $^\circ C/W$ |
| Thermal Resistance-Junction to Case(Note A)                           | $R_{\theta JC}$ | 4.3              | $^\circ C/W$ |

Note A: The device mounted on 1in<sup>2</sup> FR4 board with 2 oz copper

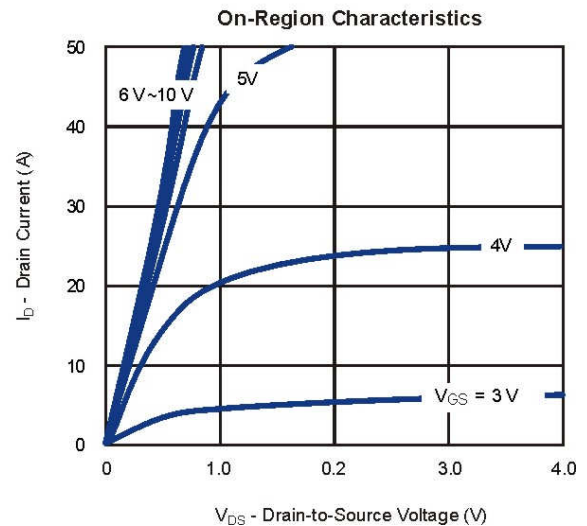
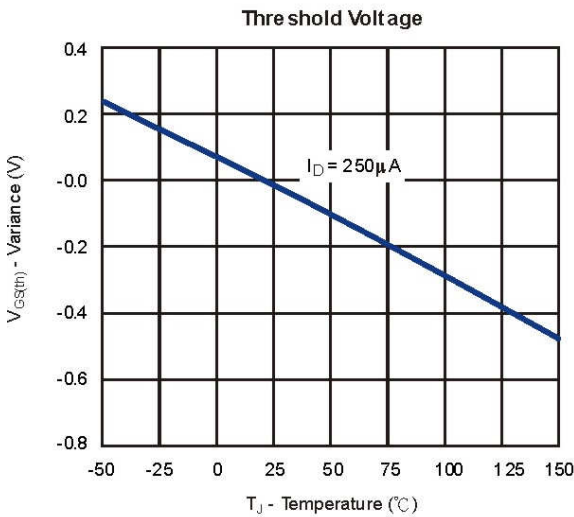
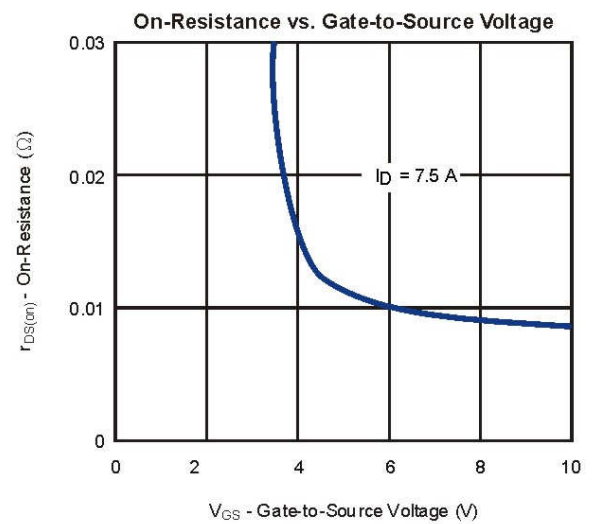
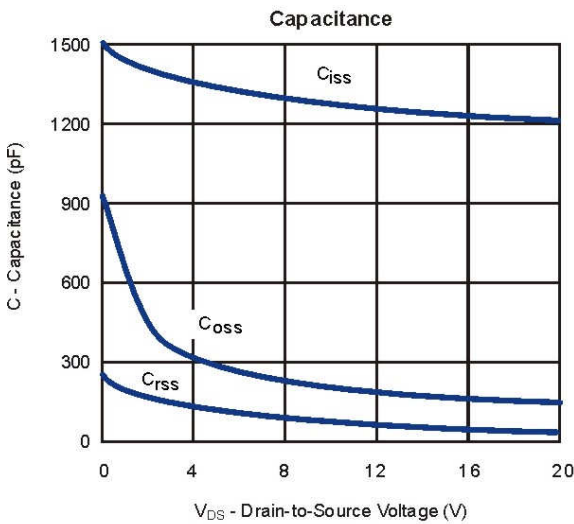
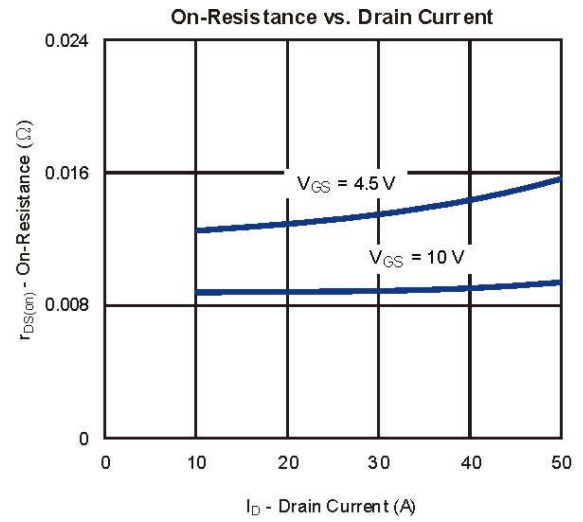
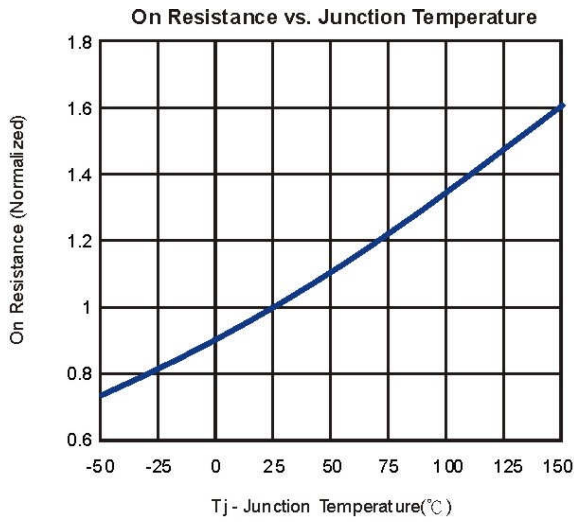
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Electrical Characteristics (TA=25°C Unless Otherwise Specified)

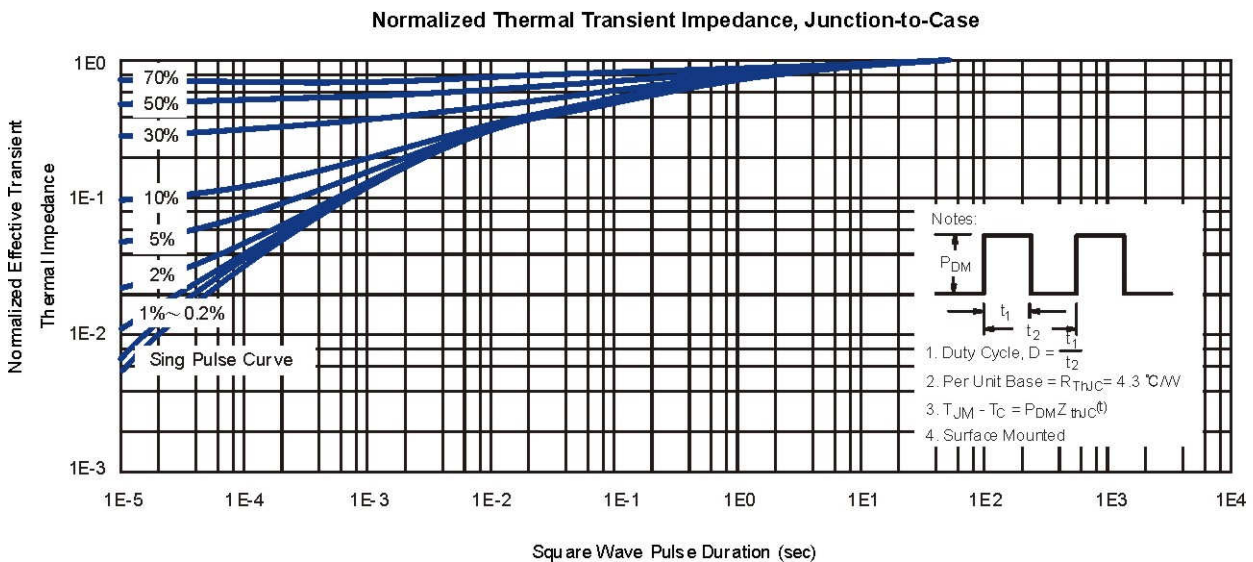
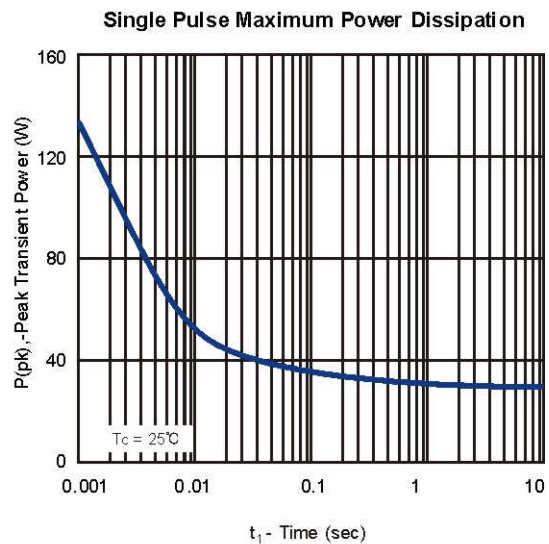
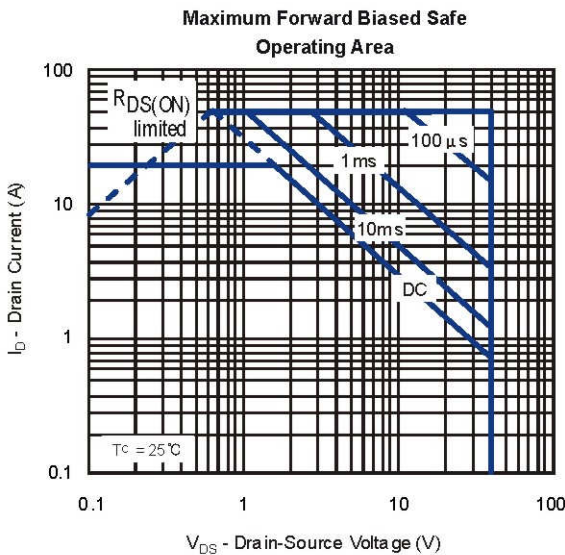
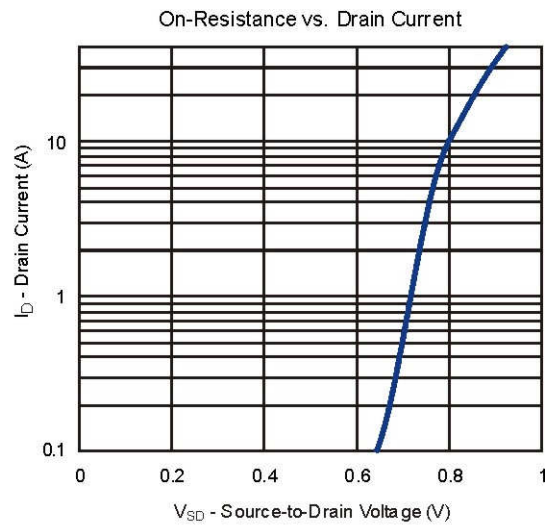
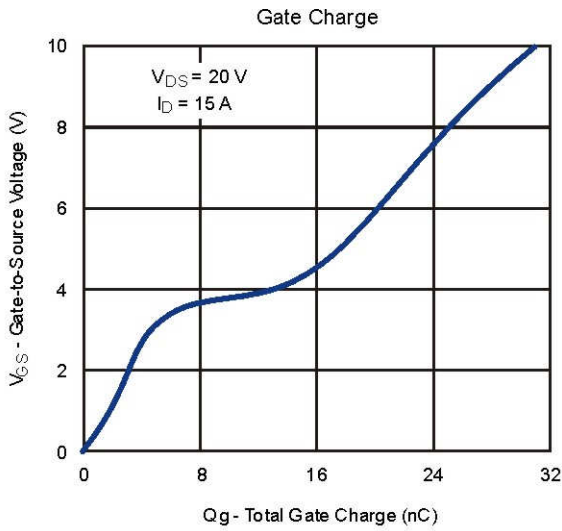
| Symbol               | Parameter                                     | Conditions   | Min | Typ  | Max  | Unit |
|----------------------|---|--|-----|------|------|------|
| <b>STATIC</b>        |   |  |     |      |      |      |
| V <sub>(BR)DSS</sub> | Drain-Source Breakdown Voltage                | V <sub>GS</sub> =0V, I <sub>D</sub> =250 μA  | 40  |      |      | V    |
| V <sub>GS(th)</sub>  | Gate Threshold Voltage                        | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 μA                              | 1   | 1.9  | 3    | V    |
| I <sub>GSS</sub>     | Gate Leakage Current                          | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V   |     |      | ±100 | nA   |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current               | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V  |     |      | 1    | μA   |
| R <sub>DS(ON)</sub>  | Drain-Source On-State Resistance <sup>a</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> = 15A   |     | 9    | 12   | mΩ   |
|                      |   | V <sub>GS</sub> =4.5V, I <sub>D</sub> = 13A  |     | 13   | 17   |      |
| V <sub>SD</sub>      | Diode Forward Voltage                         | I <sub>S</sub> =15A, V <sub>GS</sub> =0V   |     | 0.8  | 1.2  | V    |
| <b>DYNAMIC</b>       |   |  |     |      |      |      |
| Q <sub>g</sub> (TOT) | Total Gate Charge, V <sub>GS</sub> =10V       | V <sub>DS</sub> =20V, I <sub>D</sub> =15A  |     | 31   | 36   | nC   |
| Q <sub>g</sub>       | Total Gate Charge, V <sub>GS</sub> =4.5V      |  |     | 16   | 18   |      |
| Q <sub>gs</sub>      | Gate-Source Charge                            |  |     | 6.5  |      |      |
| Q <sub>gd</sub>      | Gate-Drain Charge                             |  |     | 8.3  |      |      |
| R <sub>g</sub>       | Gate Resistance                               | V <sub>gs</sub> =V <sub>ds</sub> =0V, f=1MHz   |     | 1.6  |      | Ω    |
| C <sub>iss</sub>     | Input capacitance                             | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz                                      |     | 1240 | 1500 | pF   |
| C <sub>oss</sub>     | Output Capacitance                            |  |     | 170  |      |      |
| C <sub>rss</sub>     | Reverse Transfer Capacitance                  |  |     | 60   |      |      |
| t <sub>d(on)</sub>   | Turn-On Delay Time                            | V <sub>DD</sub> =20V, I <sub>D</sub> =1A<br>V <sub>GS</sub> =10V, R <sub>GEN</sub> =6Ω |     | 16   | 20   | ns   |
| t <sub>r</sub>       | Turn-On Rise Time                             |  |     | 13   | 17   |      |
| t <sub>d(off)</sub>  | Turn-Off Delay Time                           |  |     | 60   | 75   |      |
| t <sub>f</sub>       | Turn-On Fall Time                             |  |     | 7    | 10   |      |

Notes: a. Pulse test; pulse width ≤ 300us, duty cycle ≤ 2%

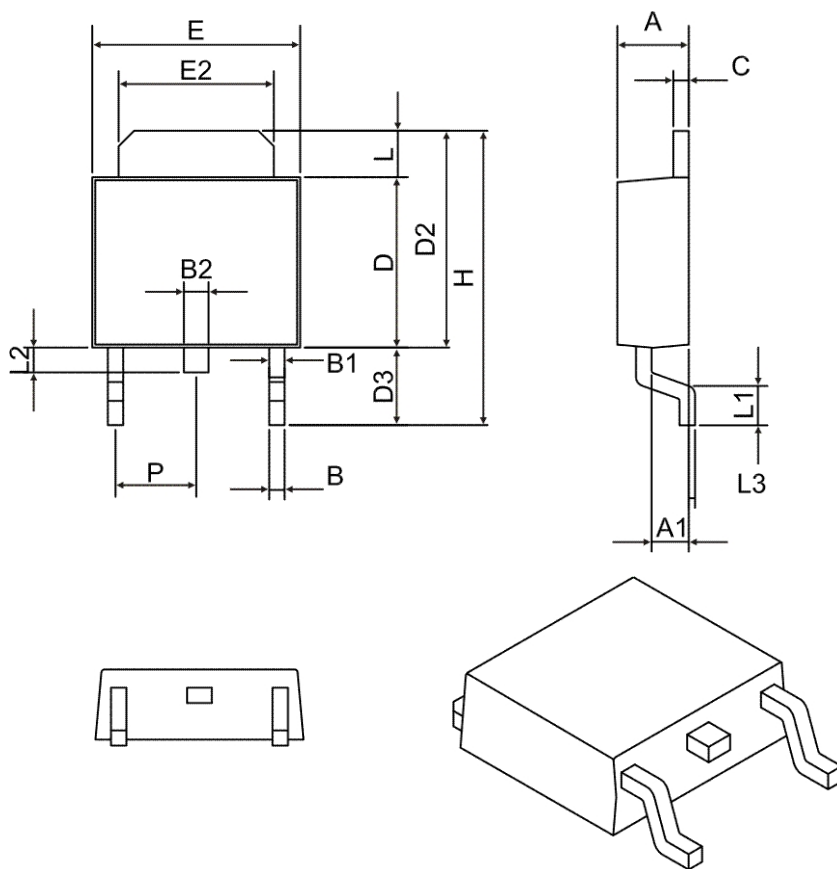
### Typical Characteristics (T<sub>J</sub> = 25°C Noted)



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### TO-252 Package Outline



| SYMBOL | MILLIMETERS |      |
|--------|-------------|------|
|        | MIN         | MAX  |
| A      | 2.00        | 2.50 |
| A1     | 1.1         | 1.3  |
| B      | 0.30        | 0.70 |
| B1     | 0.40        | 0.80 |
| B2     | 0.60        | 1.00 |
| C      | 0.40        | 0.60 |
| D      | 5.30        | 5.70 |
| D2     | 6.70        | 7.30 |
| D3     | 2.20        | 3.00 |
| H      | 9.20        | 9.80 |
| E      | 6.30        | 6.70 |
| E2     | 4.80        | 5.20 |
| L      | 1.30        | 1.70 |
| L1     | 0.90        | 1.50 |
| L3     | 0           | 0.30 |
| P      | 2.40        | 2.80 |