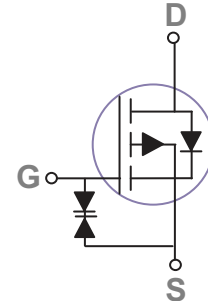


P-Channel Enhancement Mode Power MOSFET

Description

The RM4P20ES6 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.



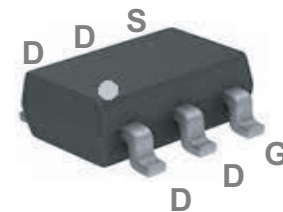
Schematic diagram

General Features

- $V_{DS} = -20V, I_D = -4.1A$
 $R_{DS(ON)} < 80m\Omega @ V_{GS} = -2.5V$
 $R_{DS(ON)} < 52m\Omega @ V_{GS} = -4.5V$
- ESD: HBM > 2000V
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

Application

- PWM applications
- Load switch
- Power management
- Halogen-free



SOT23-6 top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|------------|
| 4P20 | RM4P20ES6 | SOT23-6 | Ø180mm | 8 mm | 3000 units |

Absolute Maximum Ratings ($T_A = 25$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|--|----------------|--------------------|------|
| Drain-Source Voltage | V_{DS} | -20 | V |
| Gate-Source Voltage | V_{GS} | ±12 | V |
| Continuous Drain Current | I_D | $T_C = 25^\circ C$ | -4.1 |
| | | $T_C = 70^\circ C$ | -3.2 |
| | | $T_A = 25^\circ C$ | -3 |
| | | $T_A = 70^\circ C$ | -2.3 |
| Drain Current -Pulsed (Note 1) | I_{DM} | -15 | A |
| Maximum Power Dissipation | P_D | 1.7 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 150 | °C |

Thermal Characteristic

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

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

| Parameter | Symbol | Condition | 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} | $V_{GS}=\pm 12V, V_{DS}=0V$ | - | - | ± 100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$ | -0.45 | -0.7 | -1.0 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=-4.5V, I_D=-4.1A$ | - | 39 | 52 | m Ω |
| | | $V_{GS}=-2.5V, I_D=-3.6A$ | - | 60 | 80 | |
| Forward Transconductance | g_{FS} | $V_{DS}=-5V, I_D=-2A$ | 6 | - | - | S |
| Dynamic Characteristics (Note4) | | | | | | |
| Input Capacitance | C_{ISS} | $V_{DS}=-4V, V_{GS}=0V,$ $F=1.0MHz$ | - | 740 | - | PF |
| Output Capacitance | C_{OSS} | | - | 290 | - | PF |
| Reverse Transfer Capacitance | C_{RSS} | | - | 190 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=-4V, I_D=-3.3A,$ $R_L=-1.2\Omega, V_{GEN}=-4.5V, R_g=1\Omega$ | - | 12 | - | nS |
| Turn-on Rise Time | t_r | | - | 35 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 30 | - | nS |
| Turn-Off Fall Time | t_f | | - | 10 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=-4V, I_D=-4.1A, V_{GS}=-4.5V$ | - | 7.8 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 1.2 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 1.6 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V_{SD} | $V_{GS}=0V, I_S=-1.6A$ | - | - | -1.2 | V |
| Diode Forward Current (Note 2) | I_S | | - | - | 1.6 | A |

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

RATING AND CHARACTERISTICS CURVES (RM4P20ES6)

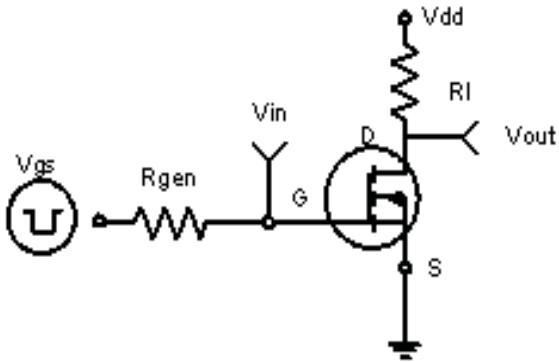


Figure 1: Switching Test Circuit

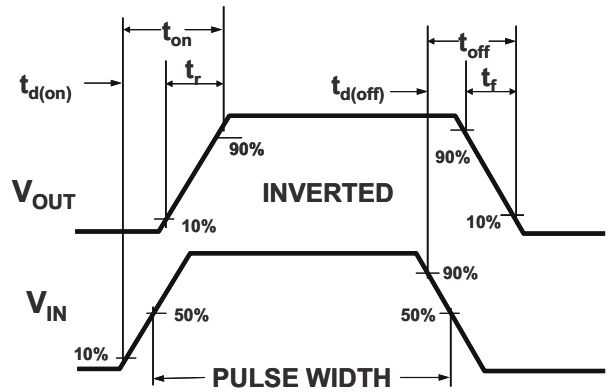
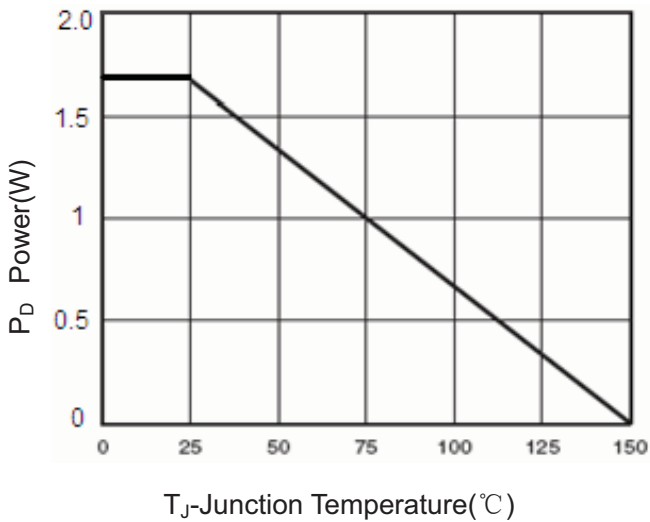
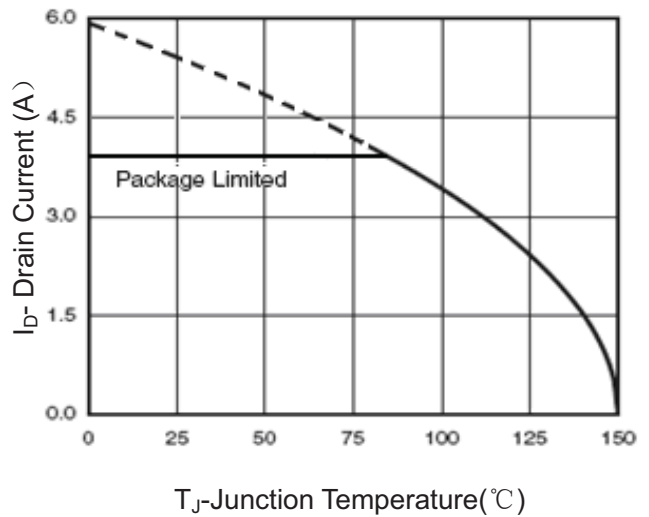


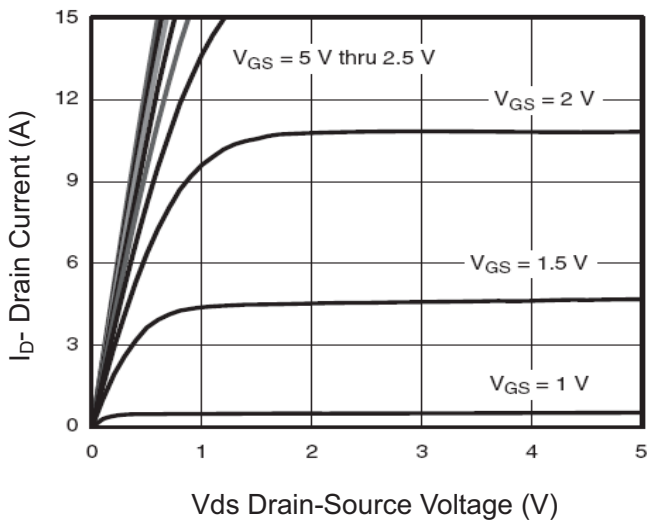
Figure 2: Switching Waveforms



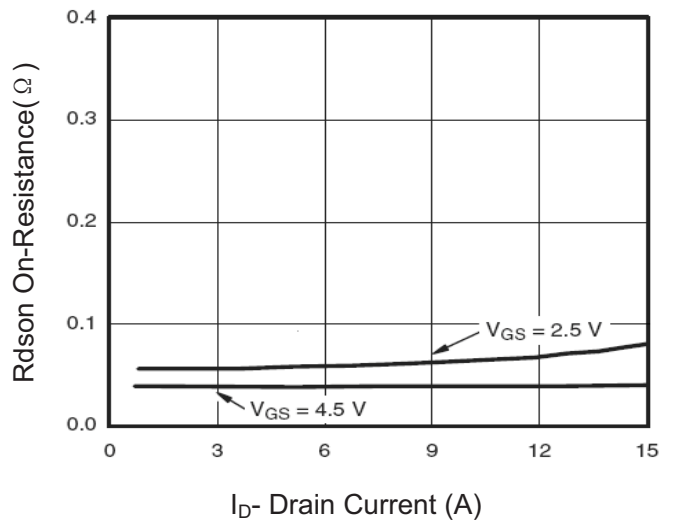
T_J-Junction Temperature(°C)
Figure 3 Power Dissipation



T_J-Junction Temperature(°C)
Figure 4 Drain Current

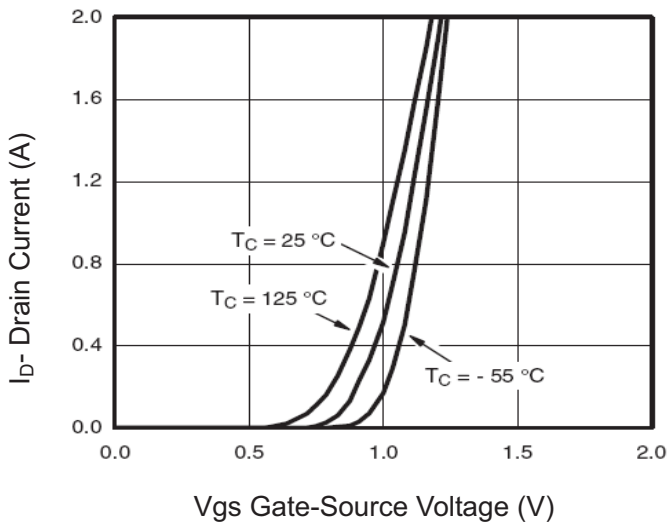


V_{ds} Drain-Source Voltage (V)
Figure 5 Output Characteristics

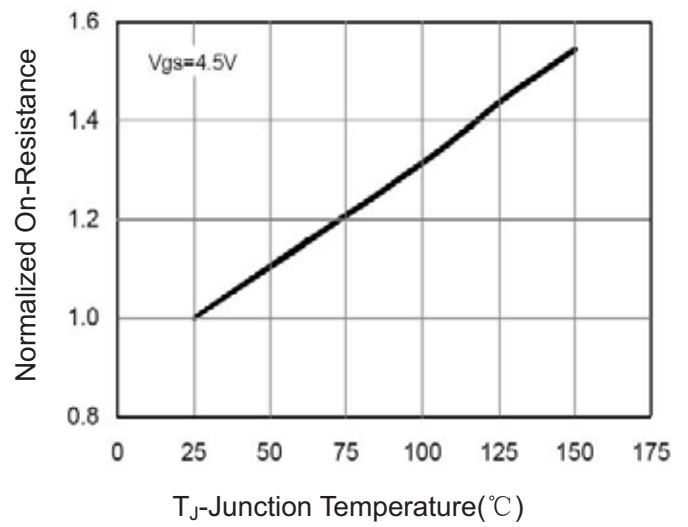


I_D- Drain Current (A)
Figure 6 Drain-Source On-Resistance

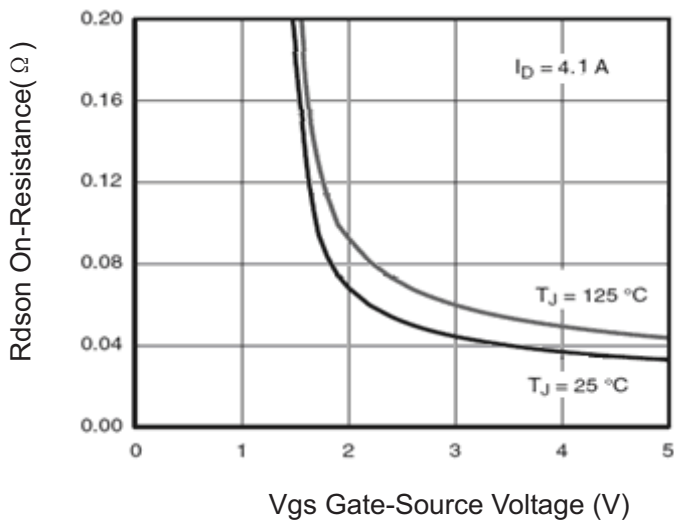
RATING AND CHARACTERISTICS CURVES (RM4P20ES6)



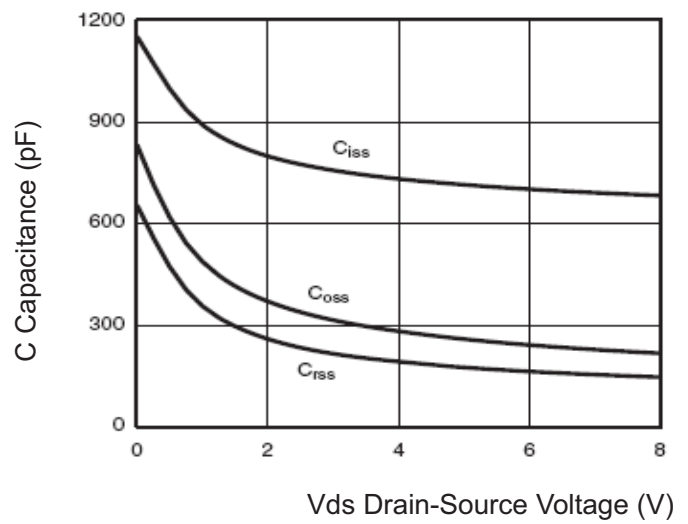
Vgs Gate-Source Voltage (V)
Figure 7 Transfer Characteristics



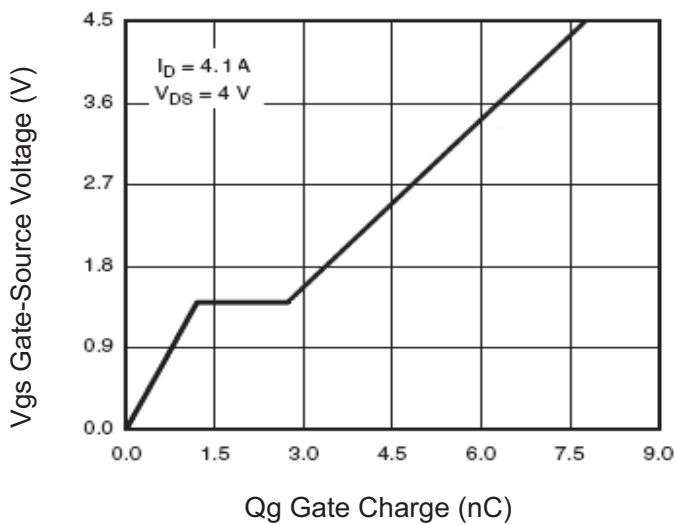
T_J -Junction Temperature($^\circ\text{C}$)
Figure 8 Drain-Source On-Resistance



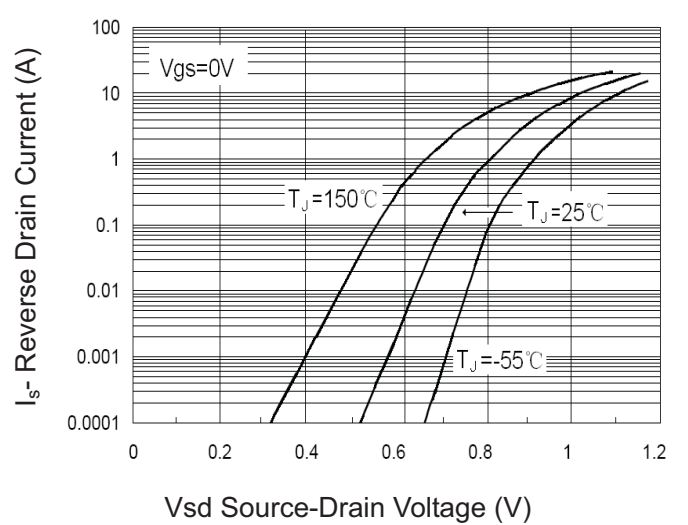
Vgs Gate-Source Voltage (V)
Figure 9 Rdson vs Vgs



V_{ds} Drain-Source Voltage (V)
Figure 10 Capacitance vs Vds



Q_g Gate Charge (nC)
Figure 11 Gate Charge



V_{sd} Source-Drain Voltage (V)
Figure 12 Source- Drain Diode Forward

RATING AND CHARACTERISTICS CURVES (RM4P20ES6)

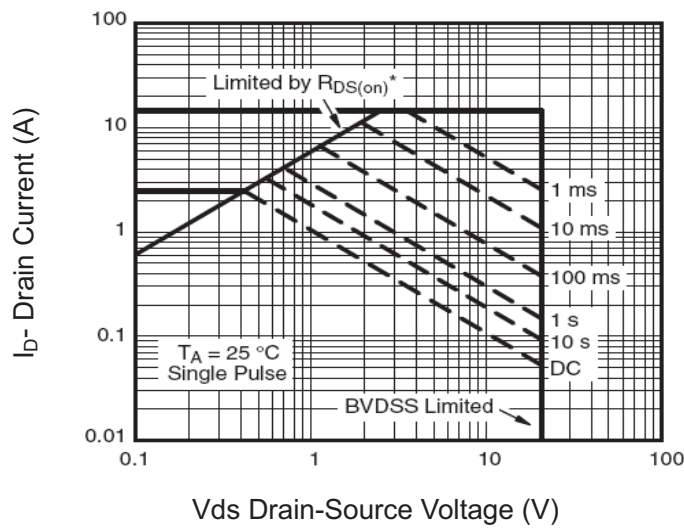


Figure 13 Safe Operation Area

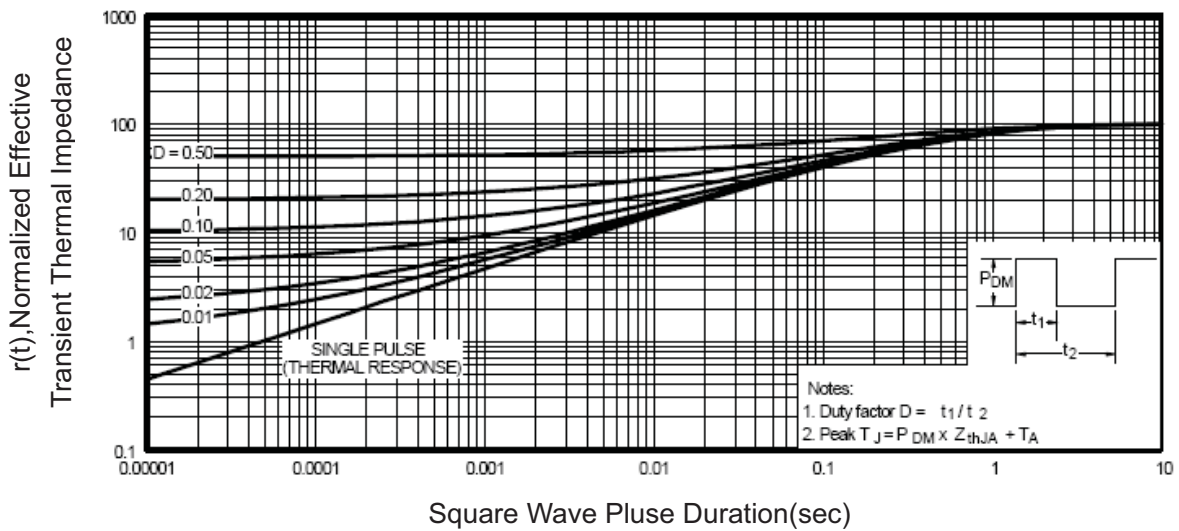
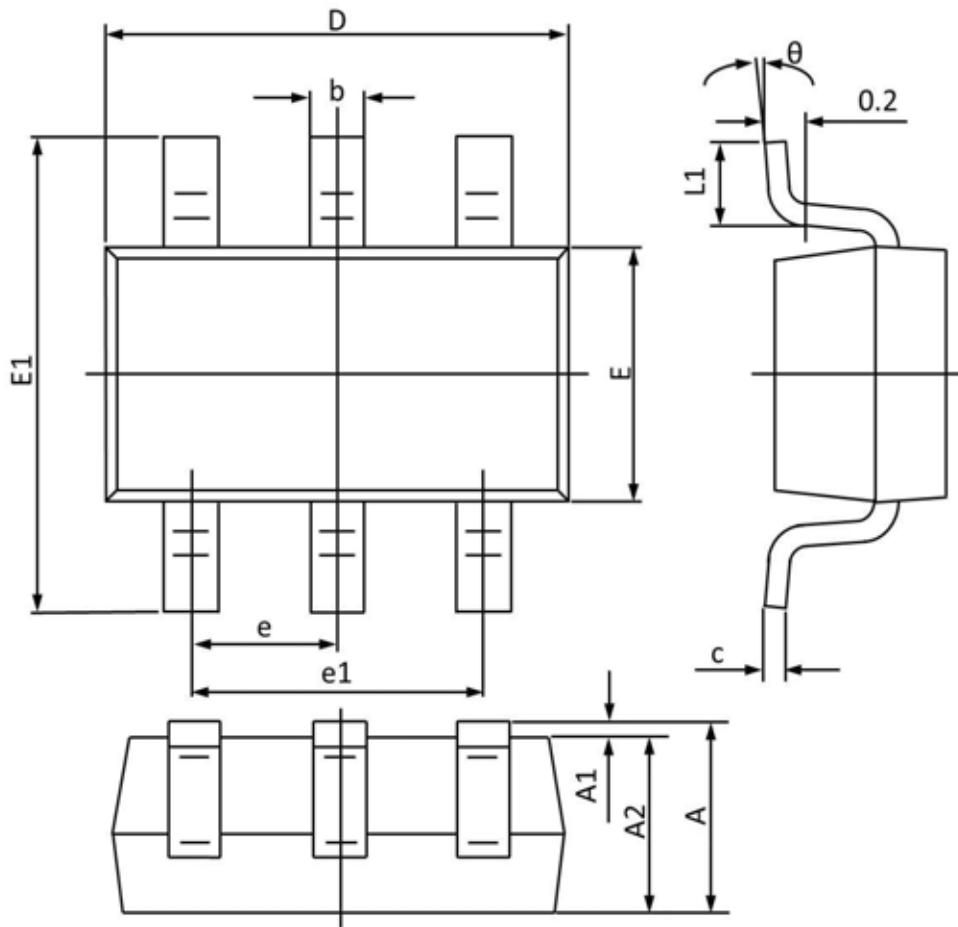


Figure 14 Normalized Maximum Transient Thermal Impedance

SOT23-6 PACKAGE INFORMATION



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | MAX | MIN | MAX | MIN |
| A | 1.450 | - | 0.057 | - |
| A1 | 0.100 | 0.000 | 0.004 | 0.000 |
| A2 | 1.300 | 1.050 | 0.051 | 0.041 |
| b | 0.500 | 0.300 | 0.020 | 0.012 |
| c | 0.200 | 0.100 | 0.008 | 0.004 |
| D | 3.100 | 2.700 | 0.122 | 0.106 |
| E | 1.800 | 1.400 | 0.071 | 0.055 |
| E1 | 3.000 | 2.600 | 0.118 | 0.102 |
| e | 0.95BSC | | 0.037BSC | |
| e1 | 2.000 | 1.800 | 0.079 | 0.071 |
| L1 | 0.600 | 0.300 | 0.024 | 0.012 |
| θ | 10° | 0° | 10° | 0° |

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