

DESCRIPTION

The MX3415A uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. It can be used in a wide variety of applications.

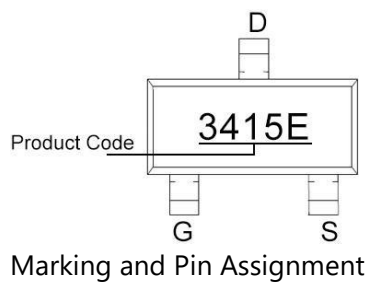
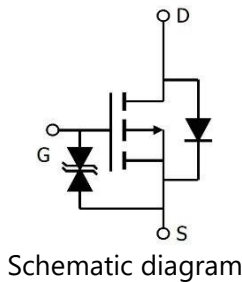
GENERAL FEATURES

- $V_{DS}=-20V$, $I_D=-5A$
 $R_{DS(ON)}(Typ.)=35m\Omega$ @ $V_{GS}=-2.5V$
 $R_{DS(ON)}(Typ.)=30m\Omega$ @ $V_{GS}=-4.5V$
- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package

APPLICATION

- PWM applications
- Load switch
- Power management

PINOUT



ABSOLUTE MAXIMUM RATINGS ($T_A=25^\circ C$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|--|----------------|------------|------------|
| Drain-Source Voltage | V_{DS} | -20 | V |
| Gate-Source Voltage | V_{GS} | ± 12 | V |
| Drain Current-Continuous | I_D | -5 | A |
| Drain Current-Pulsed ^(Note1) | I_{DM} | -25 | A |
| Maximum Power Dissipation | P_D | 1.4 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | $^\circ C$ |

THERMAL CHARACTERISTIC

| | | | |
|---|-----------------|----|--------------|
| Thermal Resistance, Junction-to-Ambient ^(Note 2) | $R_{\theta JA}$ | 89 | $^\circ C/W$ |
|---|-----------------|----|--------------|

Note 1. Repetitive Rating: Pulse width limited by maximum junction temperature.

Note 2. Surface Mounted on FR4 Board, $t \leq 10$ sec.



ELECTRICAL CHARACTERISTICS($T_A=25^{\circ}\text{C}$ unless otherwise noted)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|-----------|--------|------------|-----|-----|-----|------|
|-----------|--------|------------|-----|-----|-----|------|

Off Characteristics

| | | | | | | |
|---------------------------------|------------|-----------------------------|-----|---|-----------|---------|
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=-250\mu A$ | -20 | - | - | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=-20V, V_{GS}=0V$ | - | - | -1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 10V, V_{DS}=0V$ | - | - | ± 100 | nA |

On Characteristics(Note3)

| | | | | | | |
|----------------------------------|--------------|--------------------------------|------|------|----|-----------|
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$ | -0.4 | -0.7 | -1 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=-2.5V, I_D=-2A$ | - | 35 | 60 | $m\Omega$ |
| | | $V_{GS}=-4.5V, I_D=-4A$ | - | 30 | 40 | $m\Omega$ |
| Forward Transconductance | g_{FS} | $V_{DS}=-4V, I_D=-4A$ | - | 20 | - | S |

Dynamic Characteristics(Note4)

| | | | | | | |
|------------------------------|-----------|------------------------------------|---|-----|---|------------|
| Input Capacitance | C_{iss} | $V_{DS}=-10V, V_{GS}=0V, F=1.0MHz$ | - | 490 | - | pF |
| Output Capacitance | C_{oss} | | - | 130 | - | pF |
| Reverse Transfer Capacitance | C_{rss} | | - | 60 | - | pF |
| Gate Resistance | R_g | $V_{DS}=0V, V_{GS}=0V, F=1.0MHz$ | - | 7 | - | k Ω |

Switching Characteristics(Note4)

| | | | | | | |
|---------------------|--------------|---|---|-----|---|----|
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=-10V, R_L=1\Omega, V_{GS}=-4.5V, R_G=3\Omega$ | - | 13 | - | nS |
| Turn-on Rise Time | t_r | | - | 11 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 20 | - | nS |
| Turn-Off Fall Time | t_f | | - | 31 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=-10V, I_D=-4A, V_{GS}=-4.5V$ | - | 10 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 1.1 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 2.4 | - | nC |

Drain-Source Diode Characteristics

| | | | | | | |
|--|----------|----------------------|---|---|------|---|
| Diode Forward Voltage ^(Note3) | V_{SD} | $V_{GS}=0V, I_S=-1A$ | - | - | -1.2 | V |
| Diode Forward Current ^(Note2) | I_S | | - | - | -2 | A |

Note 2. Surface Mounted on FR4 Board, $t \leq 10$ sec.

Note 3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.

Note 4. Guaranteed by design, not subject to production

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 1. Switching Test Circuit

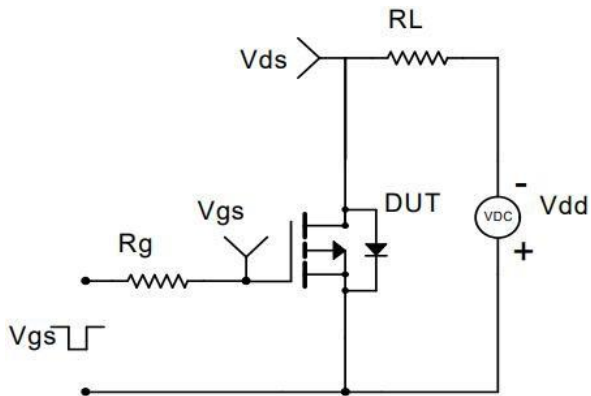


Figure 2. Switching Waveform

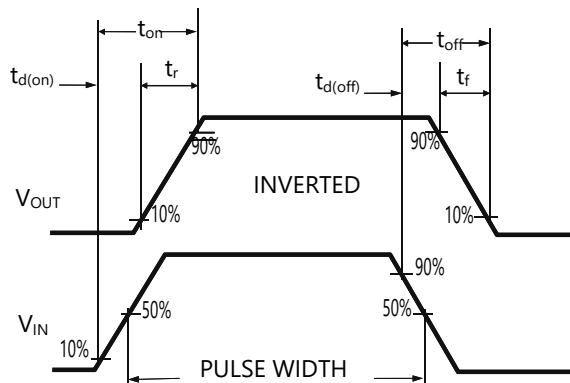


Figure 3. Power Dissipation

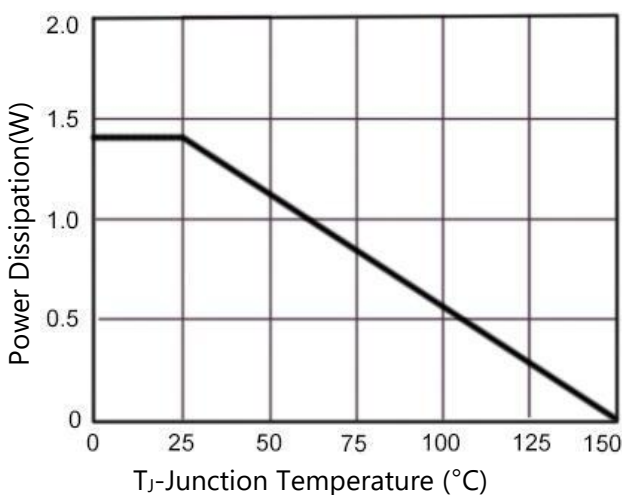


Figure 4. Drain Current

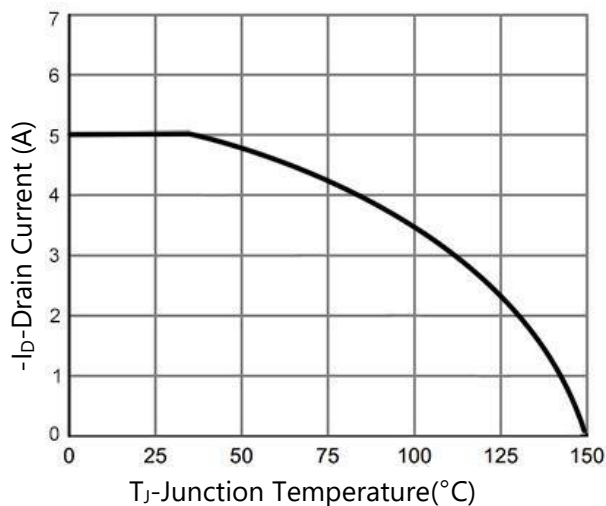


Figure 5. Output Characteristics

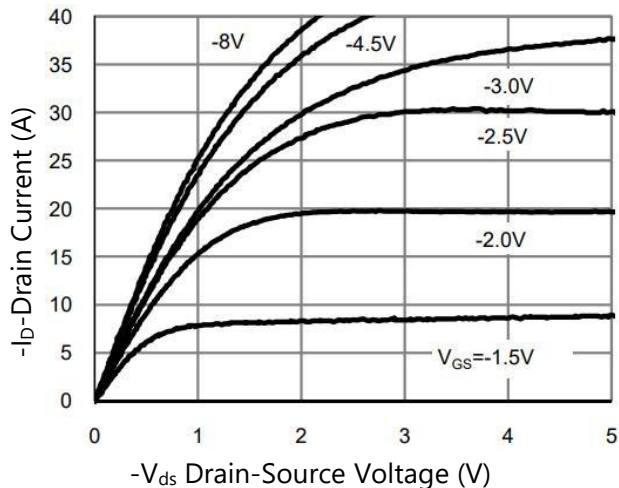
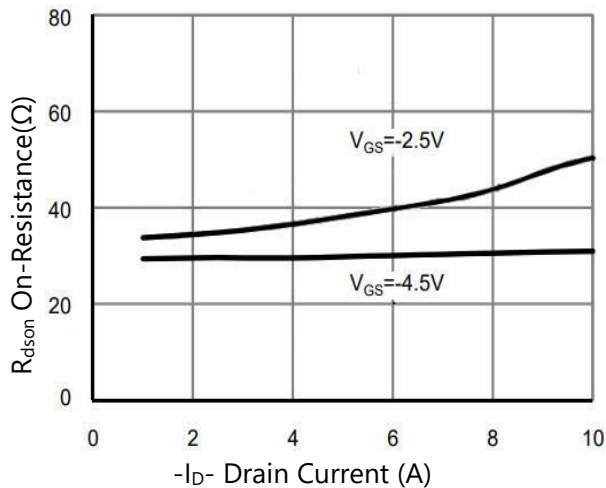


Figure 6. Drain-Source On-Resistance



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 7. Transfer Characteristics

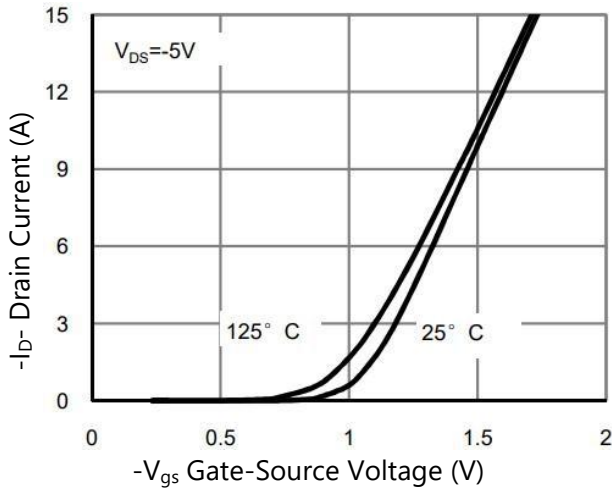


Figure 8. Drain-Source On-Resistance

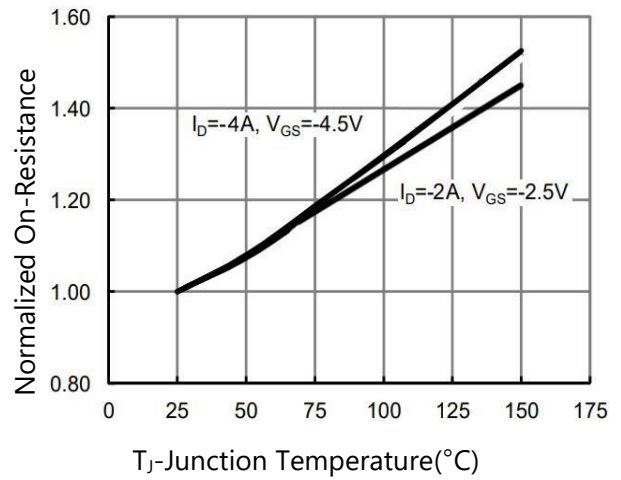


Figure 9. R_{dson} vs V_{GS}

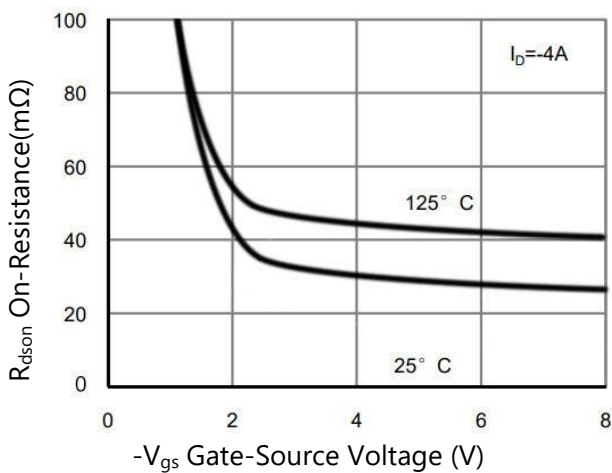


Figure 10. Capacitance vs V_{ds}

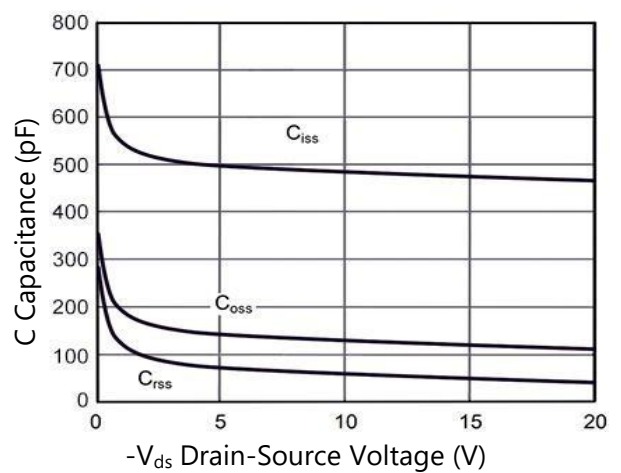


Figure 11. Gate Charge

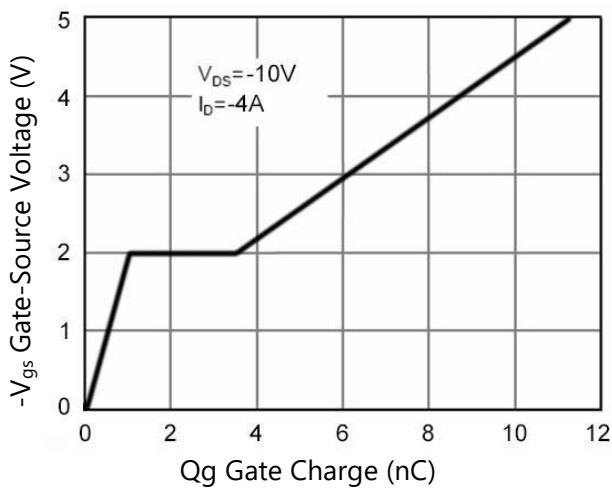
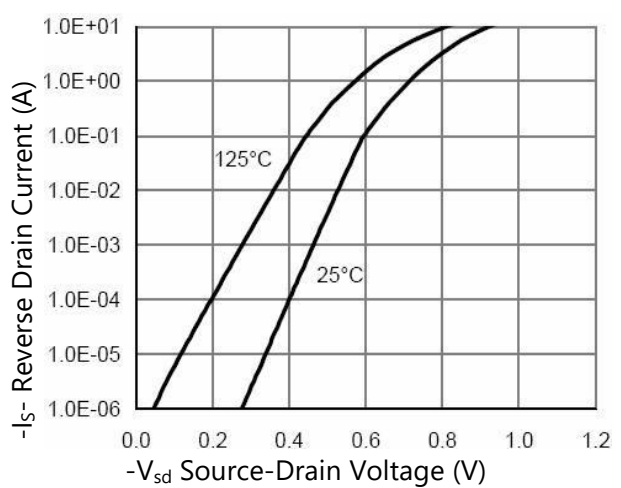


Figure 12. Source- Drain Diode Forward



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 13. Safe Operation Area

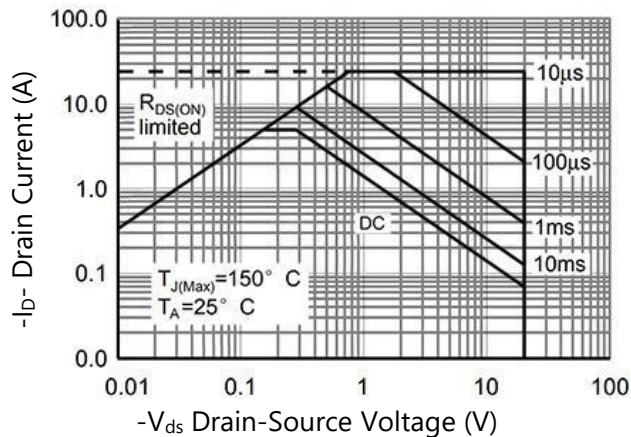
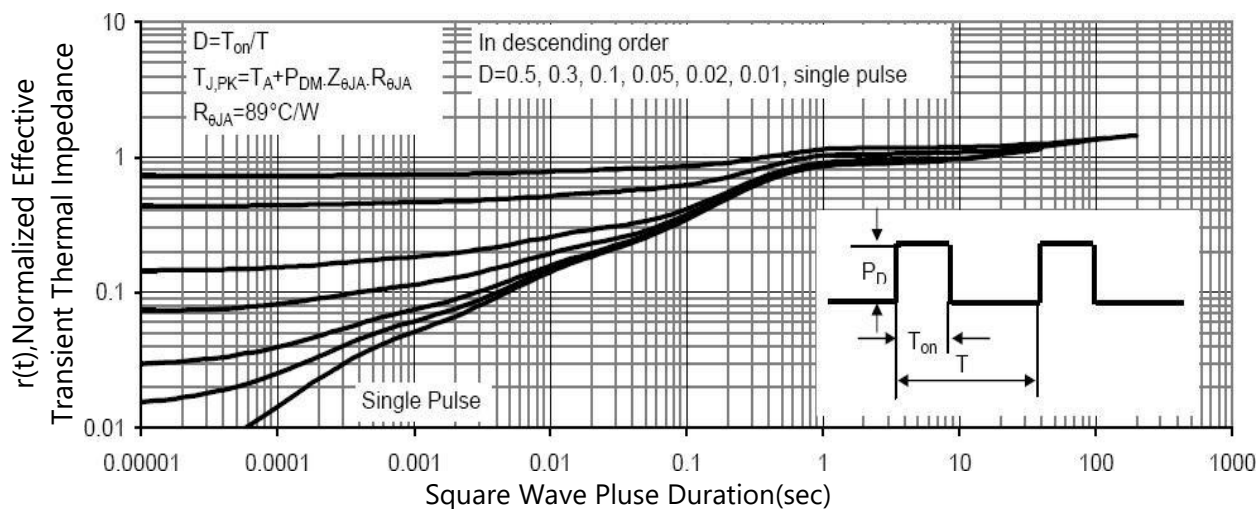
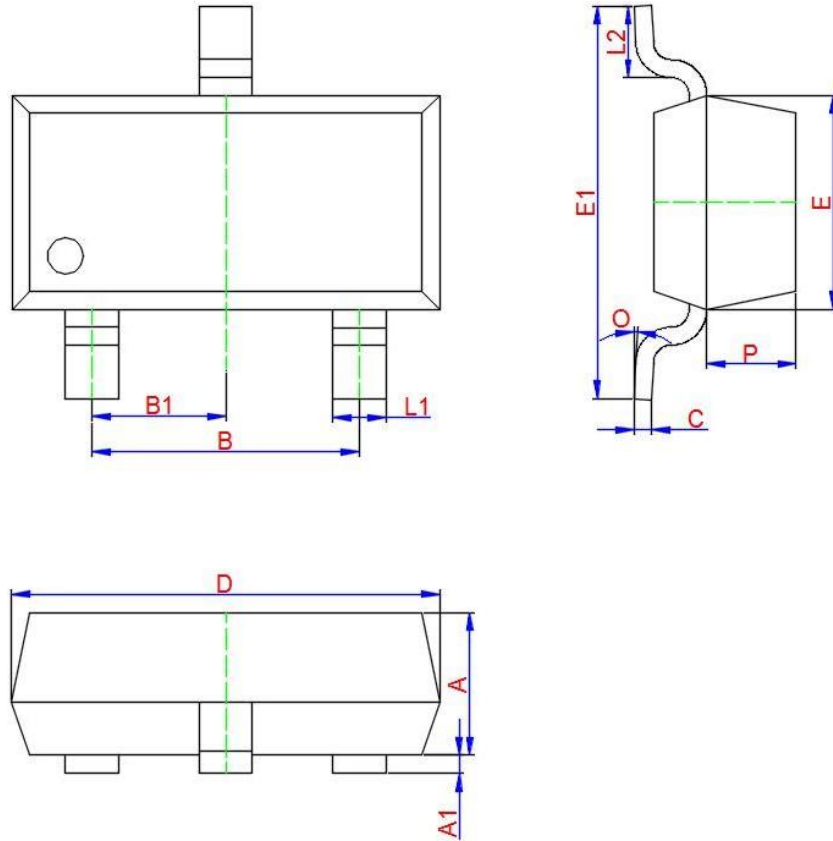


Figure 14. Normalized Maximum Transient Thermal Impedance



PACKAGE INFORMATION

SOT-23



| Symbol | Dimensions In Millimeters | | |
|--------|---------------------------|-------|-------|
| | Min. | Typ. | Max. |
| A | 0.900 | 1.000 | 1.100 |
| A1 | 0.000 | 0.050 | 0.100 |
| L1 | 0.300 | 0.400 | 0.500 |
| C | 0.100 | 0.110 | 0.120 |
| D | 2.800 | 2.900 | 3.000 |
| E | 1.250 | 1.300 | 1.350 |
| E1 | 2.250 | 2.400 | 2.550 |
| B | 1.800 | 1.900 | 2.000 |
| B1 | 0.950 TYP. | | |
| L2 | 0.200 | 0.350 | 0.450 |
| P | 0.550 | 0.575 | 0.600 |
| O | 0° | 4° | 8° |