

**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	80mΩ @ $V_{GS} = -10V$	-3.7 A
	150mΩ @ $V_{GS} = -4.5V$	-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.

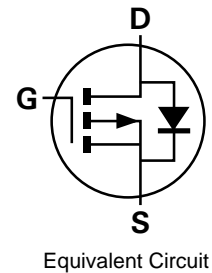
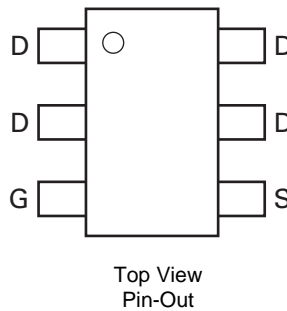
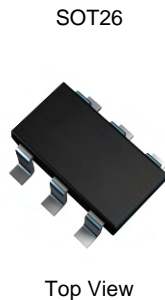
- Motor control
- DC-DC Converters
- Power management functions
- Uninterrupted power supply

**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)

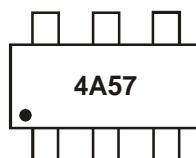


**Ordering Information** (Note 3)

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

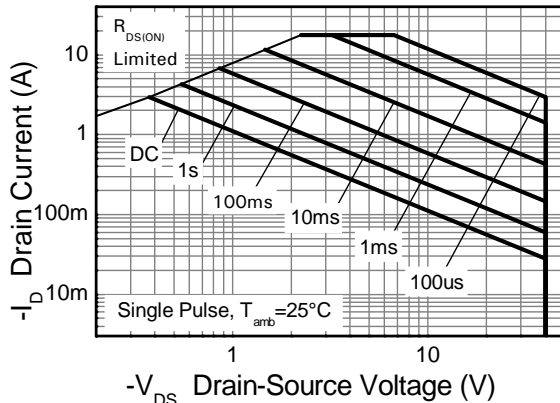
Characteristic			Symbol	Value	Unit	
Drain-Source voltage			$V_{DSS}$	-40	V	
Gate-Source voltage			$V_{GS}$	$\pm 20$	V	
Continuous Drain current	$V_{GS} = 10\text{V}$	(Note 5)	$I_D$	-3.7	A	
		$T_A = 70^\circ\text{C}$ (Note 5)		-2.9		
		(Note 4)		-2.9		
Pulsed Drain current	$V_{GS} = 10\text{V}$	(Note 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

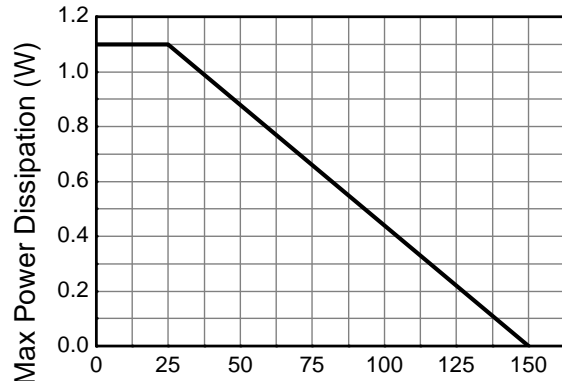
Characteristic		Symbol	Value	Unit
Power dissipation	(Note 4)	$P_D$	1.1	W
			8.8	
Linear derating factor	(Note 5)		1.7	$\text{mW}/^\circ\text{C}$
			13.7	
Thermal Resistance, Junction to Ambient	(Note 4)	$R_{\theta JA}$	113	$^\circ\text{C}/\text{W}$
	(Note 5)		73	
Operating and storage temperature range		$T_J, T_{STG}$	-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 $\mu\text{s}$ . The pulse current is limited by the maximum junction temperature.

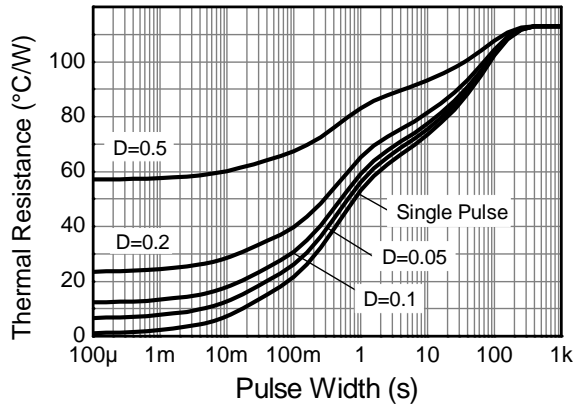
**Thermal Characteristics**



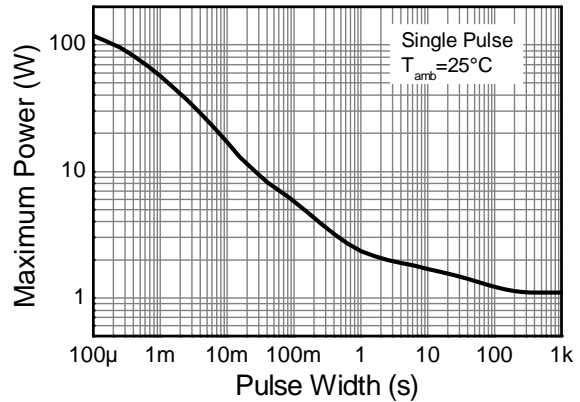
**P-channel Safe Operating Area**



**Derating Curve**



**Transient Thermal Impedance**



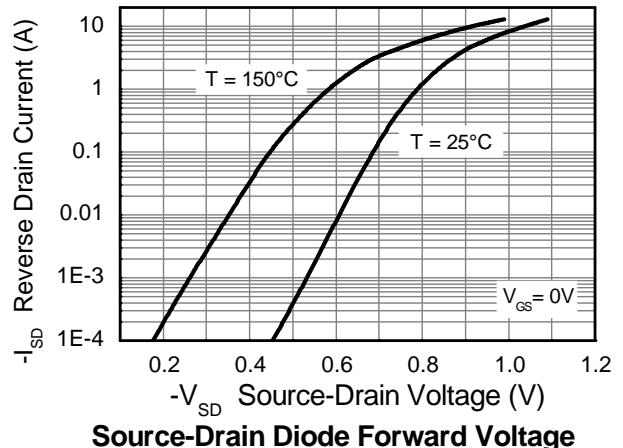
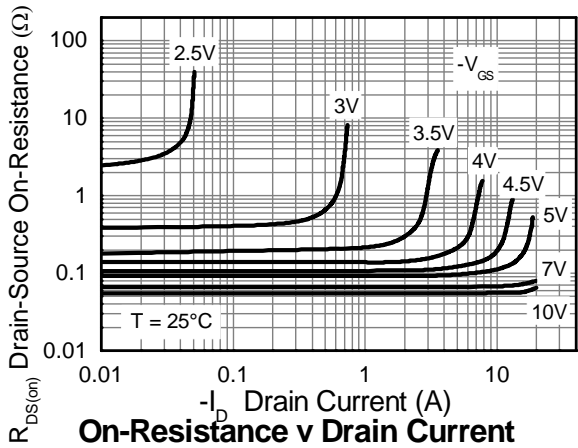
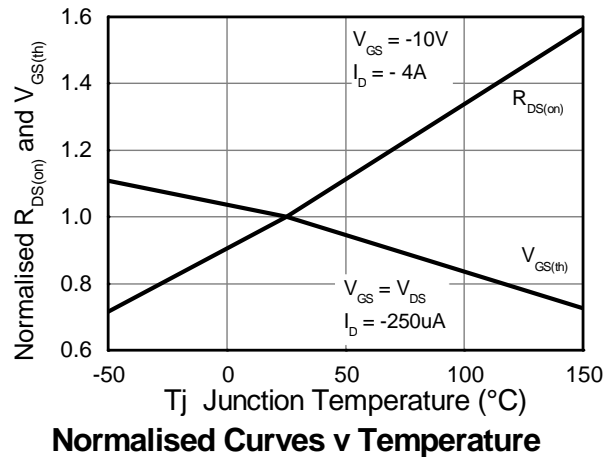
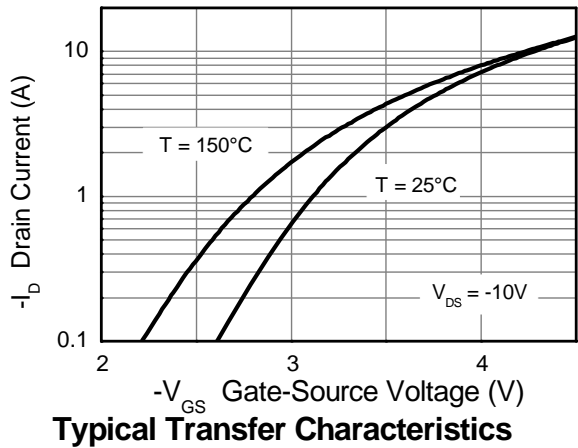
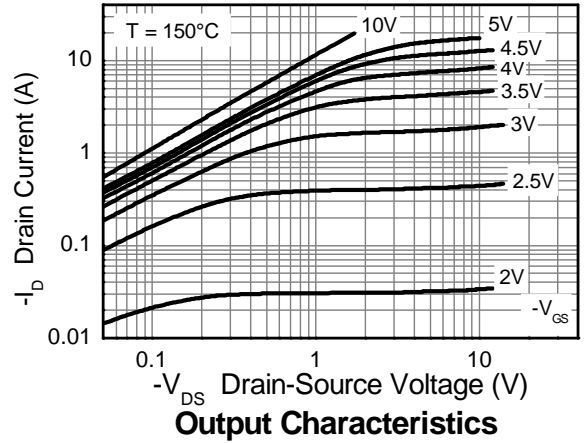
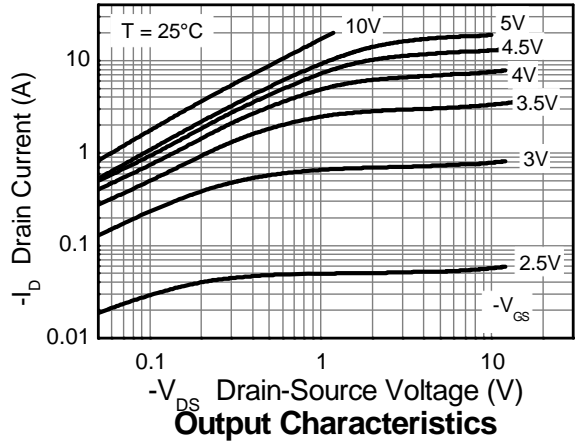
**Pulse Power Dissipation**

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

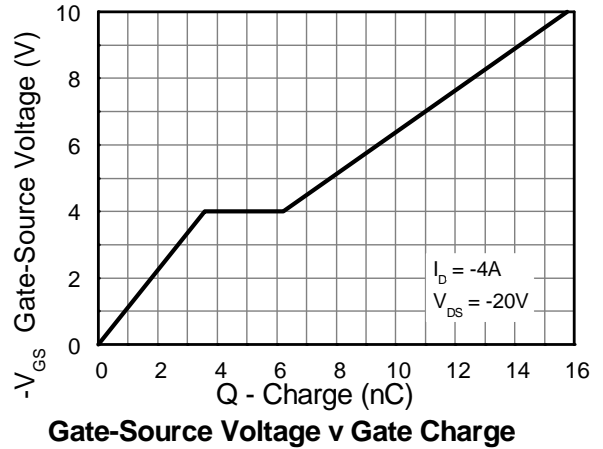
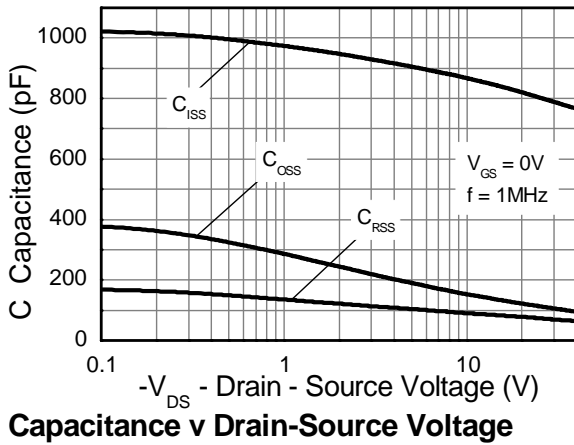
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	-40	—	—	V	$I_D = -250\mu\text{A}, V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	-0.5	$\mu\text{A}$	$V_{DS} = -40\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS</b>						
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	$\Omega$	$V_{GS} = -10\text{V}, I_D = -4\text{A}$
		—	—	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	
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
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	$V_{DD} = -20\text{V}, V_{GS} = -10\text{V}$ $I_D = -1\text{A}, R_G = 6.0\Omega$
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.

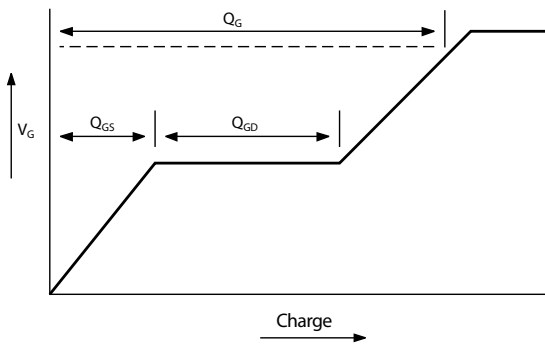
**Typical Characteristics**



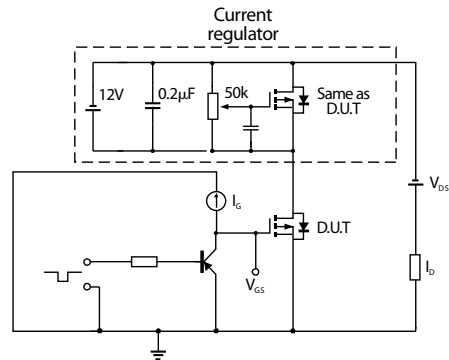
**Typical Characteristics - continued**



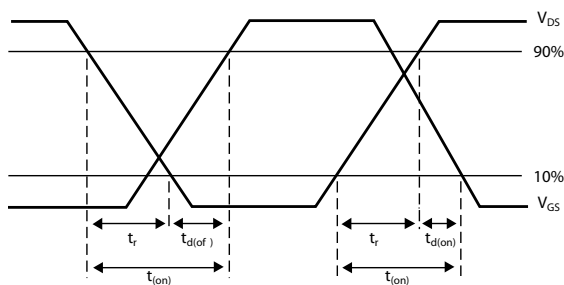
**Test Circuits**



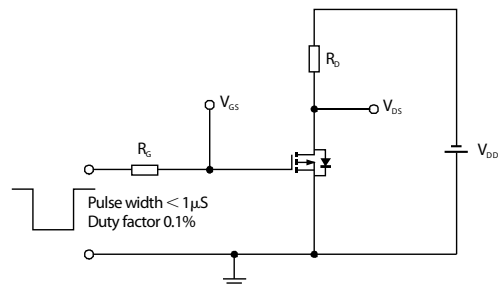
**Basic gate charge waveform**



**Gate charge test circuit**

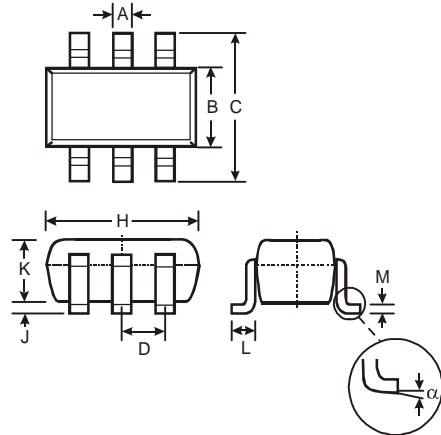


**Switching time waveforms**



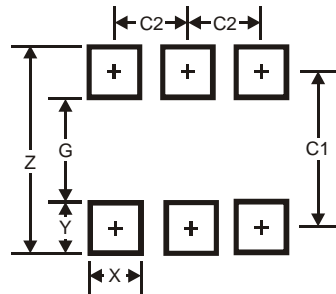
**Switching time test circuit**

**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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