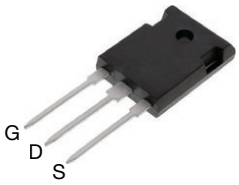
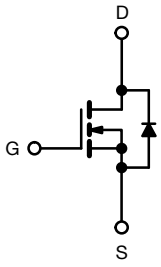
Automotive E Series Power MOSFET with Fast Body Diode

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	700	
$R_{DS(on)}$ typ. at 25 °C (Ω)	V_{GS} = 10 V	0.045
Q_g typ. (nC)	229	
Q_{gs} (nC)	53	
Q_{gd} (nC)	91	
Configuration	Single	

TO-247AD





N-Channel MOSFET

FEATURES

- Fast body diode MOSFET using Automotive Grade E series technology
- Reduced t_{rr}, Q_{rr}, and I_{RRM}
- Low figure-of-merit (FOM) R_{on} x Q_g
- Low input capacitance (C_{iss})
- Low switching losses due to reduced Q_{rr}
- 175 °C operating temperature
- AEC-Q101 qualified
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

RoHS COMPLIANT

HALOGEN FREE

APPLICATIONS

- Automotive onboard charger
- Automotive DC/DC converter

ORDERING INFORMATION	
Package	TO-247AD
Lead (Pb)-Free and Halogen-Free	SQW61N65EF-GE3

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	650	V
Gate-Source Voltage			V_{GS}	± 30	
Continuous Drain Current (T_J = 175 °C)	V_{GS} at 10 V	T_C = 25 °C	I_D	62	A
		T_C = 100 °C		44	
Pulsed Drain Current [a]			I_{DM}	187	
Linear Derating Factor				4.2	W/°C
Single Pulse Avalanche Energy [b]			E_{AS}	1323	mJ
Maximum Power Dissipation			P_D	625	W
Operating Junction and Storage Temperature Range			T_J, T_{stg}	-55 to +175	°C
Drain-Source Voltage Slope			dV/dt	70	V/ns
Reverse Diode dV/dt [d]				50	
Soldering Recommendations (Peak temperature) [c]	For 10 s			260	°C

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature
b. V_{DD} = 140 V, starting T_J = 25 °C, L = 73.5 mH, R_g = 25 Ω, I_{AS} = 6 A
c. 1.6 mm from case
d. $I_{SD} \leq I_D$, di/dt = 470 A/µs, starting T_J = 25 °C

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Maximum Junction-to-Ambient	R_{thJA}	40	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	0.24	

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	650	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 30 mA	-	0.77	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	2.0	-	4.0	V
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 20 V	-	-	± 100	nA
		V_{GS} = ± 30 V	-	-	± 1	µA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 520 V, V_{GS} = 0 V	-	-	1	µA
		V_{DS} = 520 V, V_{GS} = 0 V, T_J = 125 °C	-	-	500	µA
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 32 A	-	0.045	0.052	Ω
Forward Transconductance	g_{fs}	V_{DS} = 30 V, I_D = 32 A	-	28	-	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 100 V, f = 1 MHz	-	7379	-	pF
Output Capacitance	C_{oss}		-	310	-	
Reverse Transfer Capacitance	C_{rss}		-	4	-	
Effective Output Capacitance, Energy Related [a]	$C_{o(er)}$	V_{DS} = 0 V to 520 V, V_{GS} = 0 V	-	213	-	
Effective Output Capacitance, Time Related [b]	$C_{o(tr)}$		-	841	-	
Total Gate Charge	Q_g	V_{GS} = 10 V; I_D = 32 A, V_{DS} = 520 V	-	229	344	nC
Gate-Source Charge	Q_{gs}		-	53	-	
Gate-Drain Charge	Q_{gd}		-	91	-	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 520 V, I_D = 32 A, V_{GS} = 10 V, R_g = 9.1 Ω	-	65	98	ns
Rise Time	t_r		-	107	161	
Turn-Off Delay Time	$t_{d(off)}$		-	252	378	
Fall Time	t_f		-	102	153	
Gate Input Resistance	R_g	f = 1 MHz, open drain	0.5	1	2	Ω
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	62	A
Pulsed Diode Forward Current	I_{SM}		-	-	187	
Diode Forward Voltage	V_{SD}	T_J = 25 °C, I_S = 32 A, V_{GS} = 0 V	-	0.9	1.2	V
Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = I_S = 30.5 A, di/dt = 100 A/µs, V_R = 400 V	-	204	408	ns
Reverse Recovery Charge	Q_{rr}		-	1.9	3.8	µC
Reverse Recovery Current	I_{RRM}		-	18	-	A

Notes

a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS}

b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS}

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

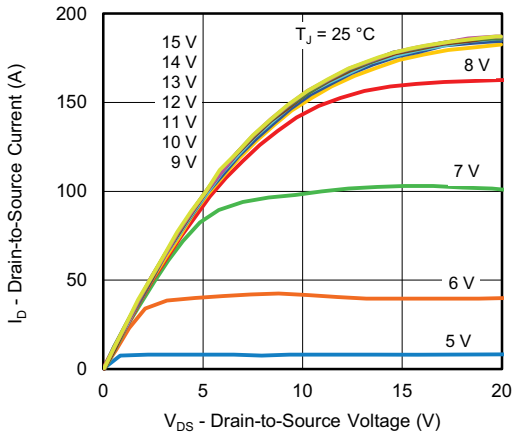


Fig. 1 - Typical Output Characteristics

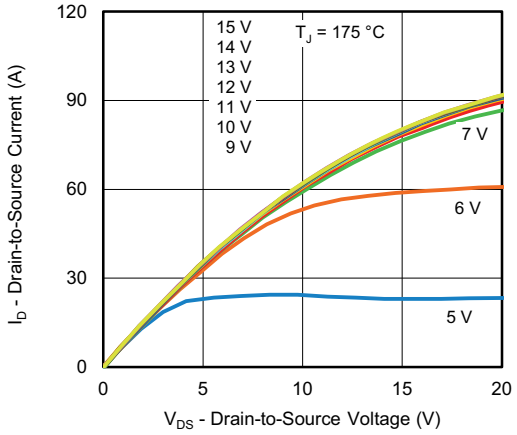


Fig. 2 - Typical Output Characteristics

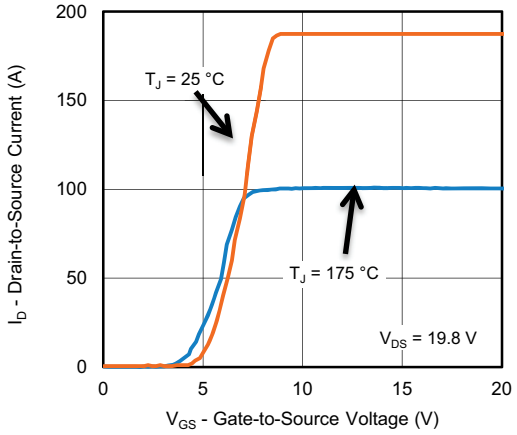


Fig. 3 - Typical Transfer Characteristics

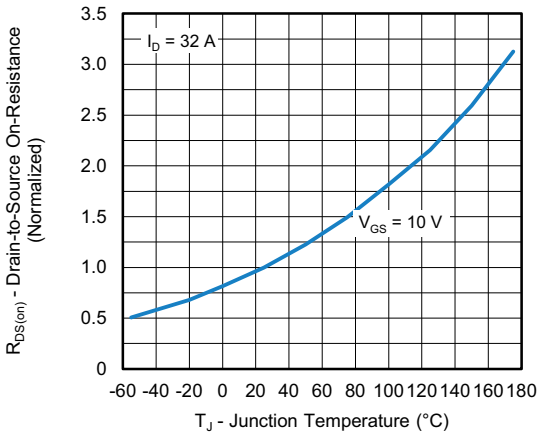


Fig. 4 - Normalized On-Resistance vs. Temperature

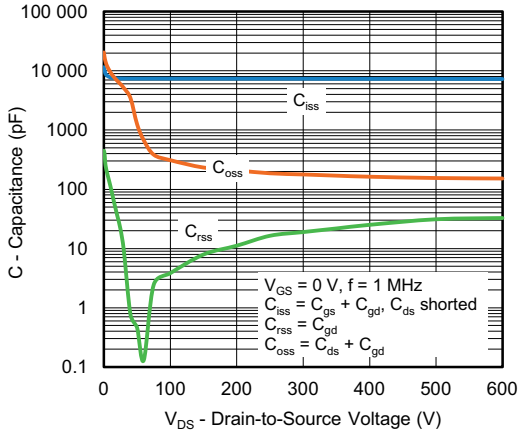


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

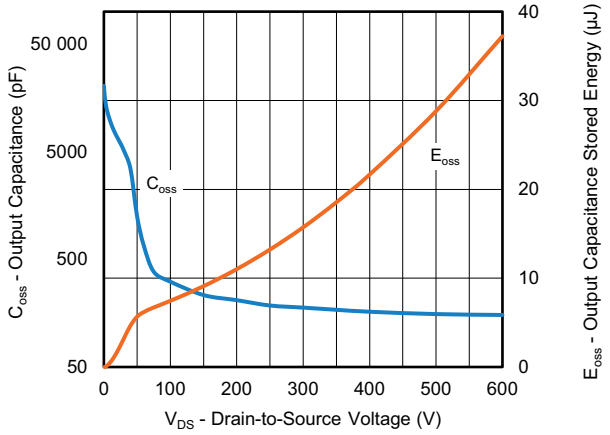


Fig. 6 - C_{oss} and E_{oss} vs. V_{DS}

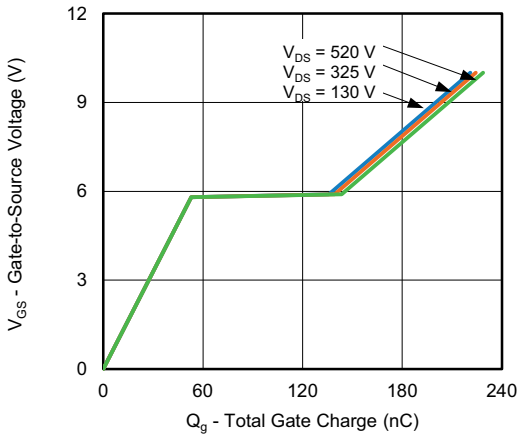


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

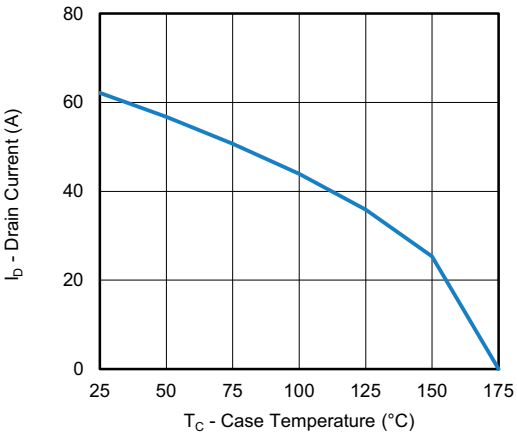


Fig. 10 - Maximum Drain Current vs. Case Temperature

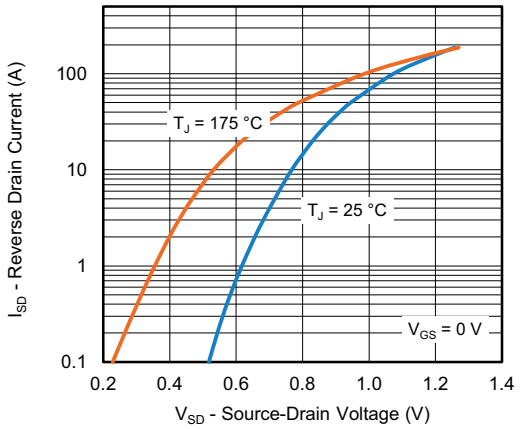


Fig. 8 - Typical Source-Drain Diode Forward Voltage

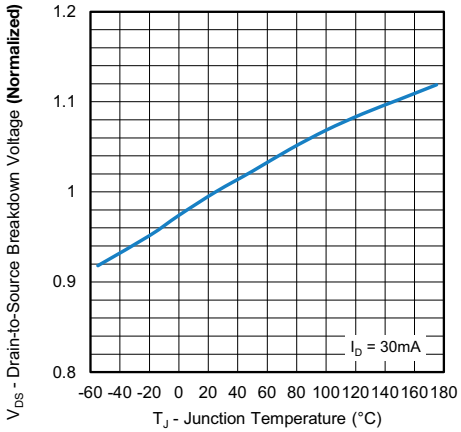


Fig. 11 - Temperature vs. Drain-to-Source Voltage

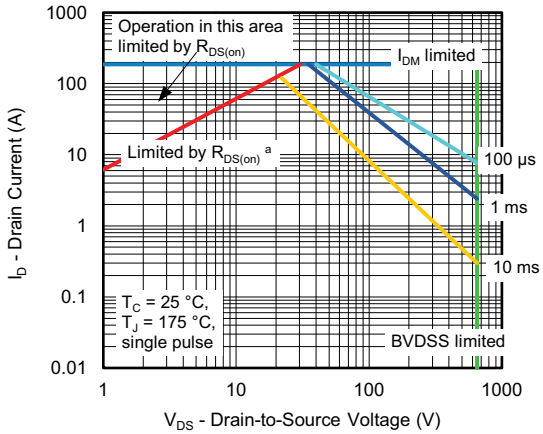


Fig. 9 - Maximum Safe Operating Area

Note

a. V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

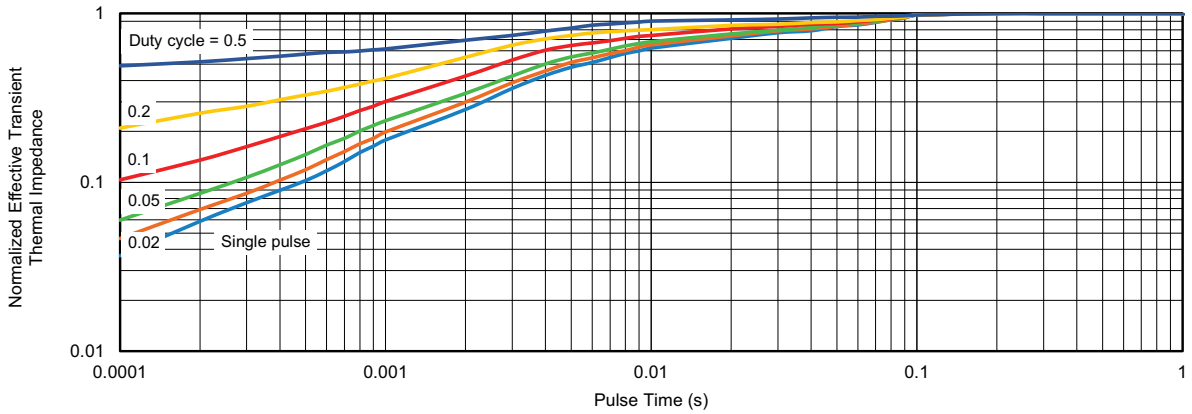


Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case

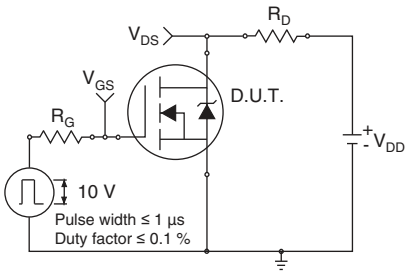


Fig. 13 - Switching Time Test Circuit

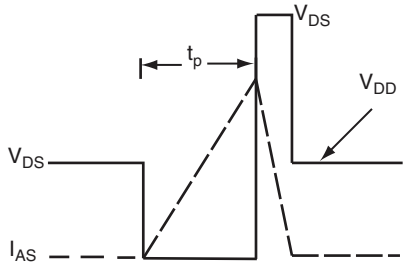


Fig. 16 - Unclamped Inductive Waveforms

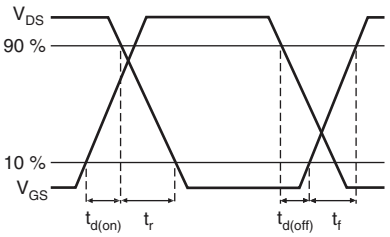


Fig. 14 - Switching Time Waveforms

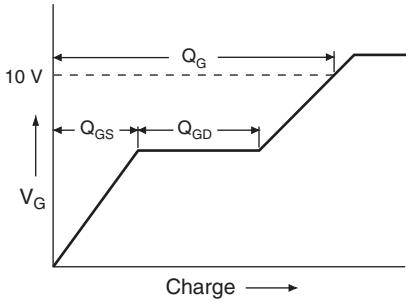


Fig. 17 - Basic Gate Charge Waveform

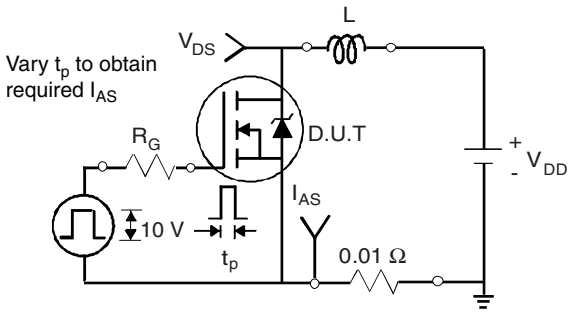


Fig. 15 - Unclamped Inductive Test Circuit

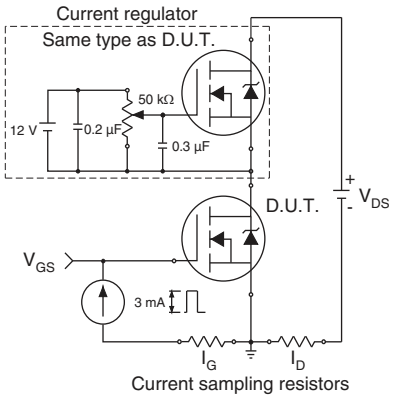
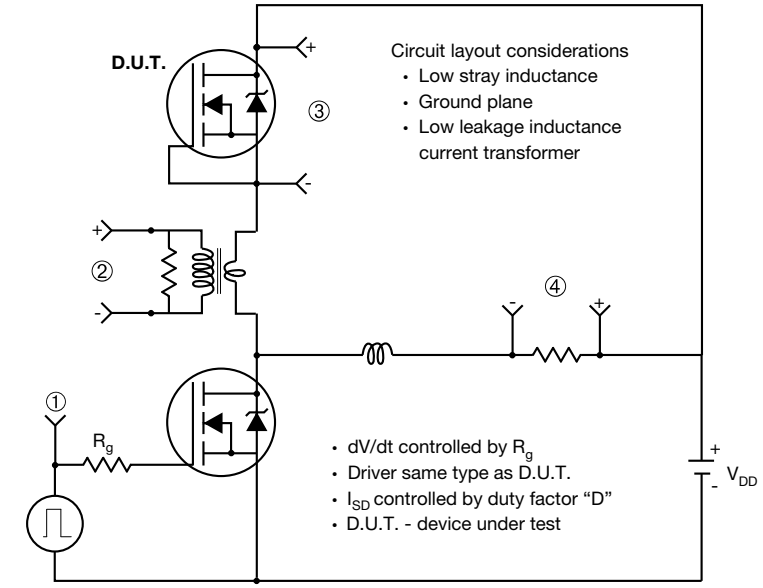
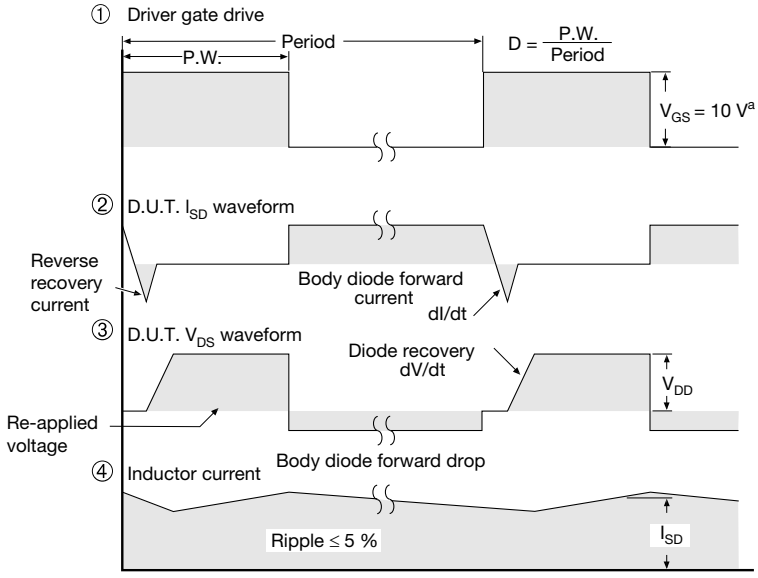


Fig. 18 - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit





Note

a. V_{GS} = 5 V for logic level devices

Fig. 19 - For N-Channel

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package / tape drawings, part marking, and reliability data, see www.vishay.com/ppg?92303.

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for MOSFETs ***category:***

Click to view products by Vishay ***manufacturer:***

Other Similar products are found below :

MCH3443-TL-E MCH6422-TL-E NTNS3A92PZT5G IRFD120 JANTX2N5237 2SK2464-TL-E 2SK3818-DL-E 2SJ277-DL-E 2SK2267(Q) BUK455-60A/B BUZ80 TK100A10N1,S4X(S MIC4420CM-TR IRFS350 VN1206L NDP4060 IPS70R2K0CEAKMA1 AON6932A TS19452CS RL TK31J60W5,S1VQ(O 2SK2614(TE16L1,Q) JANTX2N6798 DMN1017UCP3-7 EFC2J004NUZTDG DMN1053UCP4-7 SCM040600 NTE2384 2N7000TA DMN2080UCB4-7 DMN61D9UWQ-13 US6M2GTR DMN31D5UDJ-7 DMP22D4UFO-7B DMN1006UCA6-7 DMN16M9UCA6-7 STF5N65M6 IRF40H233XTMA1 STU5N65M6 DMN6022SSD-13 DMN13M9UCA6-7 DMTH10H4M6SPS-13 DMN2990UFB-7B 2N7002W-G MCAC30N06Y-TP MCQ7328-TP IPB45P03P4L11ATMA2 BXP4N65F BXP2N20L BXP2N65D TSM60NB380CP ROG