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# AO3414

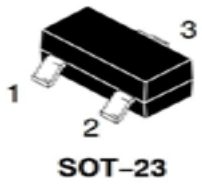
## 20V N-Channel MOSFET

### General Description

The AO3414 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

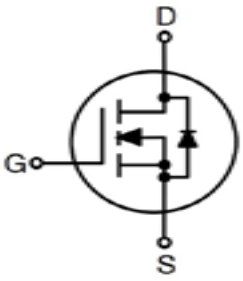
### Features

$V_{DS}$ = 20V
$I_D$ = 3A ($V_{GS}$ = 4.5V)
$R_{DS(ON)}$ < 62mΩ ($V_{GS}$ = 4.5V)
$R_{DS(ON)}$ < 70mΩ ($V_{GS}$ = 2.5V)
$R_{DS(ON)}$ < 85mΩ ($V_{GS}$ = 1.8V)




SOT-23

1 – Gate
2 – Source
3 – Drain




**Absolute Maximum Ratings $T_A$=25℃ unless otherwise noted**

| Parameter | | Symbol | Maximum | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±8 | V |
| Continuous Drain Current [A] | $T_A$=25℃ | $I_D$ | 3 | A |
| | $T_A$=70℃ | | 2.5 | |
| Pulsed Drain Current [B] | | $I_{DM}$ | 16 | |
| Power Dissipation [A] | $T_A$=25℃ | $P_D$ | 1.4 | W |
| | $T_A$=70℃ | | 0.9 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | ℃ |

**Thermal Characteristics**

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 70 | 90 | ℃/W |
| Maximum Junction-to-Ambient [A] | Steady-State | | 100 | 125 | ℃/W |
| Maximum Junction-to-Lead [C] | Steady-State | $R_{\theta JL}$ | 63 | 80 | ℃/W |

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**Electrical Characteristics ($T_J$=25℃ unless otherwise noted)**

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $I_D$=250μA, $V_{GS}$=0V | 20 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=20V, $V_{GS}$=0V | | | 1 | μA |
| | | $T_J$=55℃ | | | 5 | |
| $I_{GSS}$ | Gate-Body leakage current | $V_{DS}$=0V, $V_{GS}$=±8V | | | 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$ $I_D$=250μA | 0.4 | 0.7 | 1 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=4.5V, $V_{DS}$=5V | 16 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=4.5V, $I_D$=3A | | 51 | 62 | mΩ |
| | | $T_J$=125℃ | | 68 | 85 | |
| | | $V_{GS}$=2.5V, $I_D$=2.8A | | 58 | 70 | mΩ |
| | | $V_{GS}$=1.8V, $I_D$=2.5A | | 68 | 85 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=3A | | 11 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=1A,$V_{GS}$=0V | | 0.7 | 1 | V |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | 2 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=10V, f=1MHz | | 260 | 320 | pF |
| $C_{oss}$ | Output Capacitance | | | 48 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 27 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | 3 | 4.5 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$ | Total Gate Charge | $V_{GS}$=4.5V, $V_{DS}$=10V, $I_D$=3A | | 2.9 | 3.8 | nC |
| $Q_{gs}$ | Gate Source Charge | | | 0.4 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 0.6 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=5V, $V_{DS}$=10V, $R_L$=3.3Ω, $R_{GEN}$=6Ω | | 2.5 | | ns |
| $t_r$ | Turn-On Rise Time | | | 3.2 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 21 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 3 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=3A, dI/dt=100A/μs | | 14 | 19 | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=3A, dI/dt=100A/μs | | 3.8 | | nC |

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

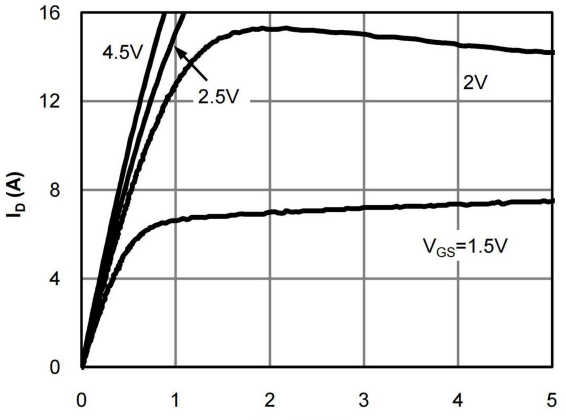



**Figure 1: On-Region Characteristics**

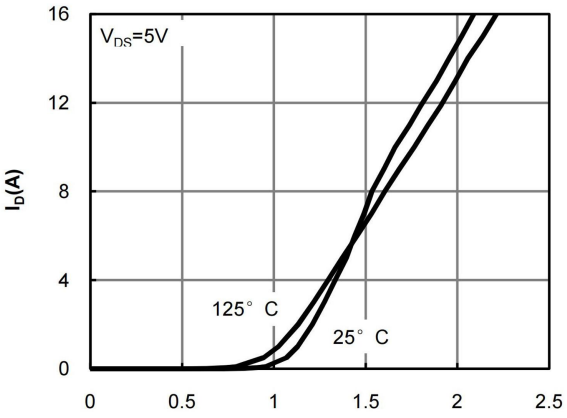



**Figure 2: Transfer Characteristics**

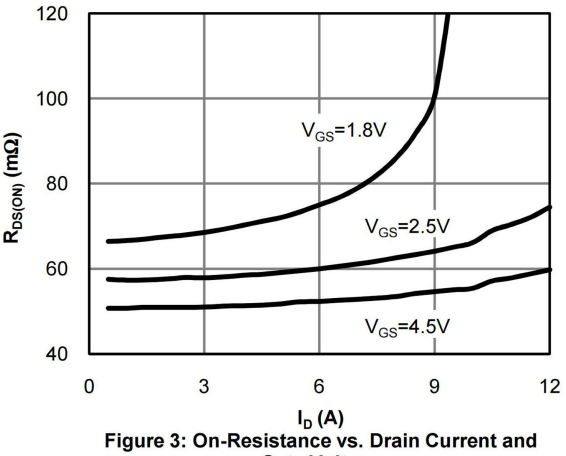



**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**

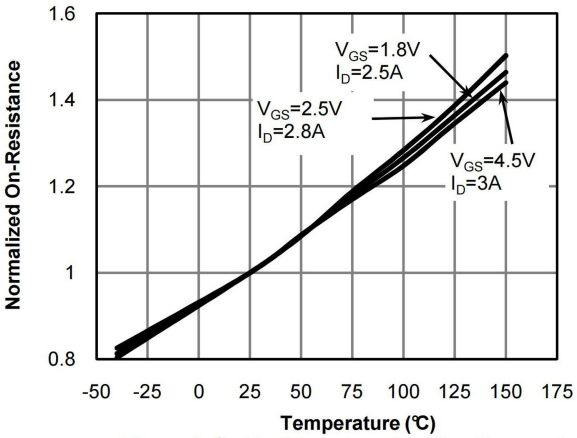



**Figure 4: On-Resistance vs. Junction Temperature**

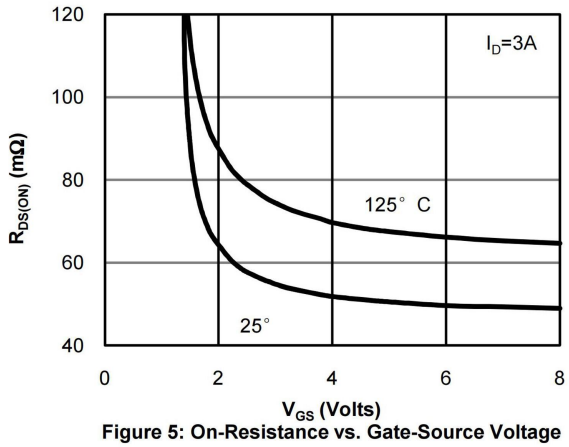



**Figure 5: On-Resistance vs. Gate-Source Voltage**

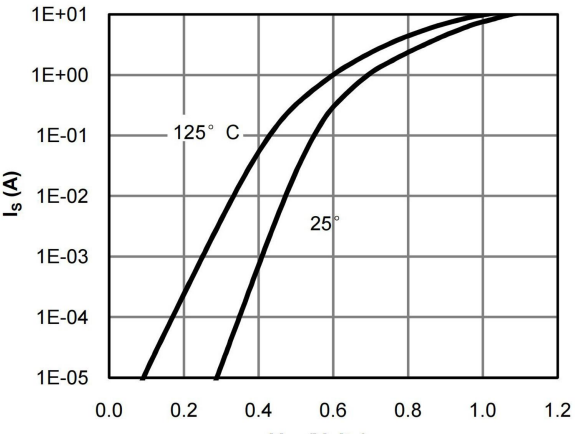



**Figure 6: Body-Diode Characteristics**

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

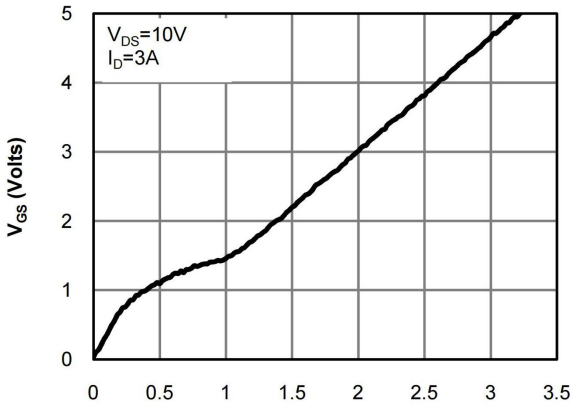



Figure 7: Gate-Charge Characteristics

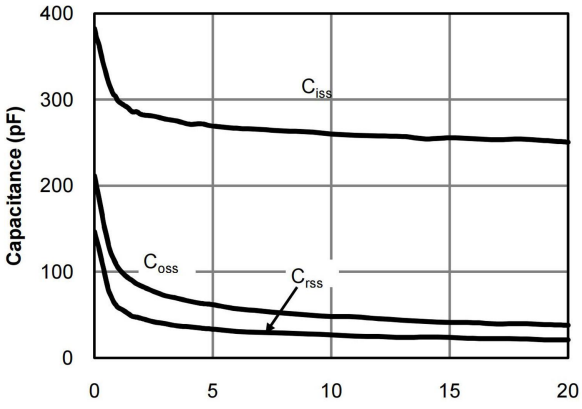



Figure 8: Capacitance Characteristics

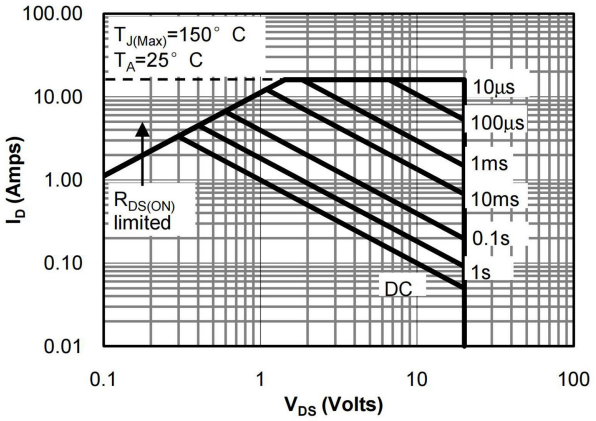



Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

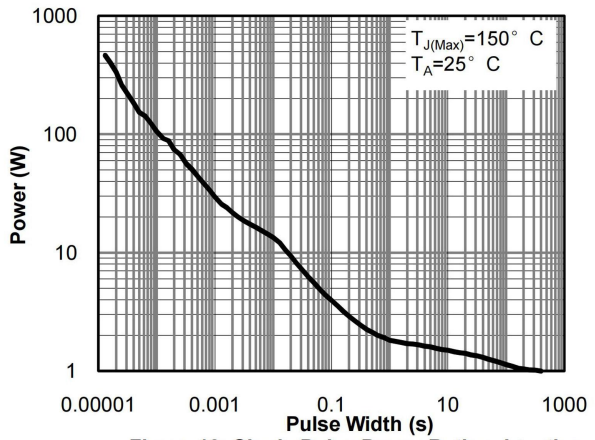



Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

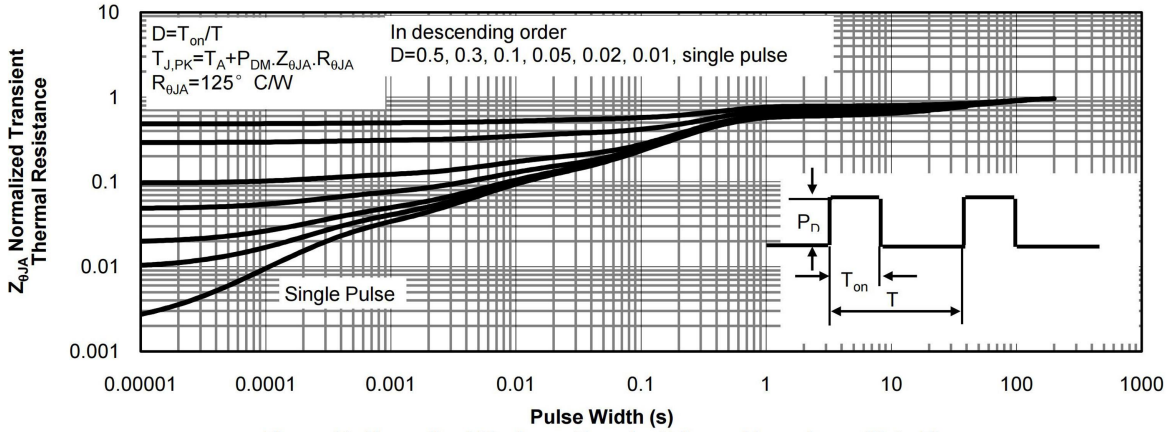


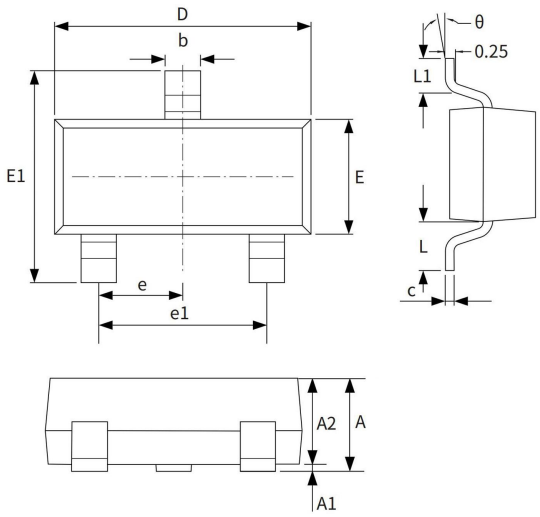

Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

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## Ordering Information

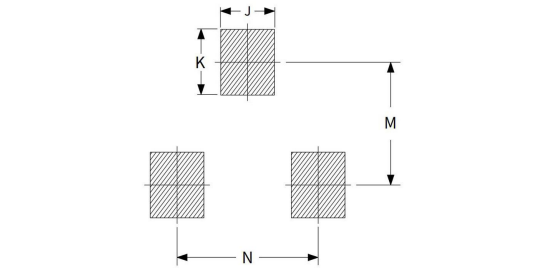
| PACKAGE | PACKAGE CODE | UNIT WEIGHT(g) | REEL(pcs) | BOX(pcs) | CARTON(pcs) | DELIVERY MODE |
|---|---|---|---|---|---|---|
| SOT-23 | R1 | 0.008 | 3000 | 30000 | 240000 | 7'' |

## Package Outline Dimensions (SOT-23)




| Symbol | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 0.90 | 1.15 | 0.035 | 0.045 |
| A1 | - | 0.10 | - | 0.004 |
| A2 | 0.90 | 1.05 | 0.035 | 0.041 |
| b | 0.30 | 0.50 | 0.012 | 0.020 |
| c | 0.10 | 0.20 | 0.004 | 0.008 |
| D | 2.80 | 3.00 | 0.110 | 0.118 |
| E | 1.20 | 1.40 | 0.047 | 0.055 |
| E1 | 2.25 | 2.55 | 0.089 | 0.100 |
| e | 0.950TYP | | 0.037TYP | |
| e1 | 1.80 | 2.00 | 0.071 | 0.079 |
| L | 0.550REF | | 0.022REF | |
| L1 | 0.30 | 0.50 | 0.012 | 0.020 |
| θ | - | 8° | - | 8° |

## Suggested Pad Layout




| Symbol | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| J | 0.75 | 0.85 | 0.030 | 0.033 |
| K | 0.85 | 0.95 | 0.033 | 0.037 |
| M | 1.95 | 2.05 | 0.077 | 0.081 |
| N | 1.85 | 1.95 | 0.073 | 0.077 |