

### • Product Summary

| Part #   | $V_{DS}$ | $R_{DS(on).typ}$<br>(@ $V_{GS}=10V$ ) | $R_{DS(on).typ}$<br>(@ $V_{GS}=4.5V$ ) | $I_D$ |
|----------|----------|---------------------------------------|----------------------------------------|-------|
| EFM3410A | 30V      | 24m $\Omega$                          | 31m $\Omega$                           | 5.8A  |

### • Features

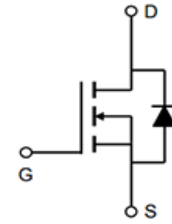
- Low  $R_{DS(on)}$  @  $V_{GS}=10V$
- 4.5V Logic Level Control
- N Channel SOT23-3L Package
- Pb-Free, RoHS Compliant

### • Application

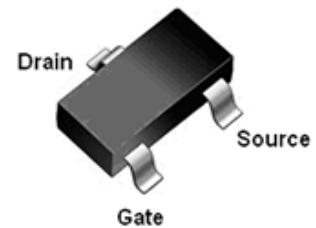
- Charging switch for portable devices
- Small brushless DC motor drive
- Load Switch for PWM
- DC-to-DC converters

### • Ordering Information:

|                           |           |
|---------------------------|-----------|
| Part NO.                  | EFM3410A  |
| Marking                   | AA****    |
| Packing Information       | REEL TAPE |
| Basic ordering unit (pcs) | 3000      |



N-Channel MOSFET



SOT23-3L



### • Absolute Maximum Ratings ( $T_C=25^\circ C$ )

| Parameter                                        | Symbol         | Limit      | Unit       |
|--------------------------------------------------|----------------|------------|------------|
| Drain-Source Voltage                             | $V_{DS}$       | 30         | V          |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 12$   | V          |
| Drain Current-Continuous                         | $I_D$          | 5.8        | A          |
| Drain Current-Pulsed <sup>(Note 1)</sup>         | $I_{DM}$       | 23         | A          |
| Maximum Power Dissipation                        | $P_D$          | 1.5        | W          |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 To 150 | $^\circ C$ |

### • Thermal Characteristic

|                                                             |                 |     |              |
|-------------------------------------------------------------|-----------------|-----|--------------|
| Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup> | $R_{\theta JA}$ | 100 | $^\circ C/W$ |
|-------------------------------------------------------------|-----------------|-----|--------------|

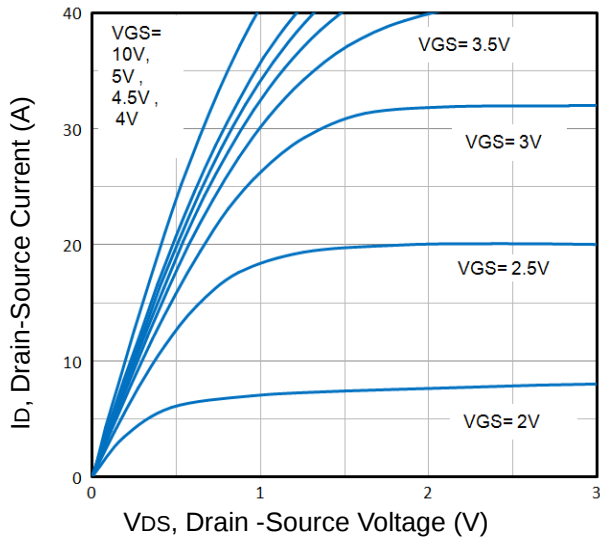
• Static Electrical Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise stated)

| Parameter                                     | Symbol       | Condition                                                    | Min | Typ  | Max       | Unit       |
|-----------------------------------------------|--------------|--------------------------------------------------------------|-----|------|-----------|------------|
| Off Characteristics                           |              |                                                              |     |      |           |            |
| Drain-Source Breakdown Voltage                | $BV_{DSS}$   | $V_{GS}=0V$ $I_D=250\mu A$                                   | 30  | --   | --        | V          |
| Zero Gate Voltage Drain Current               | $I_{DSS}$    | $V_{DS}=30V$ $V_{GS}=0V$                                     | --  | --   | 1         | $\mu A$    |
| Gate-Body Leakage Current                     | $I_{GSS}$    | $V_{GS}=\pm 12V$ $V_{DS}=0V$                                 | --  | --   | $\pm 100$ | nA         |
| On Characteristics <sup>(Note 3)</sup>        |              |                                                              |     |      |           |            |
| Gate Threshold Voltage                        | $V_{GS(th)}$ | $V_{DS}=V_{GS}$ $I_D=250\mu A$                               | 0.4 | 0.8  | 1.5       | V          |
| Drain-Source On-State Resistance              | $R_{DS(ON)}$ | $V_{GS}=10V$ $I_D=5.8A$                                      | --  | 24   | 30        | m $\Omega$ |
|                                               |              | $V_{GS}=4.5V$ $I_D=5A$                                       | --  | 31   | 36        | m $\Omega$ |
| Dynamic Characteristics <sup>(Note4)</sup>    |              |                                                              |     |      |           |            |
| Input Capacitance                             | $C_{ISS}$    | $V_{DS}=15V$ $V_{GS}=0V$<br><br>$F=1.0MHz$                   | --  | 650  | --        | PF         |
| Output Capacitance                            | $C_{OSS}$    |                                                              | --  | 54   | --        | PF         |
| Reverse Transfer Capacitance                  | $C_{RSS}$    |                                                              | --  | 47   | --        | PF         |
| Switching Characteristics <sup>(Note 4)</sup> |              |                                                              |     |      |           |            |
| Turn-on Delay Time                            | $t_{d(on)}$  | $V_{DD}=15V$ $I_D=5A$<br><br>$V_{GS}=4.5V$ $R_G=3.3\Omega$ , | --  | 7.5  | --        | nS         |
| Turn-on Rise Time                             | $t_r$        |                                                              | --  | 18   | --        | nS         |
| Turn-Off Delay Time                           | $t_{d(off)}$ |                                                              | --  | 36   | --        | nS         |
| Turn-Off Fall Time                            | $t_f$        |                                                              | --  | 5    | --        | nS         |
| Total Gate Charge                             | $Q_g$        | $V_{DS}=15V$ $I_D=5A$<br><br>$V_{GS}=4.5V$                   | --  | 6.2  | --        | nC         |
| Gate-Source Charge                            | $Q_{gs}$     |                                                              | --  | 1.2  | --        | nC         |
| Gate-Drain Charge                             | $Q_{gd}$     |                                                              | --  | 1.9  | --        | nC         |
| Drain-Source Diode Characteristics            |              |                                                              |     |      |           |            |
| Diode Forward Voltage <sup>(Note 3)</sup>     | $V_{SD}$     | $V_{GS}=0V$ $I_S=2A$                                         | --  | 0.83 | 1.2       | V          |
| Diode Forward Current <sup>(Note 2)</sup>     | $I_S$        |                                                              | --  | --   | 1.5       | A          |

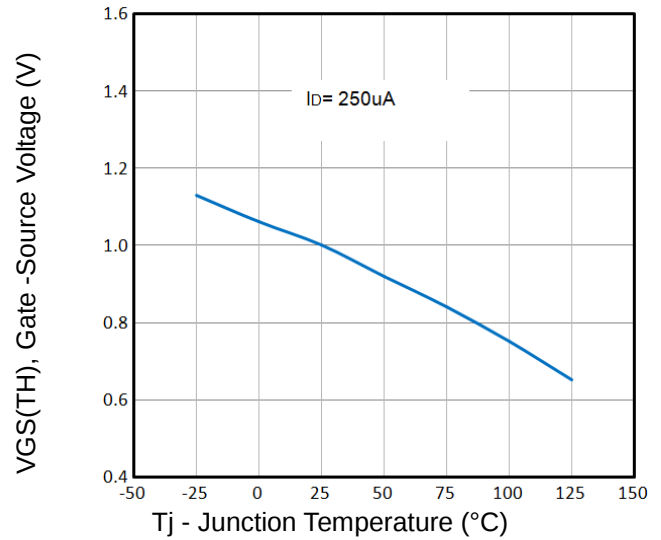
Notes:

- ① Pulse width limited by maximum allowable junction temperature  
 ② Pulse test ; Pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

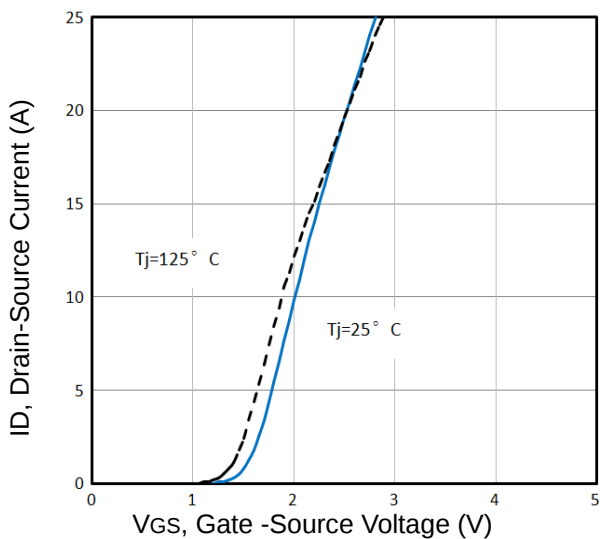
## • Typical Characteristics



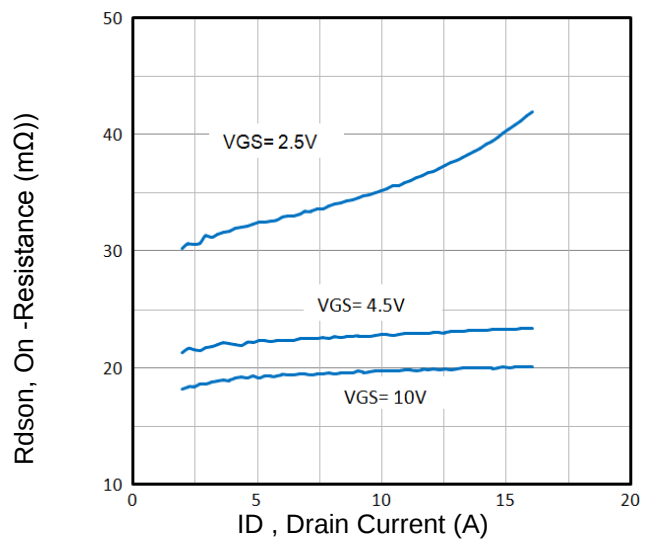
**Fig1.** Typical Output Characteristics



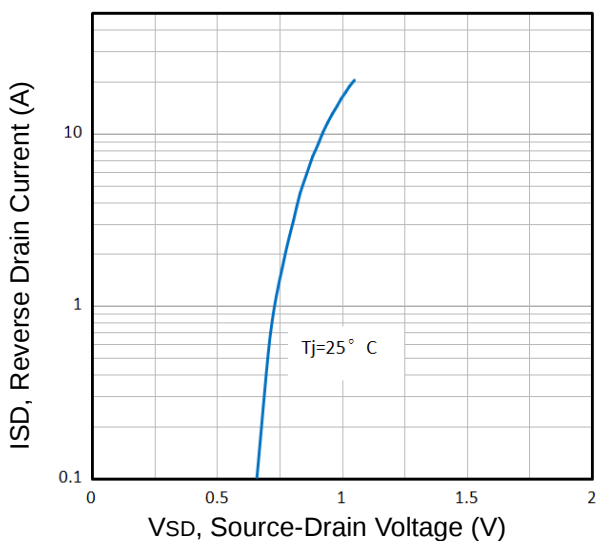
**Fig2.** Normalized Threshold Voltage Vs. Temperature



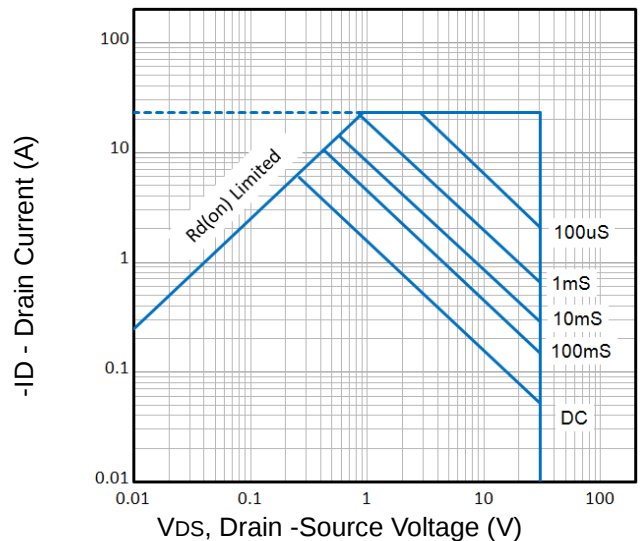
**Fig3.** Typical Transfer Characteristics



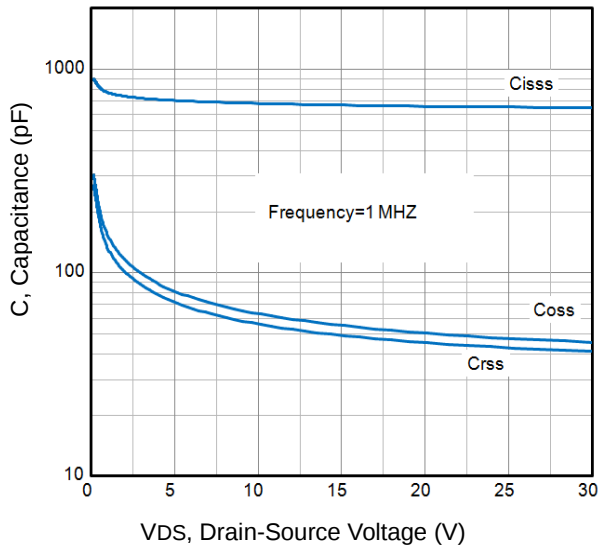
**Fig4.** On-Resistance vs. Drain Current and VGS



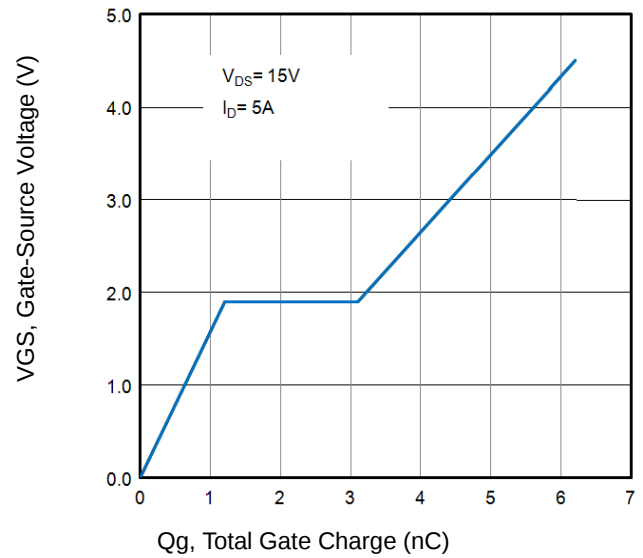
**Fig5.** Typical Source-Drain Diode Forward Voltage



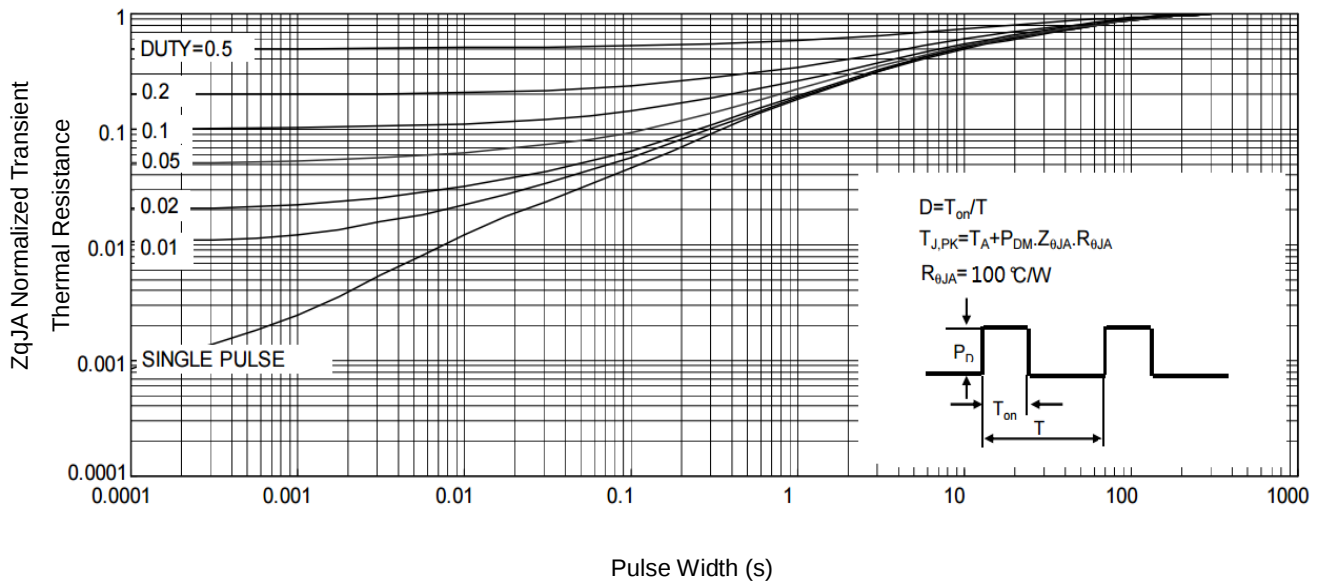
**Fig6.** Maximum Safe Operating Area



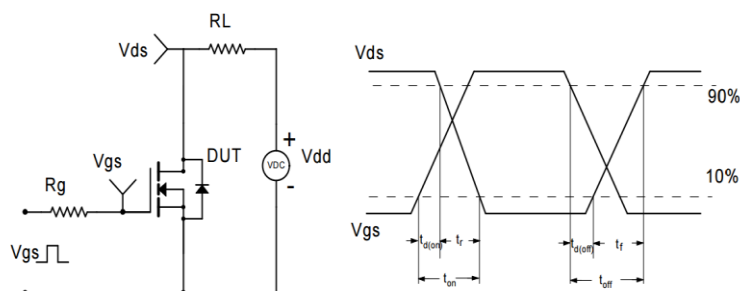
**Fig7.** Typical Capacitance Vs. Drain-Source Voltage



**Fig8.** Typical Gate Charge Vs. Gate-Source Voltage

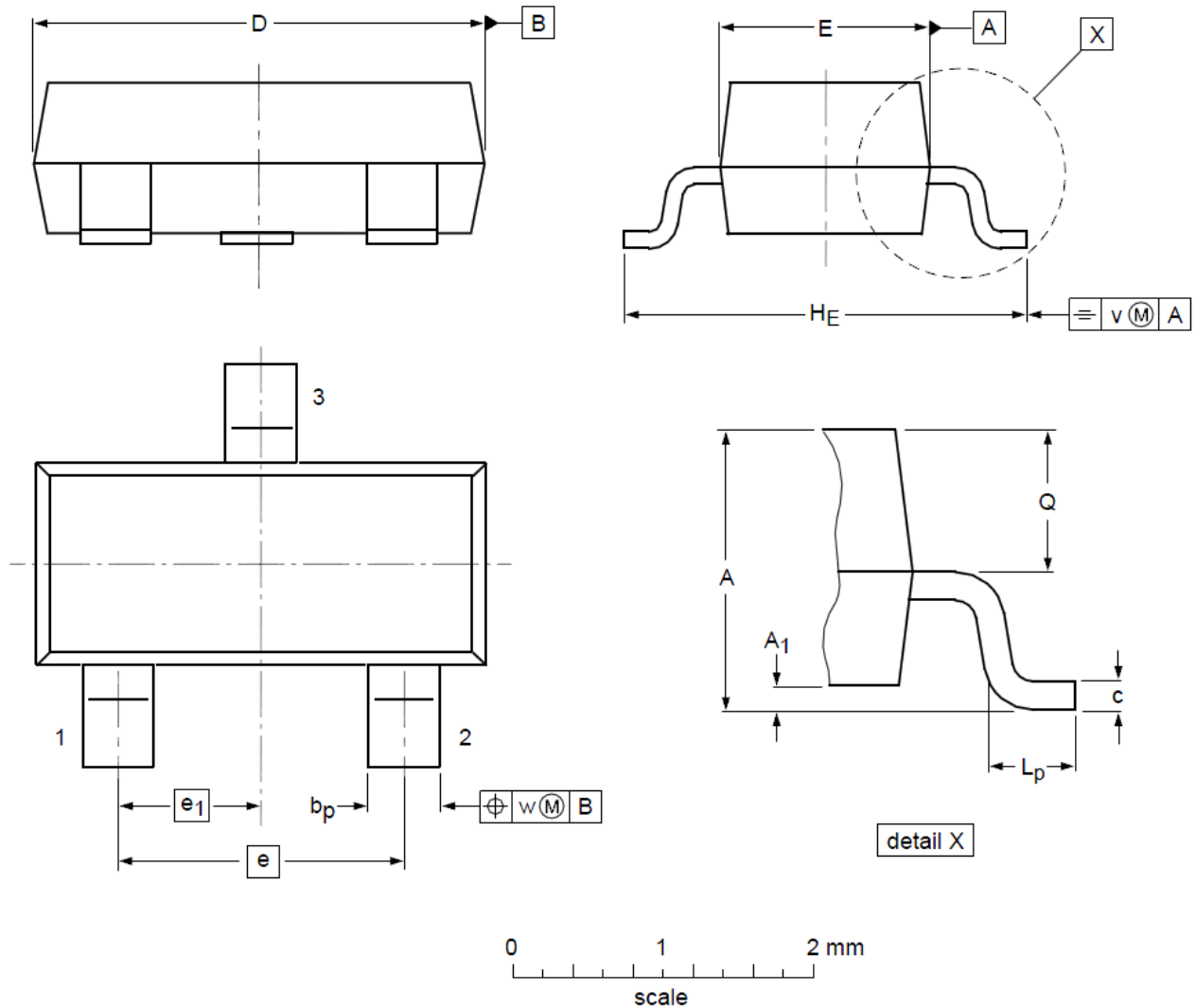


**Fig9.** Normalized Maximum Transient Thermal Impedance



**Fig10.** Switching Time Test Circuit and waveforms

## SOT23-3L Package Outline Dimensions



**DIMENSIONS** ( unit : mm )

| Symbol         | Min  | Typ  | Max  | Symbol         | Min  | Typ  | Max  |
|----------------|------|------|------|----------------|------|------|------|
| A              | 1.00 | 1.17 | 1.30 | A <sub>1</sub> | 0.01 | 0.05 | 0.10 |
| b <sub>p</sub> | 0.35 | 0.39 | 0.50 | c              | 0.10 | 0.20 | 0.26 |
| D              | 2.70 | 2.90 | 3.10 | E              | 1.30 | 1.58 | 1.70 |
| e              | --   | 1.90 | --   | e <sub>1</sub> | --   | 0.95 | --   |
| H <sub>E</sub> | 2.50 | 2.78 | 3.00 | L <sub>p</sub> | 0.20 | 0.32 | 0.60 |
| Q              | 0.23 | 0.27 | 0.33 | v              | --   | 0.20 | --   |
| w              | --   | 0.20 | --   |                |      |      |      |