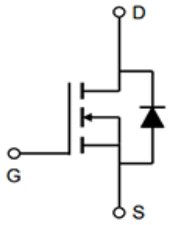
EFMICRO
Semiconductor Limited Company

# EFM6005A

**N-Channel Advanced Power MOSFET**

## • Product Summary

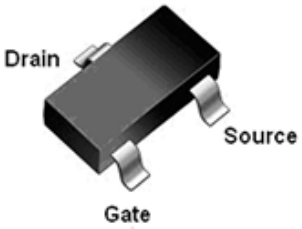
| Part # | $V_{DS}$ | $R_{DS(on).typ}$ ($@V_{GS}$=10V) | $R_{DS(on).typ}$ ($@V_{GS}$=4.5V) | $I_D$ |
|---|---|---|---|---|
| EFM6005A | 60V | 38mΩ | 50mΩ | 5A |




**N- Channel MOSFET**

## • Features

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




**SOT23-3L**

RoHS

HF

## •Application

- Load Switch
- *Battery switch*
- *DC/DC Converter*

## •Ordering Information:

| | |
|---|---|
| Part NO. | EFM6005A |
| Marking | 6005A |
| Packing Information | REEL TAPE |
| Basic ordering unit (pcs) | 3000 |

## •Absolute Maximum Ratings ($T_C$=25℃)

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 5 | A |
| Drain Current-Pulsed (Note 1) | $I_{DM}$ | 16 | A |
| Maximum Power Dissipation | $P_D$ | 1.7 | W |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55 To 150 | ℃ |

## •Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 74 | ℃/W |

## ● Static Electrical Characteristics @ $T_J$ = 25°C (unless otherwise stated)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250uA | 60 | -- | -- | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=60V $V_{GS}$=0V | -- | -- | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V $V_{DS}$=0V | -- | -- | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$ $I_D$=250uA | 1.2 | 1.8 | 2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V $I_D$=5A | -- | 38 | 48 | mΩ |
| | | $V_{GS}$=4.5V $I_D$=4A | -- | 50 | 65 | mΩ |
| **Dynamic Characteristics** (Note4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=30V $V_{GS}$=0V F=1.0MHz | -- | 553 | -- | PF |
| Output Capacitance | $C_{oss}$ | | -- | 43 | -- | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 37 | -- | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=30V $I_D$=4A $V_{GS}$=10V $R_G$=1Ω, | -- | 6 | -- | nS |
| Turn-on Rise Time | $t_r$ | | -- | 11 | -- | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | -- | 18 | -- | nS |
| Turn-Off Fall Time | $t_f$ | | -- | 10 | -- | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=30V $I_D$=4A $V_{GS}$=10V | -- | 11 | -- | nC |
| Gate-Source Charge | $Q_{gs}$ | | -- | 1.7 | -- | nC |
| Gate-Drain Charge | $Q_{gd}$ | | -- | 2.6 | -- | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V $I_S$=4A | -- | -- | 1.2 | V |
| Diode Forward Current (Note 2) | $I_S$ | | -- | -- | 4 | A |

## Notes:

**1.** Repetitive Rating: Pulse width limited by maximum junction temperature.
**2.** The value of R θJA is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25°C. The value in any given application depends on the user's specific board design.
**3.** Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
**4.** Guaranteed by design, not subject to production
5. EAS condition : Tj=25℃,$V_{DD}$=30V,$V_G$=10V,L=0.5mH,Rg=25Ω

## • Typical Characteristics

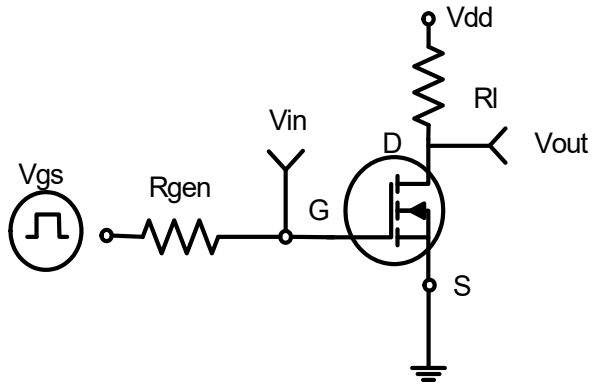



**Figure 1:Switching Test Circuit**

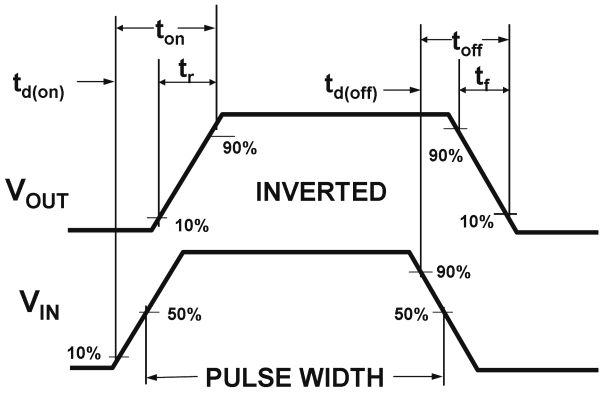
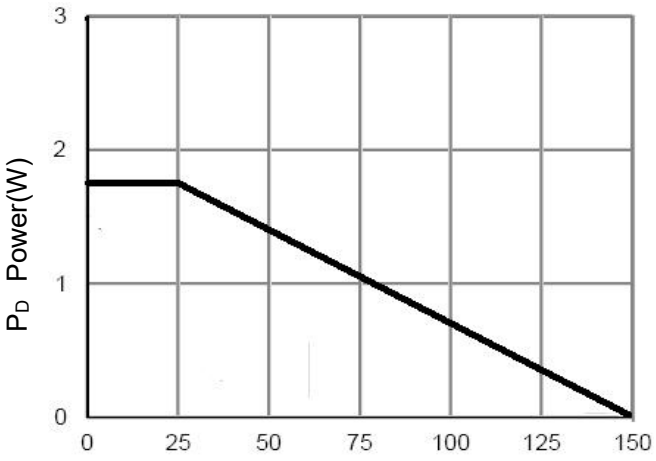
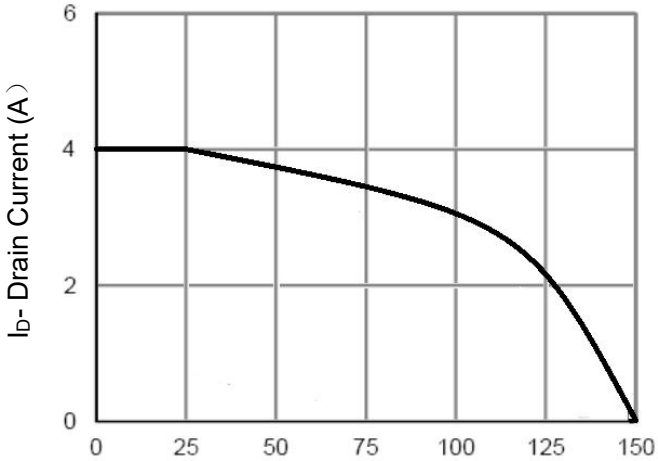



**Figure 2:Switching Waveforms**



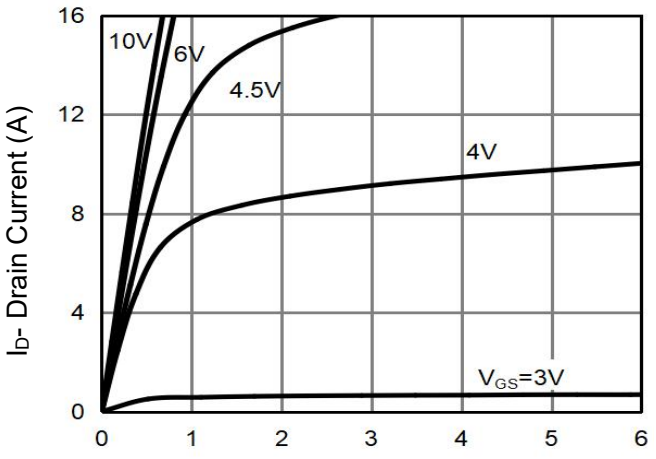

$T_J$-Junction Temperature(℃)

**Figure 3 Power Dissipation**



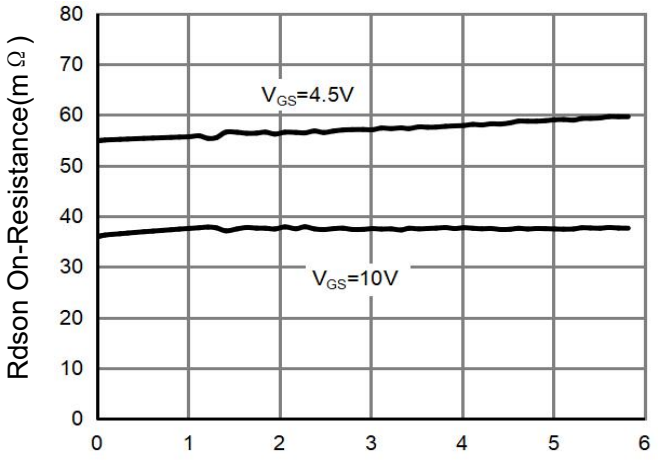

$T_J$-Junction Temperature(℃)

**Figure 4 Drain Current**




Vds Drain-Source Voltage (V)

**Figure 5 Output Characteristics**




$I_D$- Drain Current (A)

**Figure 6 Drain-Source On-Resistance**

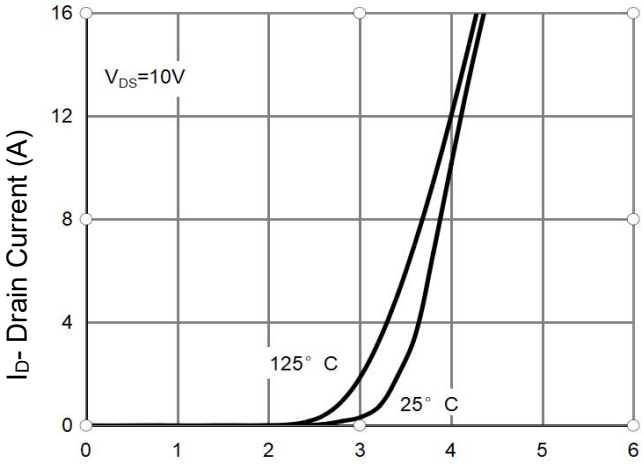



**Figure 7 Transfer Characteristics**

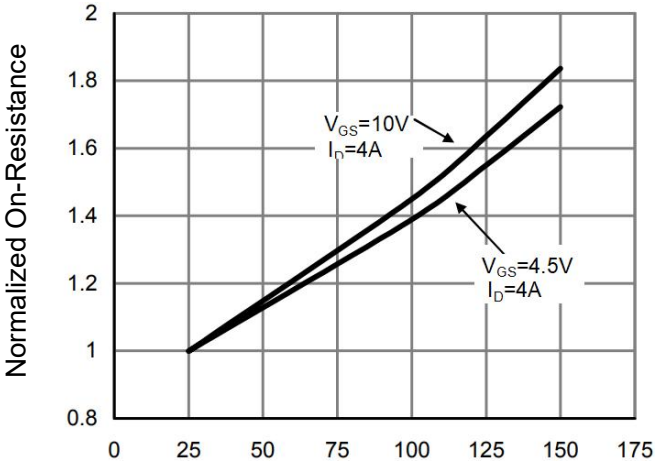



**Figure 8 Drain-Source On-Resistance**

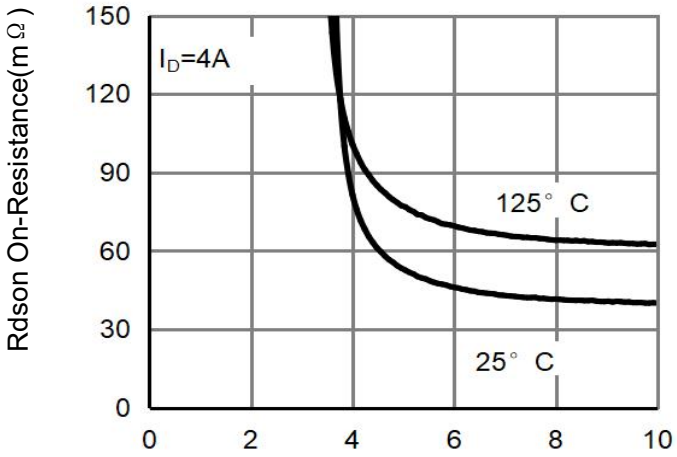



**Figure 9 Rdson vs Vgs**

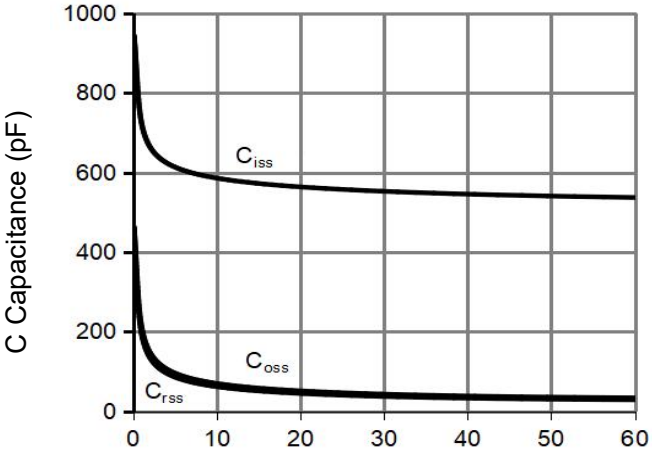



**Figure 10 Capacitance vs Vds**

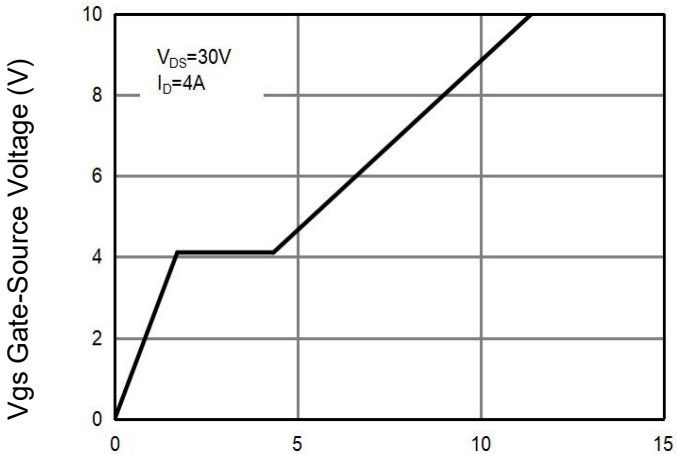



**Figure 11 Gate Charge**

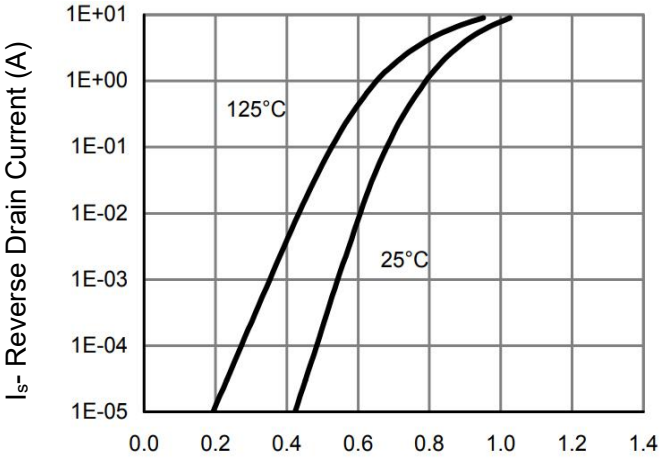



**Figure 12 Source- Drain Diode Forward**

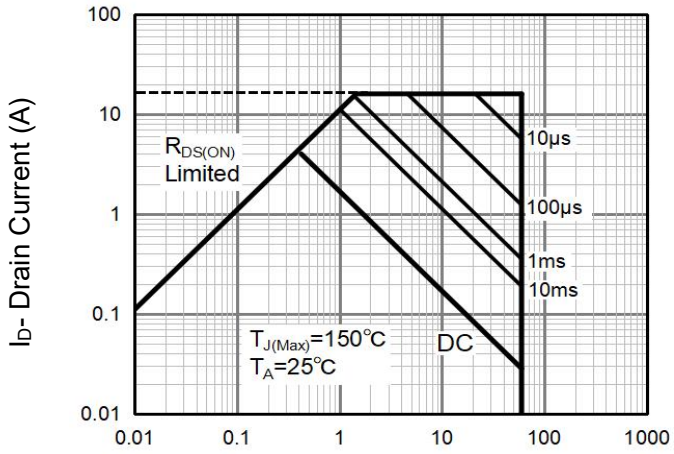



**Figure 13 Safe Operation Area**

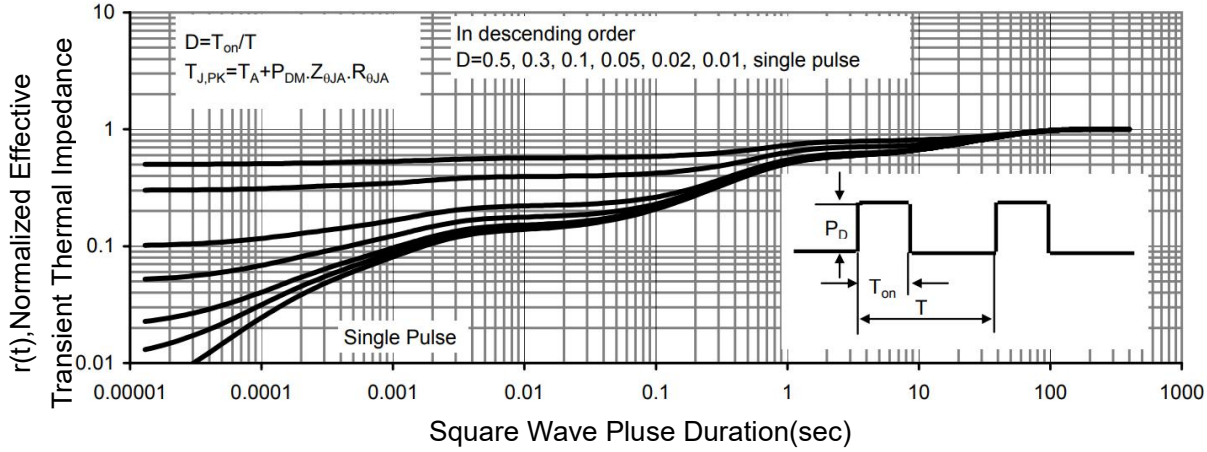
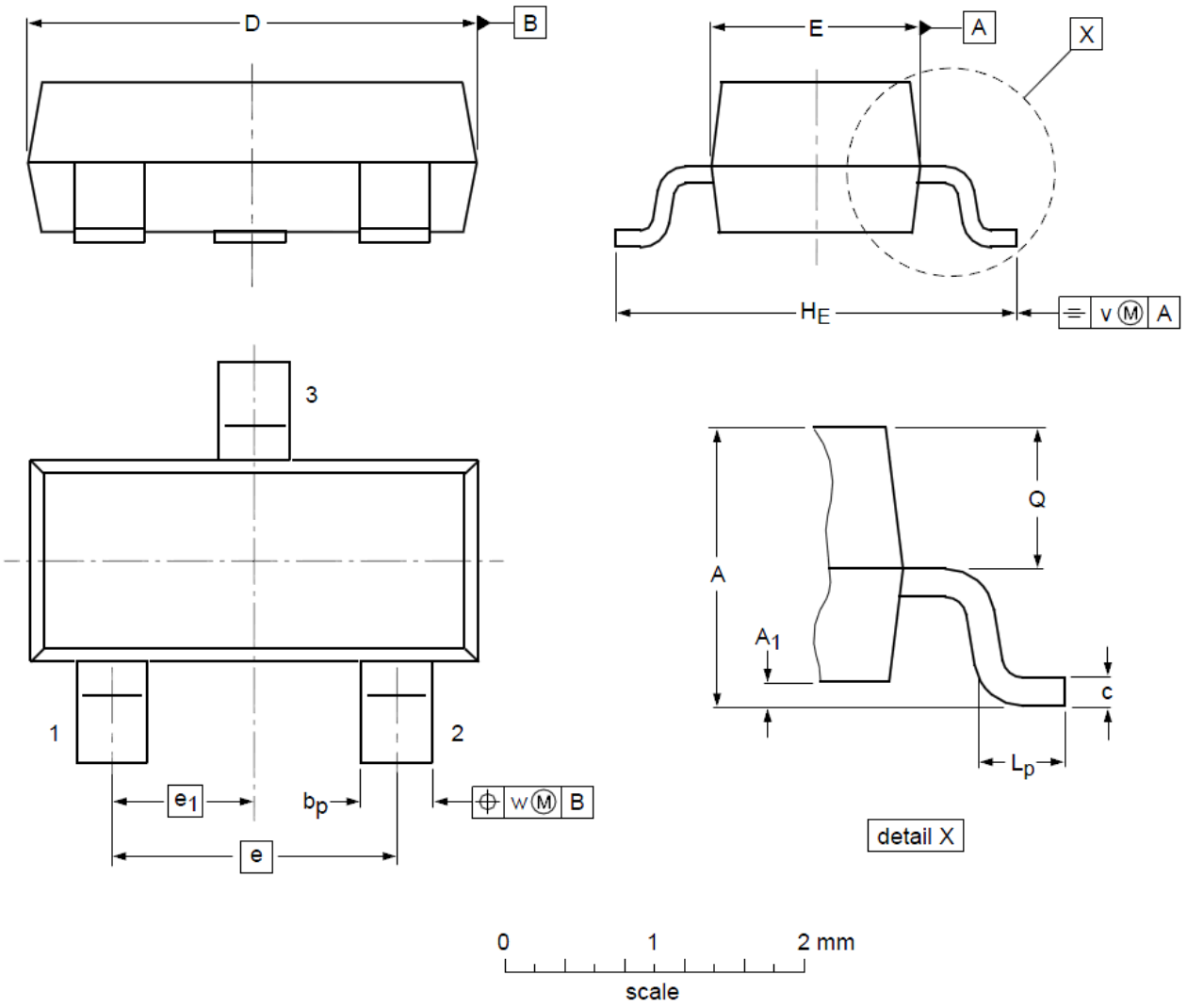



**Figure 14 Normalized Maximum Transient Thermal Impedance**

## SOT23-3L Package Outline Dimensions




**DIMENSIONS** ( unit : mm )

| Symbol | Min | Typ | Max | Symbol | Min | Typ | Max |
|---|---|---|---|---|---|---|---|
| **A** | 1.00 | 1.17 | 1.30 | **$A_1$** | 0.01 | 0.05 | 0.10 |
| **$b_p$** | 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 | -- | **$e_1$** | -- | 0.95 | -- |
| **$H_E$** | 2.50 | 2.78 | 3.00 | **$L_p$** | 0.20 | 0.32 | 0.60 |
| **Q** | 0.23 | 0.27 | 0.33 | **v** | -- | 0.20 | -- |
| **w** | -- | 0.20 | -- | | | | |