

ZXMP6A17K

60V DPAK P-channel enhancement mode MOSFET

Summary

$V_{(BR)DSS}$	$R_{DS(on)}$ (Ω)	I_D (A)
-60	0.125 @ $V_{GS} = -10V$	15.6
	0.190 @ $V_{GS} = -4.5V$	12.6



DPAK

Description

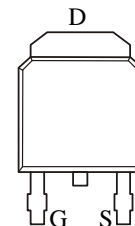
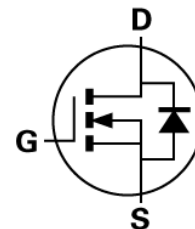
This new generation Trench MOSFET from Zetex features a unique structure combining the benefits of low on-resistance and fast switching, making it ideal for high efficiency power management applications.

Features

- Low on-resistance
- Fast switching speed
- Low gate drive
- DPAK package

Applications

- DC-DC Converters
- Power Management functions
- Disconnect switches
- Motor control



Pinout – top view

Ordering information

Device	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMP6A17KTC	13	16	2,500

Device marking

ZXMP
6A17

Absolute maximum ratings

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DSS}	-60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current @ $V_{GS}=10V$; $T_C=25^\circ C$ (e) @ $V_{GS}=10V$; $T_C=100^\circ C$ (e)	I_D	15.6 9.9	A
Continuous Drain Current @ $V_{GS}=10V$; $T_A=25^\circ C$ (b) @ $V_{GS}=10V$; $T_A=70^\circ C$ (b) @ $V_{GS}=10V$; $T_A=25^\circ C$ (a)	I_D	6.6 5.3 4.4	A
Pulsed Drain Current (c)	I_{DM}	20.3	A
Continuous Source Current (Body Diode) (b)	I_S	9.3	A
Pulsed Source Current (Body Diode) (c)	I_{SM}	20.3	A
Power Dissipation at $T_A=25^\circ C$ (a) Linear Derating Factor	P_D	4.17 33.3	W mW/ $^\circ C$
Power Dissipation at $T_A=25^\circ C$ (b) Linear Derating Factor	P_D	9.25 74	W mW/ $^\circ C$
Power Dissipation at $T_A=25^\circ C$ (d) Linear Derating Factor	P_D	2.11 16.8	W mW/ $^\circ C$
Operating and Storage Temperature Range	T_j, T_{stg}	-55 to +150	$^\circ C$

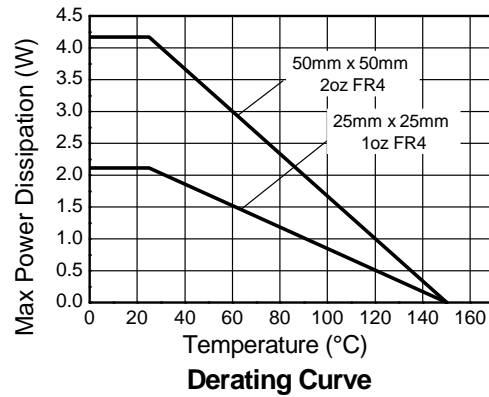
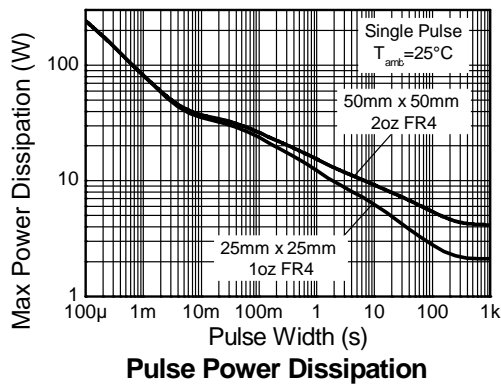
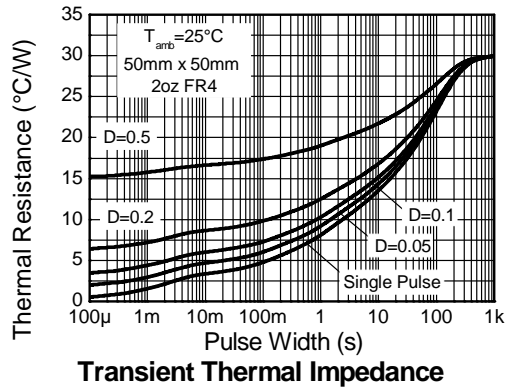
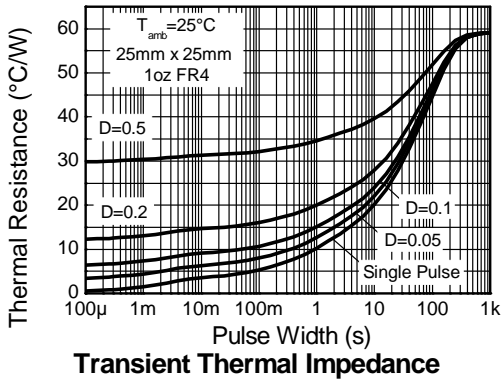
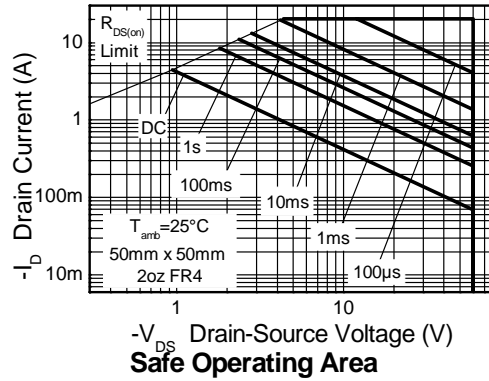
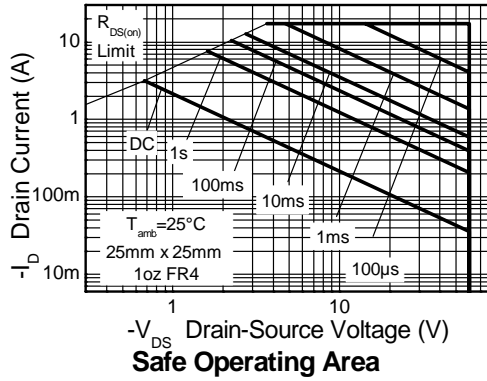
Thermal resistance

PARAMETER	SYMBOL	VALUE	UNIT
Junction to Ambient (a)	$R_{\theta JA}$	30	$^\circ C/W$
Junction to Ambient (b)	$R_{\theta JA}$	13.5	$^\circ C/W$
Junction to Ambient (d)	$R_{\theta JA}$	59.1	$^\circ C/W$
Junction to Case (e)	$R_{\theta JC}$	2.41	$^\circ C/W$

NOTES

- For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions.
- For a device surface mounted on FR4 PCB measured at $t \leq 10$ sec.
- Repetitive rating 50mm x 50mm x 1.6mm FR4 PCB, $D=0.02$ pulse width=300 μs – pulse width limited by maximum junction temperature.
- 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 terms case and case temperature refer to the exposed metal back face of the package and the drain pin.

Thermal characteristics



ZXMP6A17K

Electrical characteristics (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated).

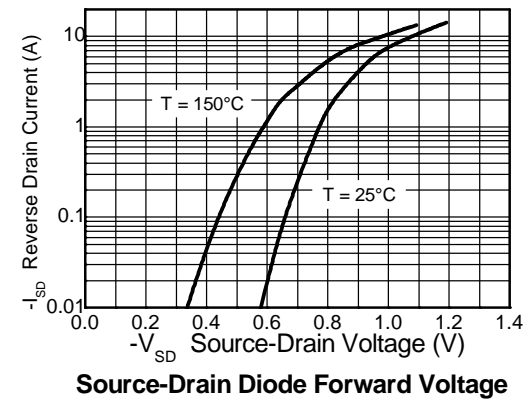
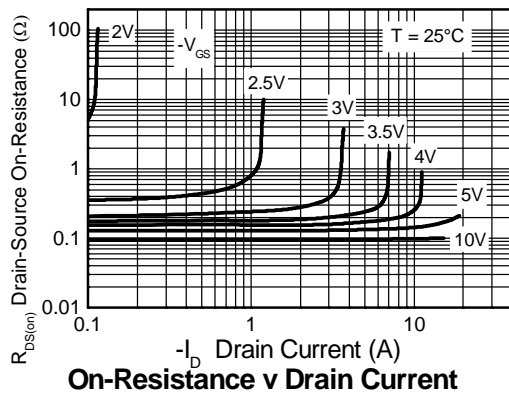
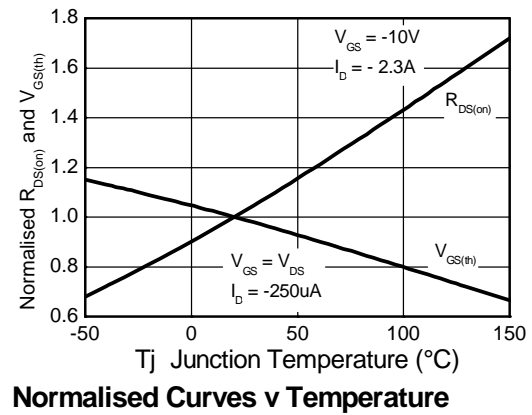
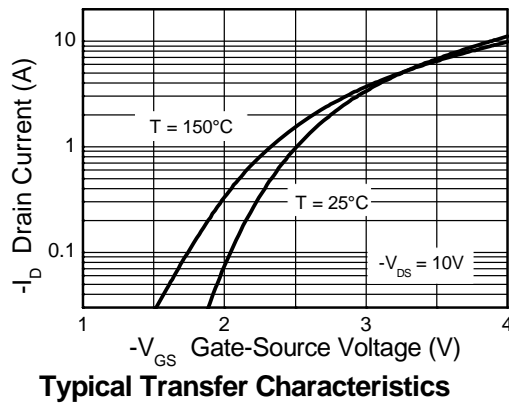
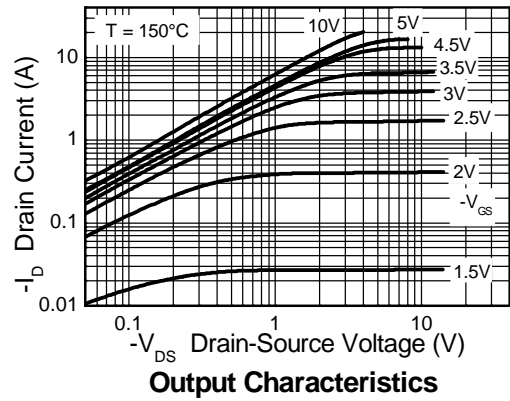
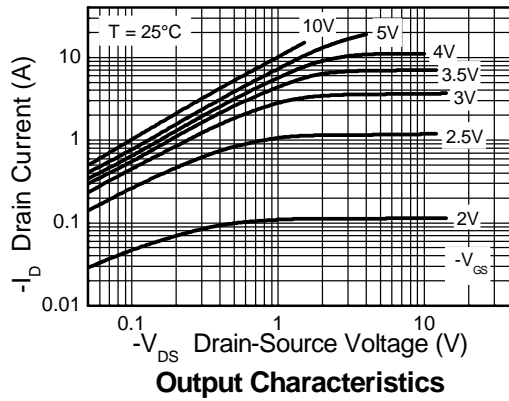
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
STATIC						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	-60			V	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	I_{DSS}			-500	nA	$V_{DS} = 60\text{V}$, $V_{GS} = 0\text{V}$
Gate-Body Leakage	I_{GSS}			100	nA	$V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1			V	$I_D = 250\mu\text{A}$, $V_{DS} = V_{GS}$
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$			0.125	Ω	$V_{GS} = -10\text{V}$, $I_D = -2.3\text{A}$
				0.190	Ω	$V_{GS} = -4.5\text{V}$, $I_D = -1.9\text{A}$
Forward Transconductance (1) (3)	g_{fs}		4.7		S	$V_{DS} = -15\text{V}$, $I_D = -2.2\text{A}$
DYNAMIC (3)						
Input Capacitance	C_{iss}		637		pF	$V_{DS} = -30\text{V}$, $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output Capacitance	C_{oss}		70		pF	
Reverse Transfer Capacitance	C_{rss}		53		pF	
SWITCHING (2) (3)						
Turn-On-Delay Time	$t_{d(on)}$		2.6		ns	$V_{DD} = -30\text{V}$, $I_D = -1.0\text{A}$ $R_G = 6.0\Omega$, $V_{GS} = -10\text{V}$
Rise Time	t_r		3.4		ns	
Turn-Off Delay Time	$t_{d(off)}$		26.2		ns	
Fall Time	t_f		11.3		ns	
Gate Charge	Q_g		9.8		nC	$V_{DS} = -30\text{V}$, $V_{GS} = -5\text{V}$ $I_D = -2.2\text{A}$
Total Gate Charge	Q_g		18		nC	$V_{DS} = -30\text{V}$, $V_{GS} = -10\text{V}$
Gate-Source Charge	Q_{gs}		1.6		nC	$I_D = -2.2\text{A}$
Gate Drain Charge	Q_{gd}		4.4		nC	
SOURCE-DRAIN DIODE						
Diode Forward Voltage (1)	V_{SD}		-0.85	-0.95	V	$T_j = 25^{\circ}\text{C}$, $I_S = -2\text{A}$, $V_{GS} = 0\text{V}$
Reverse Recovery Time (3)	t_{rr}		25.1		ns	$T_j = 25^{\circ}\text{C}$, $I_S = -1.7\text{A}$,
Reverse Recovery Charge (3)	Q_{rr}		27.2		nC	$di/dt = 100\text{A}/\mu\text{s}$

(1) Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.

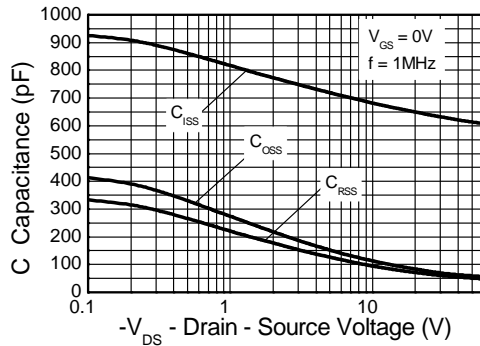
(2) Switching characteristics are independent of operating junction temperature.

(3) For design aid only, not subject to production testing.

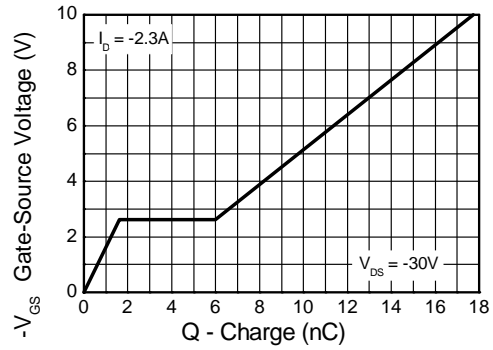
Typical characteristics



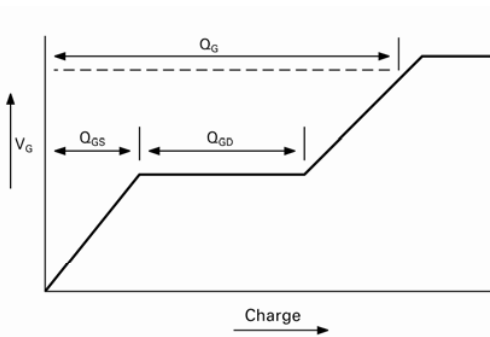
Typical characteristics



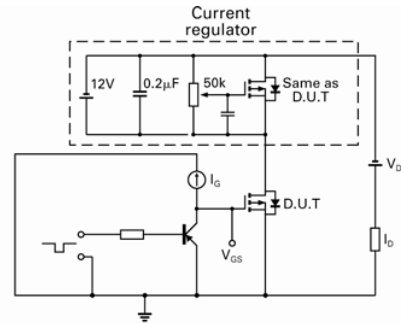
Capacitance v Drain-Source Voltage



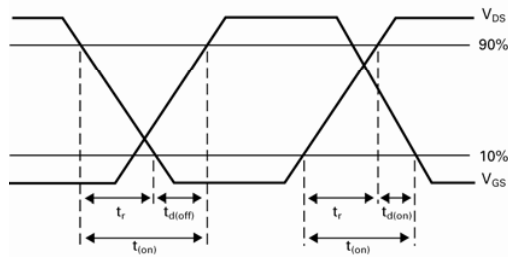
Gate-Source Voltage v Gate Charge



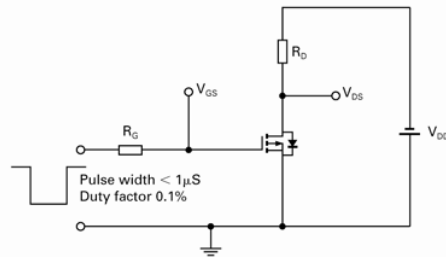
Basic gate charge waveform



Gate charge test circuit



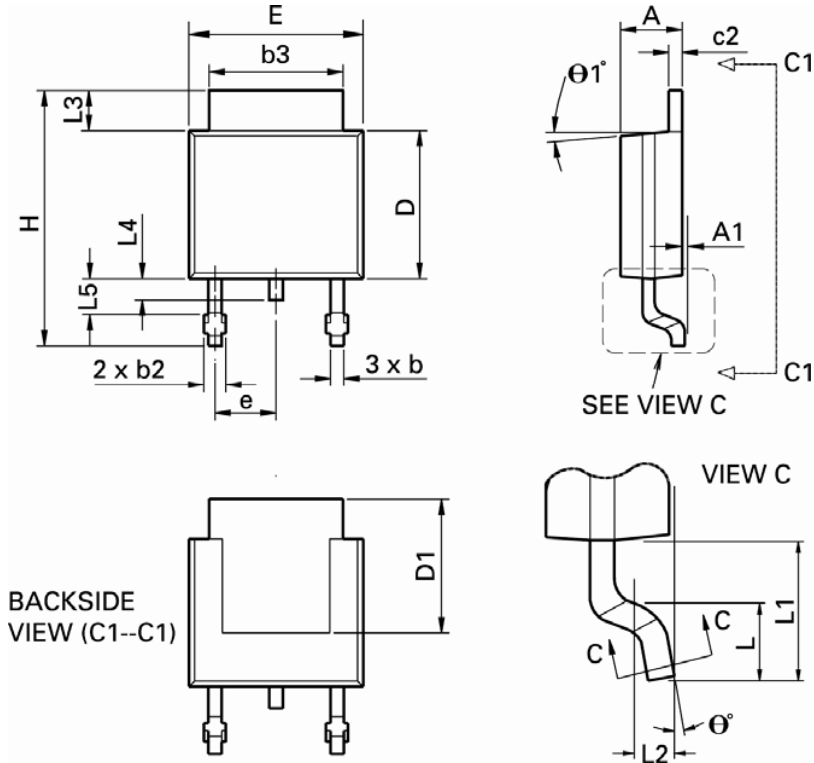
Switching time waveforms



Switching time test circuit

Packaging details – DPAK

Surface mounted, 4 pin package



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
A	0.086	0.094	2.18	2.39	e	0.090 BSC		2.29 BSC	
A1	-	0.005	-	0.127	H	0.370	0.410	9.40	10.41
b	0.020	0.035	0.508	0.89	L	0.055	0.070	1.40	1.78
b2	0.030	0.045	0.762	1.14	L1	0.108 REF		2.74 REF	
b3	0.205	0.215	5.21	5.46	L2	0.020 BSC		0.508 BSC	
c	0.018	0.024	0.457	0.61	L3	0.035	0.065	0.89	1.65
c2	0.018	0.023	0.457	0.584	L4	0.025	0.040	0.635	1.016
D	0.213	0.245	5.41	6.22	L5	0.045	0.060	1.14	1.52
D1	0.205	-	5.21	-	q1°	0°	10°	0°	10°
E	0.250	0.265	6.35	6.73	q°	0°	15°	0°	15°
E1	0.170	-	4.32	-	-	-	-	-	-

Note: Controlling dimensions are in inches. Approximate dimensions are provided in millimeters

Definitions

Product change

Diodes Incorporated reserves the right to alter, without notice, specifications, design, price or conditions of supply of any product or service. Customers are solely responsible for obtaining the latest relevant information before placing orders.

Applications disclaimer

The circuits in this design/application note are offered as design ideas. It is the responsibility of the user to ensure that the circuit is fit for the user's application and meets with the user's requirements. No representation or warranty is given and no liability whatsoever is assumed by Diodes Inc. with respect to the accuracy or use of such information, or infringement of patents or other intellectual property rights arising from such use or otherwise. Diodes Inc. does not assume any legal responsibility or will not be held legally liable (whether in contract, tort (including negligence), breach of statutory duty, restriction or otherwise) for any damages, loss of profit, business, contract, opportunity or consequential loss in the use of these circuit applications, under any circumstances.

Life support

Diodes Zetex products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

- A. Life support devices or systems are devices or systems which:
1. are intended to implant into the body
- or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.
- B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Reproduction

The product specifications contained in this publication are issued to provide outline information only which (unless agreed by the company in writing) may not be used, applied or reproduced for any purpose or form part of any order or contract or be regarded as a representation relating to the products or services concerned.

Terms and Conditions

All products are sold subjects to Diodes Inc. terms and conditions of sale, and this disclaimer (save in the event of a conflict between the two when the terms of the contract shall prevail) according to region, supplied at the time of order acknowledgement. For the latest information on technology, delivery terms and conditions and prices, please contact your nearest Zetex sales office.

Quality of product

Diodes Zetex Semiconductors Limited is an ISO 9001 and TS16949 certified semiconductor manufacturer. To ensure quality of service and products we strongly advise the purchase of parts directly from Zetex Semiconductors or one of our regionally authorized distributors. For a complete listing of authorized distributors please visit: www.zetex.com or www.diodes.com Diodes Inc. does not warrant or accept any liability whatsoever in respect of any parts purchased through unauthorized sales channels.

ESD (Electrostatic discharge)

Semiconductor devices are susceptible to damage by ESD. Suitable precautions should be taken when handling and transporting devices. The possible damage to devices depends on the circumstances of the handling and transporting, and the nature of the device. The extent of damage can vary from immediate functional or parametric malfunction to degradation of function or performance in use over time. Devices suspected of being affected should be replaced.

Green compliance

Diodes Inc. is committed to environmental excellence in all aspects of its operations which includes meeting or exceeding regulatory requirements with respect to the use of hazardous substances. Numerous successful programs have been implemented to reduce the use of hazardous substances and/or emissions. All Diodes Zetex components are compliant with the RoHS directive, and through this it is supporting its customers in their compliance with WEEE and ELV directives.

Product status key:

"Preview"	Future device intended for production at some point. Samples may be available
"Active"	Product status recommended for new designs
"Last time buy (LTB)"	Device will be discontinued and last time buy period and delivery is in effect
"Not recommended for new designs"	Device is still in production to support existing designs and production
"Obsolete"	Production has been discontinued

Datasheet status key:

"Draft version"	This term denotes a very early datasheet version and contains highly provisional information, which may change in any manner without notice.
"Provisional version"	This term denotes a pre-release datasheet. It provides a clear indication of anticipated performance. However, changes to the test conditions and specifications may occur, at any time and without notice.
"Issue"	This term denotes an issued datasheet containing finalized specifications. However, changes to specifications may occur, at any time and without notice.

Sales offices

The Americas

3050 E. Hillcrest Drive
Westlake Village,
CA 91362-3154
Tel: (+1) 805 446 4800
Fax: (+1) 805 446 4850

Europe

Kustermannpark
Balanstraße 59,
D-81541 München
Germany
Tel: (+49) 894 549 4900
Fax: (+49) 894 549 4949

Taiwan

7F, No. 50,
Min Chuan Road
Hsin-Tien
Taipei, Taiwan
Tel: (+886) 289 146 000
Fax: (+886) 289 146 639

Shanghai

Rm. 606, No.1158
Changning Road
Shanghai, China
Tel: (+86) 215 241 4882
Fax (+86) 215 241 4891

Shenzhen

Room A1103-04,
ANLIAN Plaza, #4018
Jintian Road
Futian CBD,
Shenzhen, China
Tel: (+86) 755 882 849 88
Fax: (+86) 755 882 849 99

Korea

6 Floor, Changhwa B/D,
1005-5 Yeongtong-dong,
Yeongtong-gu, Suwon-si,
Gyeonggi-do, Korea 443-813
Tel: (+82) 312 731 884
Fax: (+82) 312 731 885