

30V P-Channel Enhancement-Mode MOSFET

$$V_{DS} (V) = -30V$$

$$R_{DS(ON)} < 70m\Omega (V_{GS} = -10V)$$

$$R_{DS(ON)} < 80m\Omega (V_{GS} = -4.5V)$$

$$R_{DS(ON)} < 120m\Omega (V_{GS} = -2.5V)$$

FEATURES

Advanced trench process technology

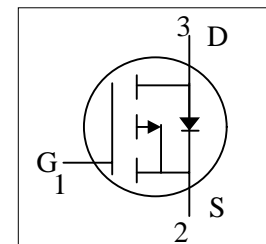
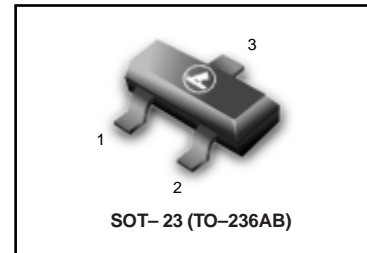
High Density Cell Design For Ultra Low On-Resistance

S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

ORDERING INFORMATION

| Device | Marking | Shipping |
|----------------------------|---------|-----------------|
| LP3401LT1G S-LP3401LT1G | A1 | 3000/Tape&Reel |
| LP3401LT3G S-LP3401LT3G | A1 | 10000/Tape&Reel |

LP3401LT1G
S-LP3401LT1G



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

| Parameter | Symbol | Maximum | Units |
|--|----------------|------------------------|------------------|
| Drain-Source Voltage | V_{DS} | -30 | V |
| Gate-Source Voltage | V_{GS} | ± 12 | V |
| Continuous Drain Current ^A | I_D | $T_A=25^\circ\text{C}$ | -4.2 |
| | | $T_A=70^\circ\text{C}$ | -3.5 |
| Pulsed Drain Current ^B | I_{DM} | -30 | A |
| Power Dissipation ^A | P_D | $T_A=25^\circ\text{C}$ | 1.4 |
| | | $T_A=70^\circ\text{C}$ | 1 |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ |

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

| Parameter | Symbol | Typ | Max | Units |
|--|-----------------|-----|-----|--------------------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 65 | 90 | $^\circ\text{C/W}$ |
| $t \leq 10s$ | | | | |
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 85 | 125 | $^\circ\text{C/W}$ |
| Steady-State | | | | |
| Maximum Junction-to-Lead ^C | $R_{\theta JL}$ | 43 | 60 | $^\circ\text{C/W}$ |

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10s$ thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|--|--|-------|-----------|------------------|
| STATIC PARAMETERS | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $I_D = -250\mu\text{A}$, $V_{GS} = 0\text{V}$ | -30 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = -24\text{V}$, $V_{GS} = 0\text{V}$ $T_J = 55^\circ\text{C}$ | | | -1 -5 | μA |
| I_{GSS} | Gate-Body leakage current | $V_{DS} = 0\text{V}$, $V_{GS} = \pm 12\text{V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$, $I_D = -250\mu\text{A}$ | -0.7 | -1 | -1.3 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS} = -4.5\text{V}$, $V_{DS} = -5\text{V}$ | -25 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS} = -10\text{V}$, $I_D = -4.2\text{A}$ | | | 70 | $\text{m}\Omega$ |
| | | $V_{GS} = -4.5\text{V}$, $I_D = -4\text{A}$ | | | 80 | $\text{m}\Omega$ |
| | | $V_{GS} = -2.5\text{V}$, $I_D = -1\text{A}$ | | | 120 | $\text{m}\Omega$ |
| g_{FS} | Forward Transconductance | $V_{DS} = -5\text{V}$, $I_D = -5\text{A}$ | 7 | 11 | | S |
| V_{SD} | Diode Forward Voltage | $I_S = -1\text{A}$, $V_{GS} = 0\text{V}$ | | -0.75 | -1 | V |
| I_S | Maximum Body-Diode Continuous Current | | | | -2.2 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS} = 0\text{V}$, $V_{DS} = -15\text{V}$, $f = 1\text{MHz}$ | | 954 | | pF |
| C_{oss} | Output Capacitance | | | 115 | | pF |
| C_{riss} | Reverse Transfer Capacitance | | | 77 | | pF |
| R_g | Gate resistance | $V_{GS} = 0\text{V}$, $V_{DS} = 0\text{V}$, $f = 1\text{MHz}$ | | 6 | | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q_g | Total Gate Charge | $V_{GS} = -4.5\text{V}$, $V_{DS} = -15\text{V}$, $I_D = -4\text{A}$ | | 9.4 | | nC |
| Q_{gs} | Gate Source Charge | | | 2 | | nC |
| Q_{gd} | Gate Drain Charge | | | 3 | | nC |
| $t_{D(on)}$ | Turn-On Delay Time | $V_{GS} = -10\text{V}$, $V_{DS} = -15\text{V}$, $R_L = 3.6\Omega$, $R_{GEN} = 6\Omega$ | | 6.3 | | ns |
| t_r | Turn-On Rise Time | | | 3.2 | | ns |
| $t_{D(off)}$ | Turn-Off Delay Time | | | 38.2 | | ns |
| t_f | Turn-Off Fall Time | | | 12 | | ns |
| t_{rr} | Body Diode Reverse Recovery Time | | $I_F = -4\text{A}$, $dI/dt = 100\text{A}/\mu\text{s}$ | | 20.2 | |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F = -4\text{A}$, $dI/dt = 100\text{A}/\mu\text{s}$ | | 11.2 | | nC |

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TYPICAL ELECTRICAL CHARACTERISTICS

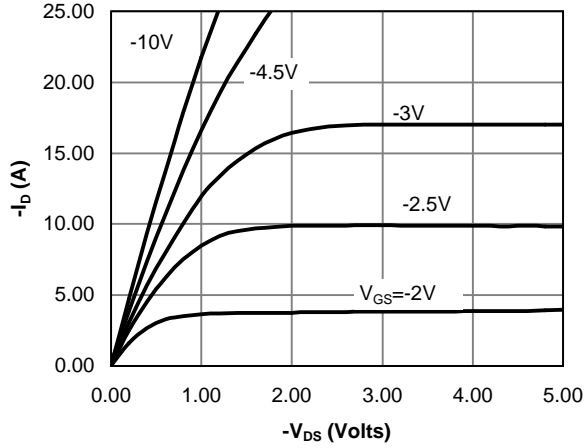


Fig 1: On-Region Characteristics

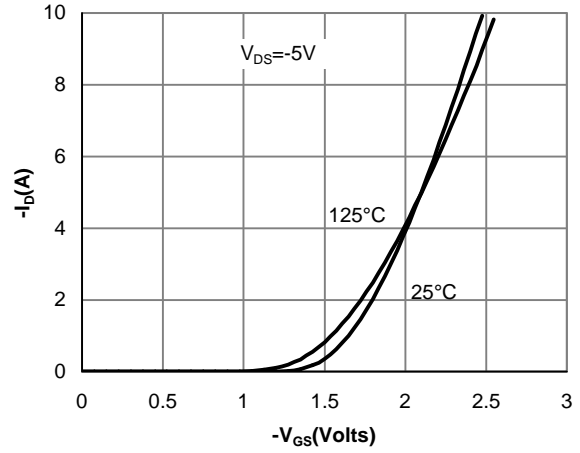


Figure 2: Transfer Characteristics

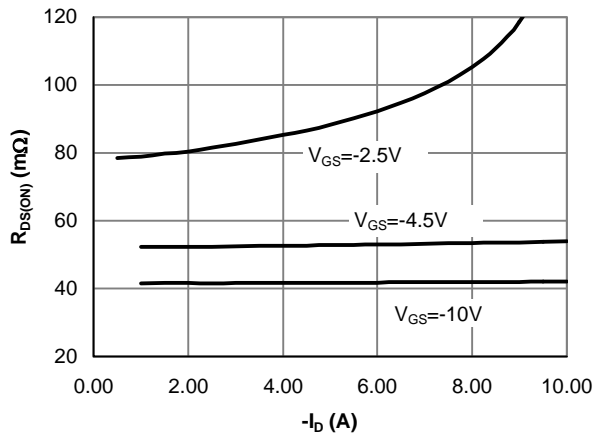


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

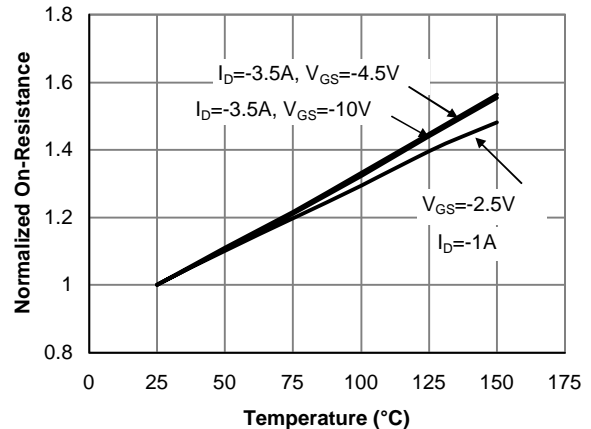


Figure 4: On-Resistance vs. Junction Temperature

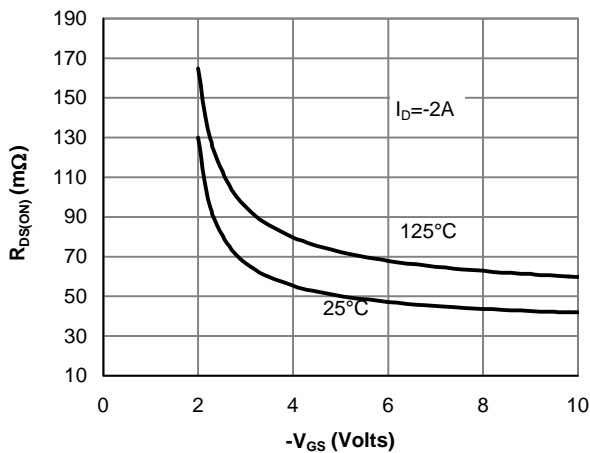


Figure 5: On-Resistance vs. Gate-Source Voltage

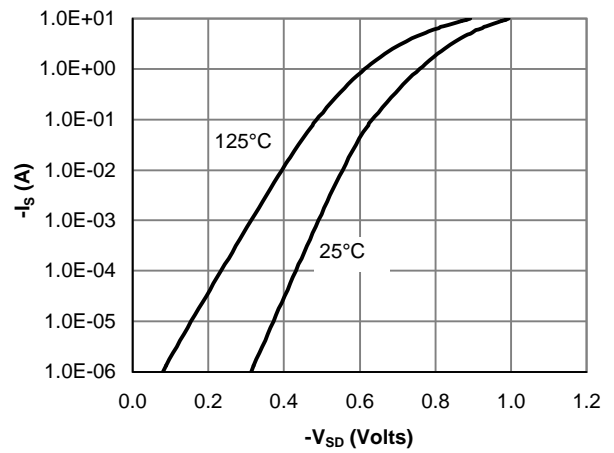


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL CHARACTERISTICS

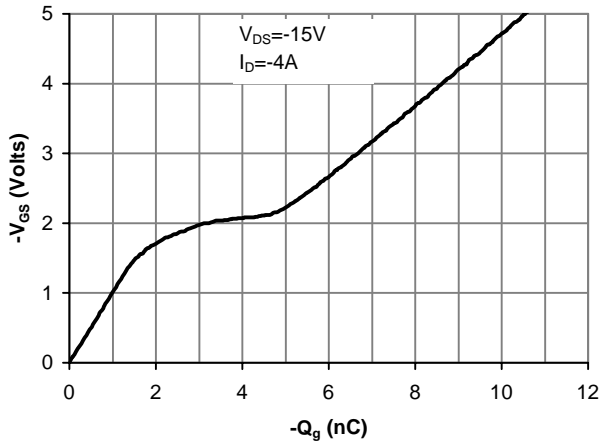


Figure 7: Gate-Charge Characteristics

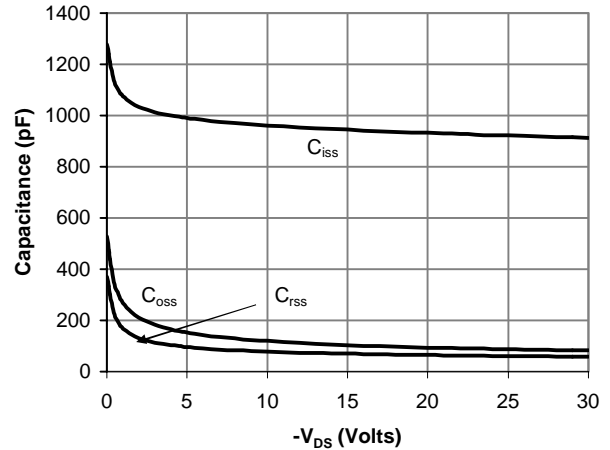


Figure 8: Capacitance Characteristics

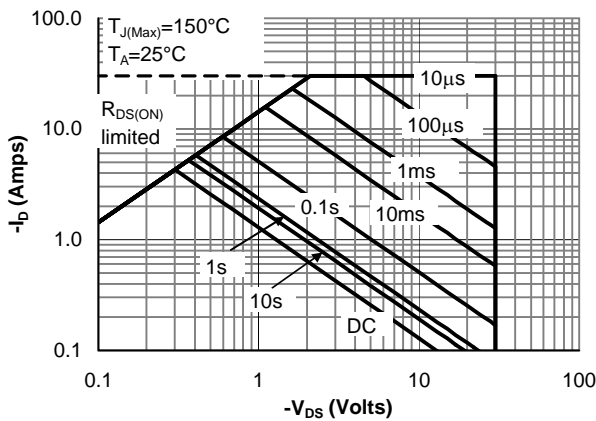


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

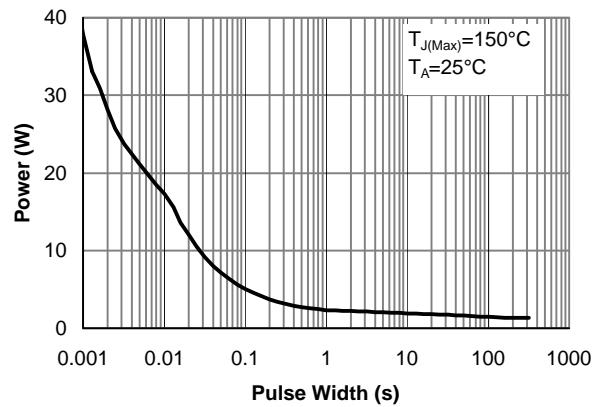


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

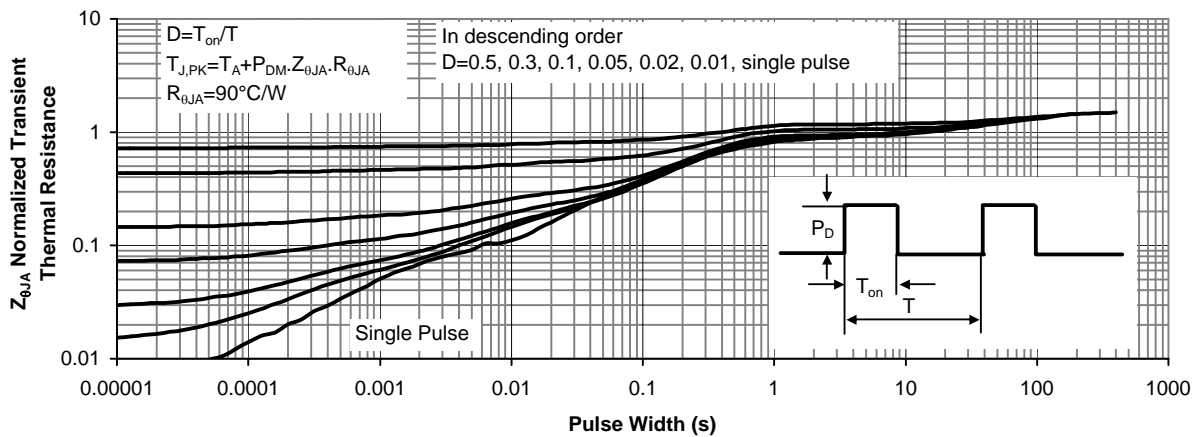


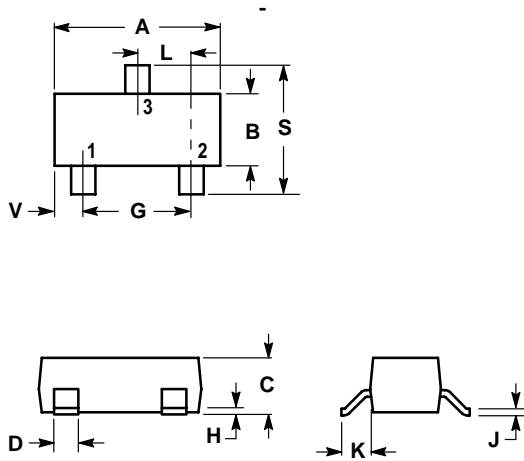
Figure 11: Normalized Maximum Transient Thermal Impedance

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SOT-23

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M,1982
2. CONTROLLING DIMENSION: INCH.



| DIM | INCHES | | MILLIMETERS | |
|-----|--------|--------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.1102 | 0.1197 | 2.80 | 3.04 |
| B | 0.0472 | 0.0551 | 1.20 | 1.40 |
| C | 0.0350 | 0.0440 | 0.89 | 1.11 |
| D | 0.0150 | 0.0200 | 0.37 | 0.50 |
| G | 0.0701 | 0.0807 | 1.78 | 2.04 |
| H | 0.0005 | 0.0040 | 0.013 | 0.100 |
| J | 0.0034 | 0.0070 | 0.085 | 0.177 |
| K | 0.0140 | 0.0285 | 0.35 | 0.69 |
| L | 0.0350 | 0.0401 | 0.89 | 1.02 |
| S | 0.0830 | 0.1039 | 2.10 | 2.64 |
| V | 0.0177 | 0.0236 | 0.45 | 0.60 |

