

ZXMP4A57E6

40V P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$ max | I_D max $T_A = 25^\circ C$ |
|---------------|----------------------------------|---------------------------------|
| -40V | 80m Ω @ $V_{GS} = -10V$ | -3.7 A |
| | 150m Ω @ $V_{GS} = -4.5V$ | -2.8 A |

Description and Applications

This MOSFET has been designed to minimize the on-state resistance and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

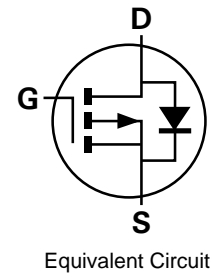
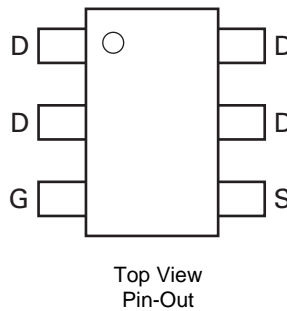
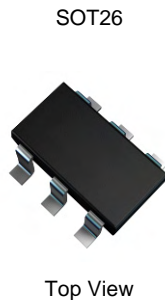
- Motor control
- DC-DC Converters
- Power management functions
- Uninterrupted power supply

Features and Benefits

- Fast switching speed
- Low gate drive
- Low input capacitance
- "Lead Free", RoHS Compliant (Note 1)
- Halogen and Antimony Free. "Green" Device (Note 2)
- Qualified to AEC-Q101 Standards for High Reliability

Mechanical Data

- Case: SOT26
- Case Material: Molded Plastic, UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin annealed over Copper lead frame. Solderable per MIL-STD-202, Method 208
- Weight 0.018 grams (approximate)

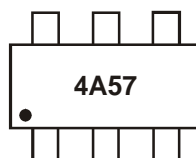


Ordering Information (Note 3)

| Product | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|--------------|---------|--------------------|-----------------|-------------------|
| ZXMP4A57E6TA | 4A57 | 7 | 8 | 3,000 |

- Notes:
1. No purposefully added lead
 2. Diodes Inc's "Green" policy can be found on our website at <http://www.diodes.com>.
 3. For packaging details, go to our website at <http://www.diodes.com>.

Marking Information



4A57 = Product Type Marking Code

Maximum Ratings @ $T_A = 25^\circ\text{C}$ unless otherwise specified

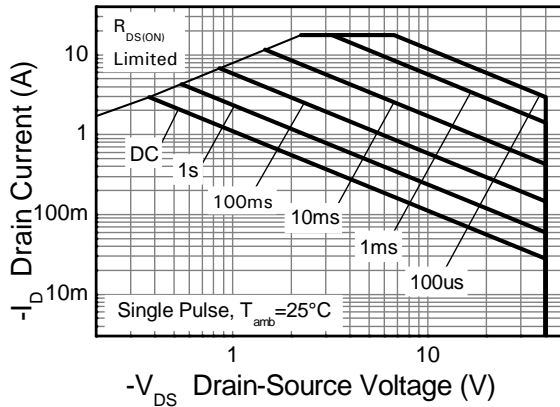
| Characteristic | | | Symbol | Value | Unit | |
|--|-----------------------|-----------------------------------|-----------|----------|------|---|
| Drain-Source voltage | | | V_{DSS} | -40 | V | |
| Gate-Source voltage | | | V_{GS} | ± 20 | V | |
| Continuous Drain current | $V_{GS} = 10\text{V}$ | (Note 5) | I_D | -3.7 | A | |
| | | $T_A = 70^\circ\text{C}$ (Note 5) | | -2.9 | | |
| | | (Note 4) | | -2.9 | | |
| Pulsed Drain current | $V_{GS} = 10\text{V}$ | (Note 6) | I_{DM} | -18 | A | |
| Continuous Source current (Body diode) | | | (Note 5) | I_S | -2.6 | A |
| Pulsed Source current (Body diode) | | | (Note 6) | I_{SM} | -18 | A |

Thermal Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

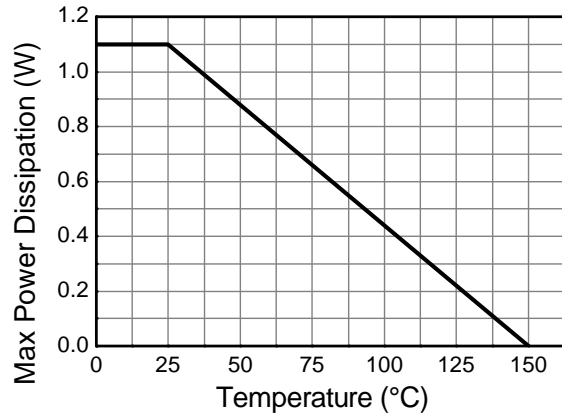
| Characteristic | | Symbol | Value | Unit |
|---|----------|-----------------|------------|---------------------------|
| Power dissipation | (Note 4) | P_D | 1.1 | W |
| | | | 8.8 | |
| Linear derating factor | (Note 5) | | 1.7 | |
| Thermal Resistance, Junction to Ambient | (Note 4) | $R_{\theta JA}$ | 113 | $^\circ\text{C}/\text{W}$ |
| | (Note 5) | | 73 | |
| Operating and storage temperature range | | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ |

- Notes:
4. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
 5. Same as note (4), except the device is measured at $t \leq 5$ sec.
 6. Same as note (4), except the device is pulsed with $D = 0.02$ and pulse width 300 μs . The pulse current is limited by the maximum junction temperature.

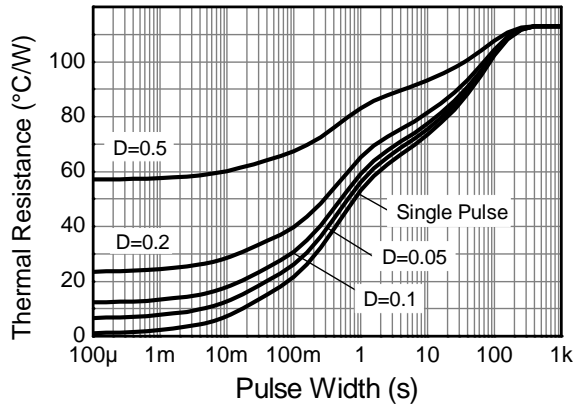
Thermal Characteristics



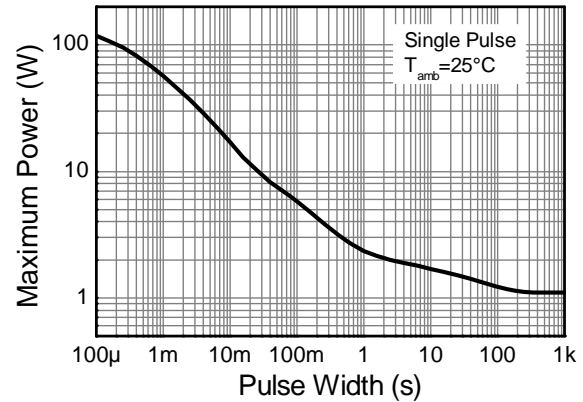
P-channel Safe Operating Area



Derating Curve



Transient Thermal Impedance



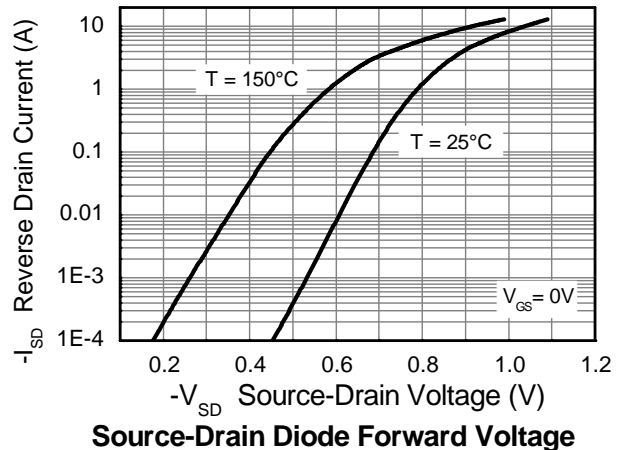
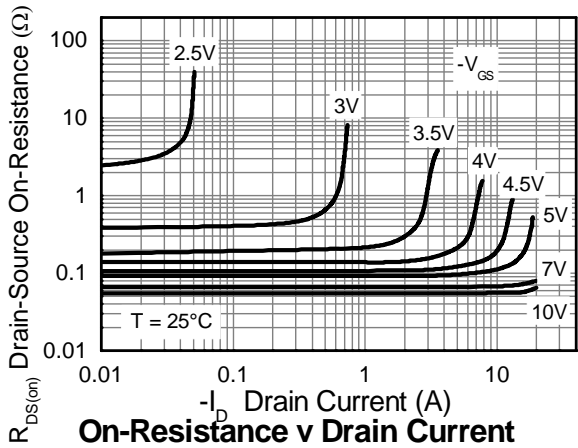
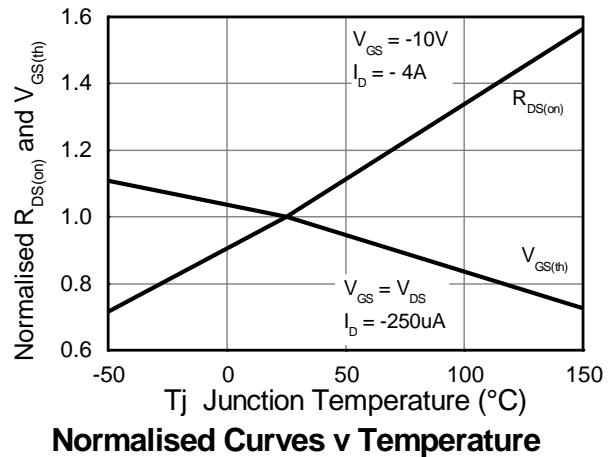
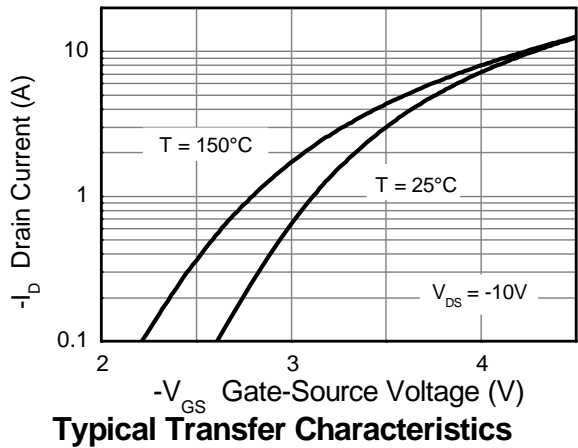
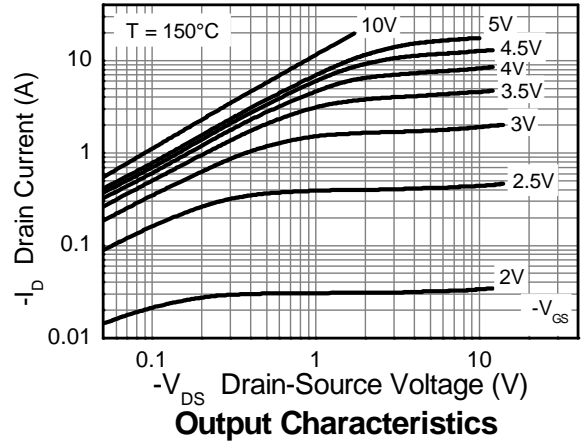
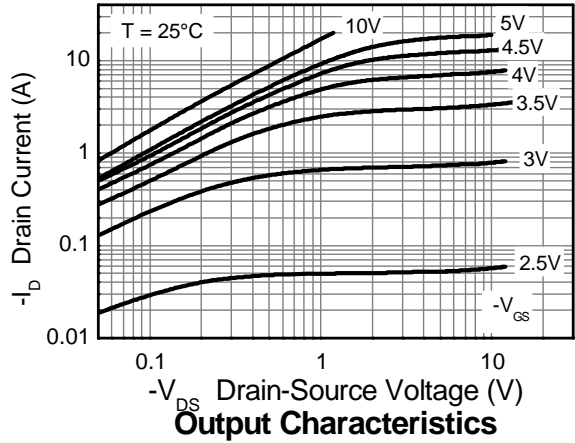
Pulse Power Dissipation

Electrical Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

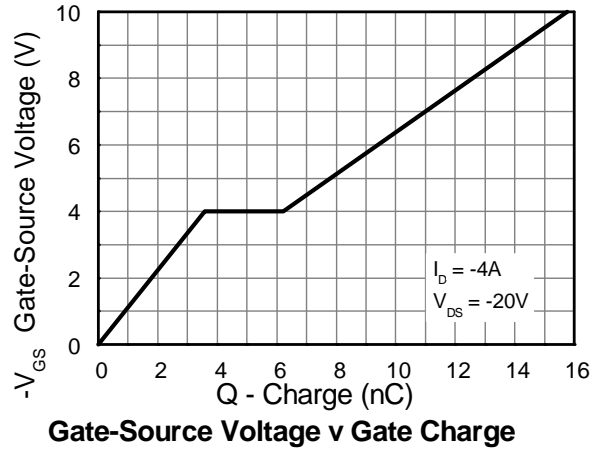
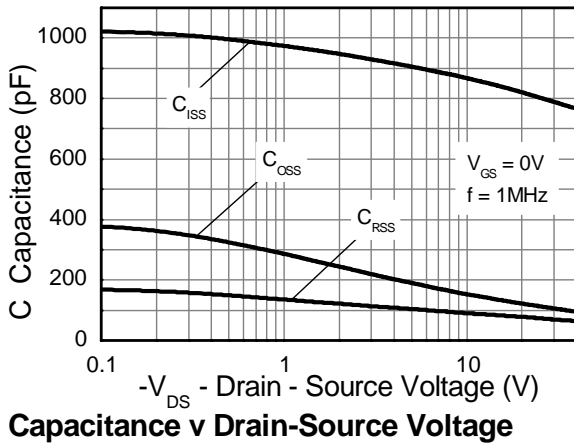
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|--------------|------|-------|-----------|---------------|---|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | -40 | — | — | V | $I_D = -250\mu\text{A}$, $V_{GS} = 0\text{V}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | — | — | -0.5 | μA | $V_{DS} = -40\text{V}$, $V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 100 | nA | $V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -1.0 | — | -3.0 | V | $I_D = -250\mu\text{A}$, $V_{DS} = V_{GS}$ |
| Static Drain-Source On-Resistance (Note 7) | $R_{DS(on)}$ | — | — | 0.080 | Ω | $V_{GS} = -10\text{V}$, $I_D = -4\text{A}$ |
| | | — | — | 0.150 | | $V_{GS} = -4.5\text{V}$, $I_D = -2\text{A}$ |
| Forward Transconductance (Notes 7 & 8) | g_{fs} | — | 7.6 | — | S | $V_{DS} = -15\text{V}$, $I_D = -4\text{A}$ |
| Diode Forward Voltage (Note 7) | V_{SD} | — | -0.86 | -0.95 | V | $I_S = -4\text{A}$, $V_{GS} = 0\text{V}$ |
| Reverse recovery time (Note 8) | t_{rr} | — | 17.4 | — | ns | $I_S = -1.8\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$ |
| Reverse recovery charge (Note 8) | Q_{rr} | — | 11.1 | — | nC | |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C_{iss} | — | 833 | — | pF | $V_{DS} = -20\text{V}$, $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$ |
| Output Capacitance | C_{oss} | — | 122 | — | | |
| Reverse Transfer Capacitance | C_{rss} | — | 78 | — | | |
| Total Gate Charge (Note 9) | Q_g | — | 7 | — | nC | $V_{GS} = -4.5\text{V}$ $V_{GS} = -10\text{V}$ $V_{DS} = -20\text{V}$ $I_D = -4\text{A}$ |
| Total Gate Charge (Note 9) | Q_g | — | 15.8 | — | | |
| Gate-Source Charge (Note 9) | Q_{gs} | — | 3.6 | — | | |
| Gate-Drain Charge (Note 9) | Q_{gd} | — | 2.7 | — | | |
| Turn-On Delay Time (Note 9) | $t_{D(on)}$ | — | 2.5 | — | ns | $V_{DD} = -20\text{V}$, $V_{GS} = -10\text{V}$ $I_D = -1\text{A}$, $R_G \equiv 6.0\Omega$ |
| Turn-On Rise Time (Note 9) | t_r | — | 3.3 | — | | |
| Turn-Off Delay Time (Note 9) | $t_{D(off)}$ | — | 47 | — | | |
| Turn-Off Fall Time (Note 9) | t_f | — | 21 | — | | |

- Notes:
7. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$
 8. For design aid only, not subject to production testing.
 9. Switching characteristics are independent of operating junction temperatures.

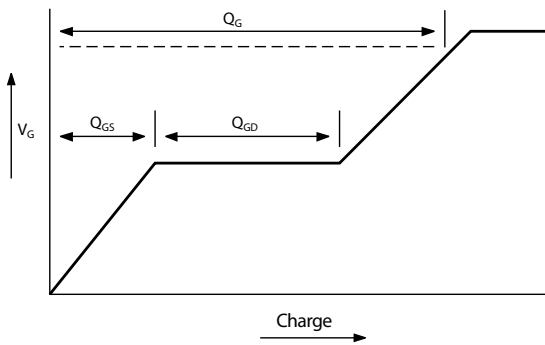
Typical Characteristics



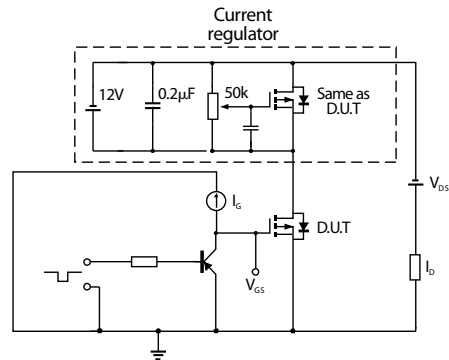
Typical Characteristics - continued



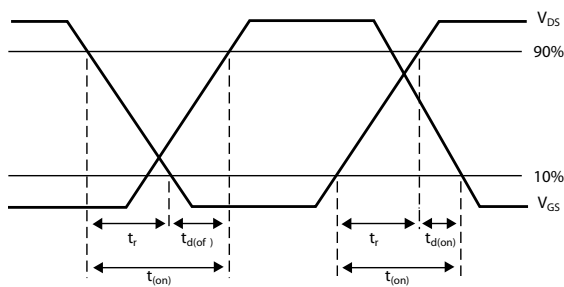
Test Circuits



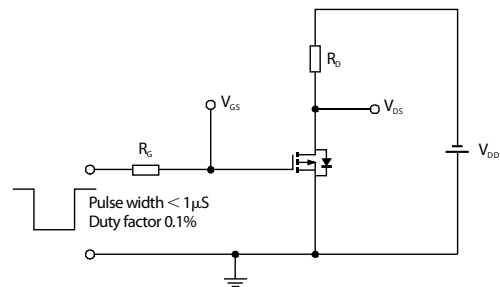
Basic gate charge waveform



Gate charge test circuit

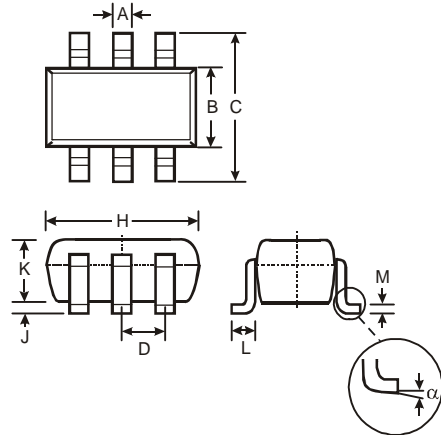


Switching time waveforms



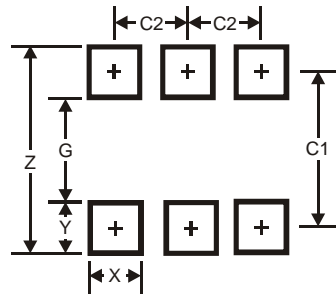
Switching time test circuit

Package Outline Dimensions



| SOT-26 | | | |
|----------------------|-------|------|------|
| Dim | Min | Max | Typ |
| A | 0.35 | 0.50 | 0.38 |
| B | 1.50 | 1.70 | 1.60 |
| C | 2.70 | 3.00 | 2.80 |
| D | — | — | 0.95 |
| H | 2.90 | 3.10 | 3.00 |
| J | 0.013 | 0.10 | 0.05 |
| K | 1.00 | 1.30 | 1.10 |
| L | 0.35 | 0.55 | 0.40 |
| M | 0.10 | 0.20 | 0.15 |
| α | 0° | 8° | — |
| All Dimensions in mm | | | |

Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| Z | 3.20 |
| G | 1.60 |
| X | 0.55 |
| Y | 0.80 |
| C1 | 2.40 |
| C2 | 0.95 |

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