

N-Channel 40-V (D-S) MOSFET with Sensing Diode

PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
40	0.0054 at $V_{GS} = 10$ V	60 ^a

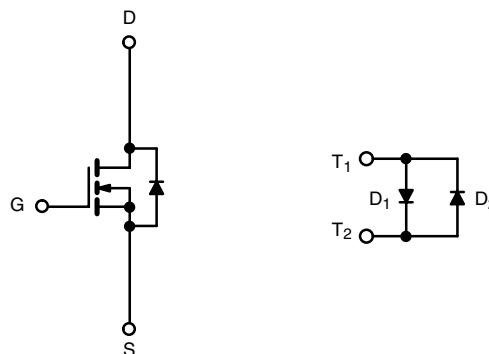
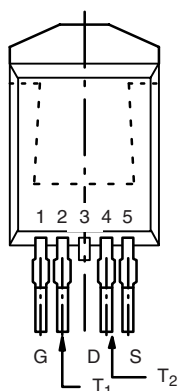
FEATURES

- TrenchFET[®] Power MOSFETS Plus Temperature Sensing Diode
- 175 °C Junction Temperature
- Low Thermal Resistance Package



Available
RoHS*
COMPLIANT

D²PAK-5



Ordering Information: SUM60N04-05T-E3 (Lead (Pb)-free)

N-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 175$ °C) ^d	I_D	$T_C = 25$ °C	A
		$T_C = 100$ °C	
Pulsed Drain Current	I_{DM}	250	
Continuous Diode Current (Diode Conduction) ^d	I_S	60 ^a	
Avalanche Current	I_{AS}	60 ^a	
Repetitive Avalanche Energy ^b	E_{AS}	180	mJ
Maximum Power Dissipation ^a	P_D	$T_C = 25$ °C	W
		$T_A = 25$ °C	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Limit	Unit
Junction-to-Ambient ^d	R_{thJA}	40	°C/W
Junction-to-Case	R_{thJC}	0.75	

Notes:

- Package limited.
- Duty cycle $\leq 1\%$.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).

* Pb containing terminations are not RoHS compliant, exemptions may apply.

MOSFET SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_{DS} = 250\text{ }\mu\text{A}$	2.5		4.5	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^{\circ}\text{C}$			50	
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^{\circ}\text{C}$			500	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$	120			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 25\text{ A}$		0.0043	0.0054	Ω
		$V_{GS} = 10\text{ V}, I_D = 25\text{ A}, T_J = 125\text{ }^{\circ}\text{C}$			0.0088	
		$V_{GS} = 10\text{ V}, I_D = 25\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$			0.011	
Sense Diode Forward Voltage	V_{FD1}	$I_F = 50\text{ }\mu\text{A}$	675		825	mV
	V_{FD2}	$I_F = 25\text{ }\mu\text{A}$	600		750	
Sense Diode Forward Voltage Increase	ΔV_F	From $I_F = 25\text{ }\mu\text{A}$ to $I_F = 50\text{ }\mu\text{A}$	50		100	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$		35		S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		6400		pF
Output Capacitance	C_{oss}			1100		
Reverse Transfer Capacitance	C_{rss}			630		
Gate Resistance	R_g	$f = 1\text{ MHz}$		2.2		Ω
Total Gate Charge ^c	Q_g	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 25\text{ A}$		115	150	nC
Gate-Source Charge ^c	Q_{gs}			35		
Gate-Drain Charge ^c	Q_{gd}			35		
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 0.8\text{ }\Omega$ $I_D \cong 25\text{ A}, V_{GEN} = 10\text{ V}, R_G = 2.5\text{ }\Omega$		15	20	ns
Rise Time ^c	t_r			150	210	
Turn-Off Delay Time ^c	$t_{d(off)}$			60	85	
Fall Time ^c	t_f			80	110	
Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^{\circ}\text{C}$ ^b						
Continuous Current	I_S				60	A
Pulsed Current	I_{SM}				200	
Forward Voltage ^a	V_{SD}	$I_F = 60\text{ A}, V_{GS} = 0\text{ V}$		1.0	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 60\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		45	70	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			2.5	5	A
Reverse Recovery Charge	Q_{rr}			0.06	0.18	μC

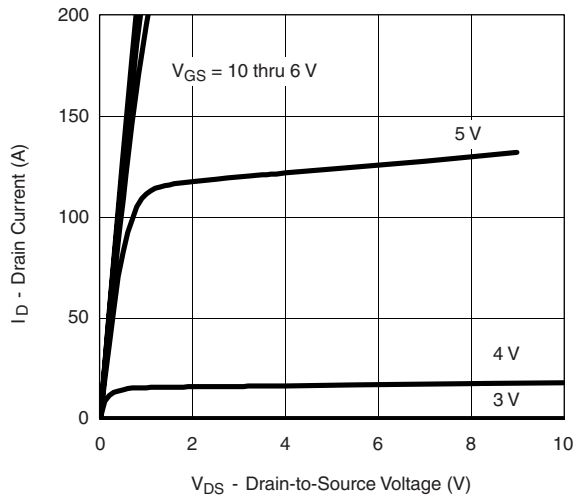
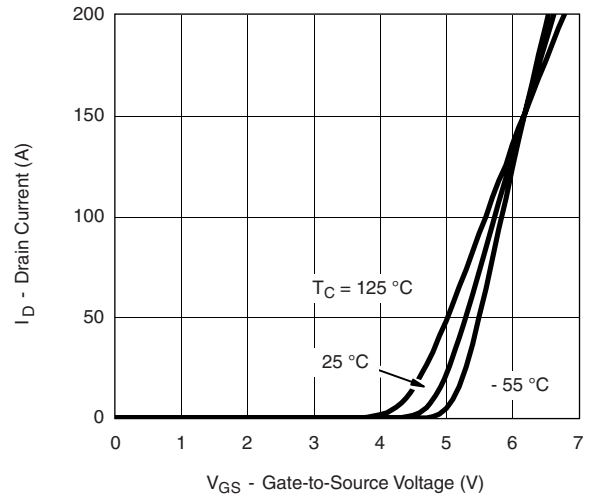
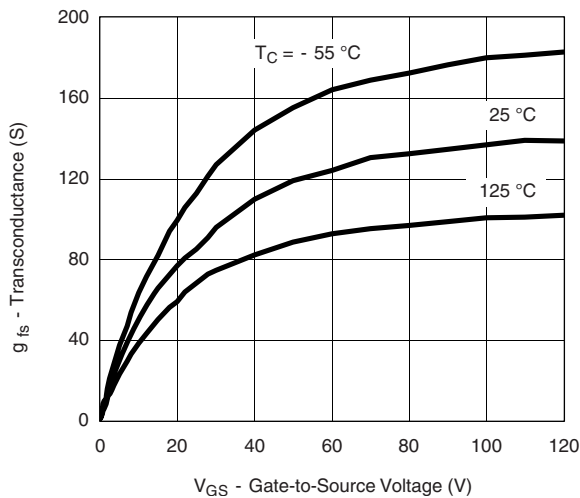
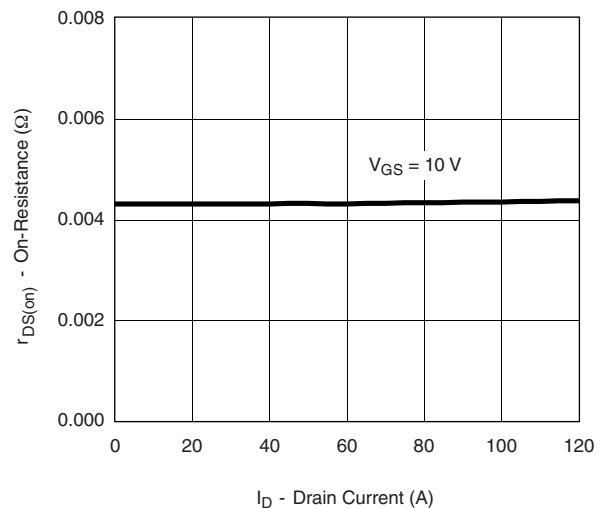
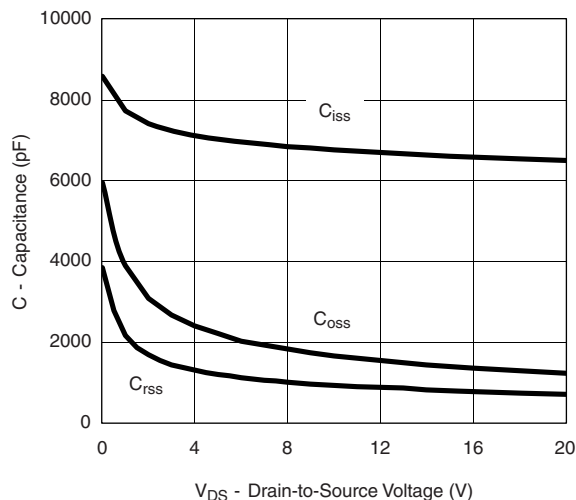
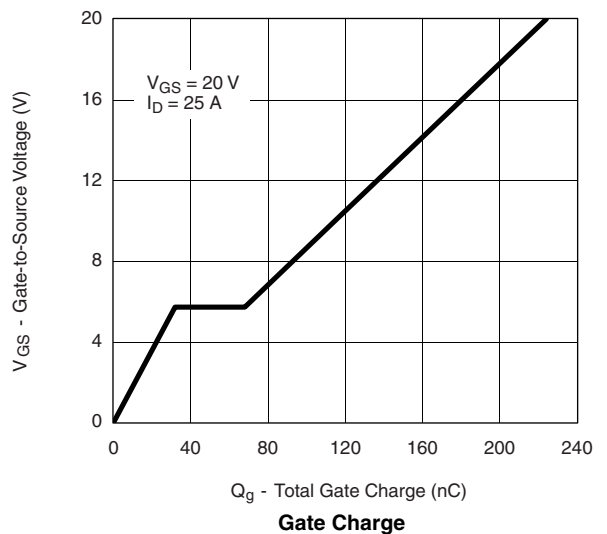
Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

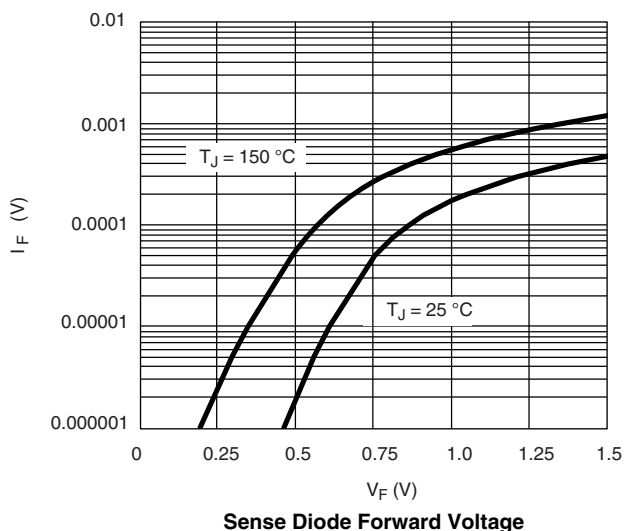
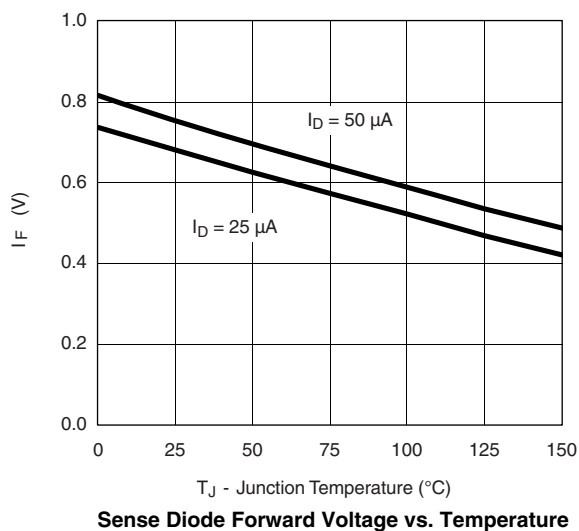
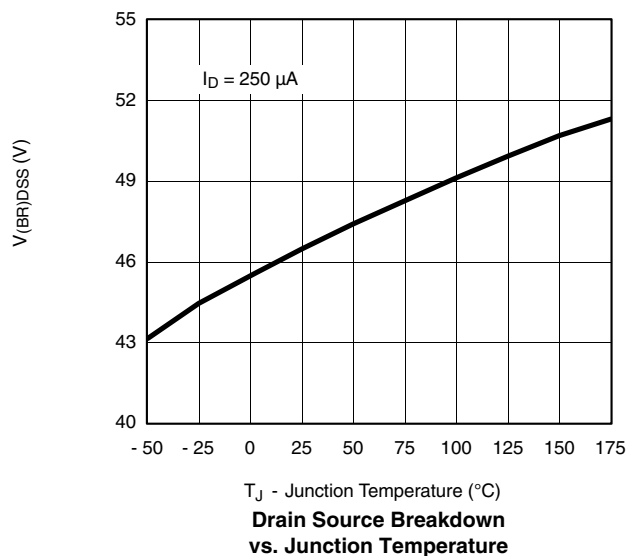
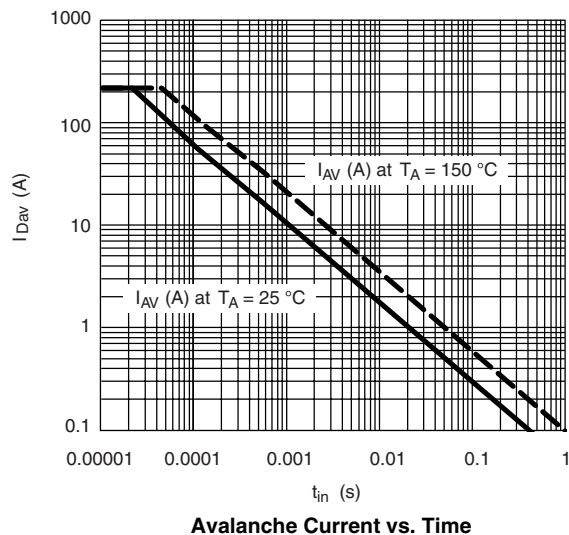
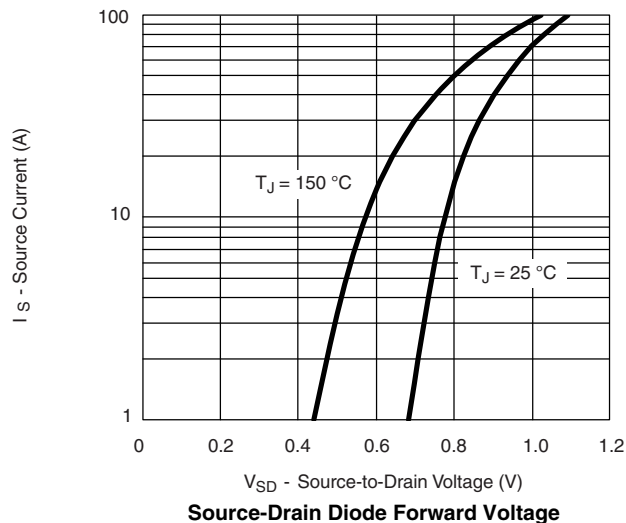
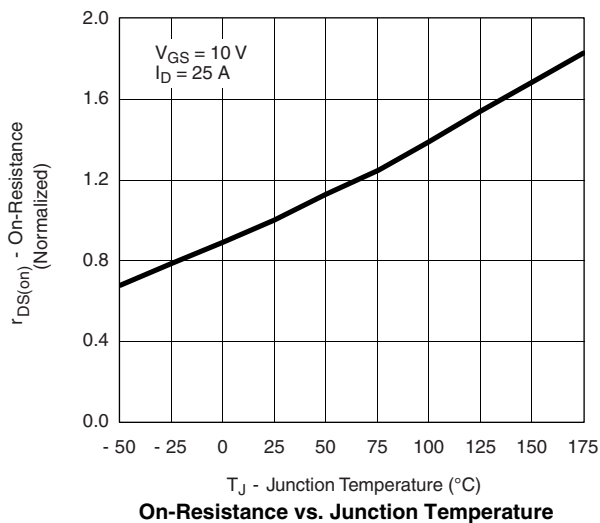
b. Guaranteed by design, not subject to production testing.

c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

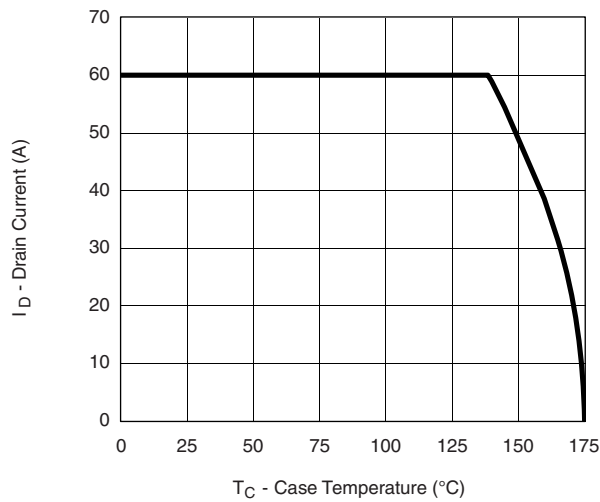
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted**Output Characteristics****Transfer Characteristics****Transconductance****On-Resistance vs. Drain Current****Capacitance****Gate Charge**

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

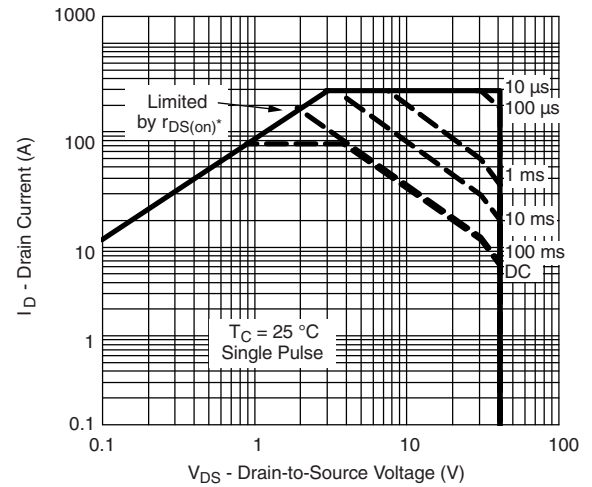




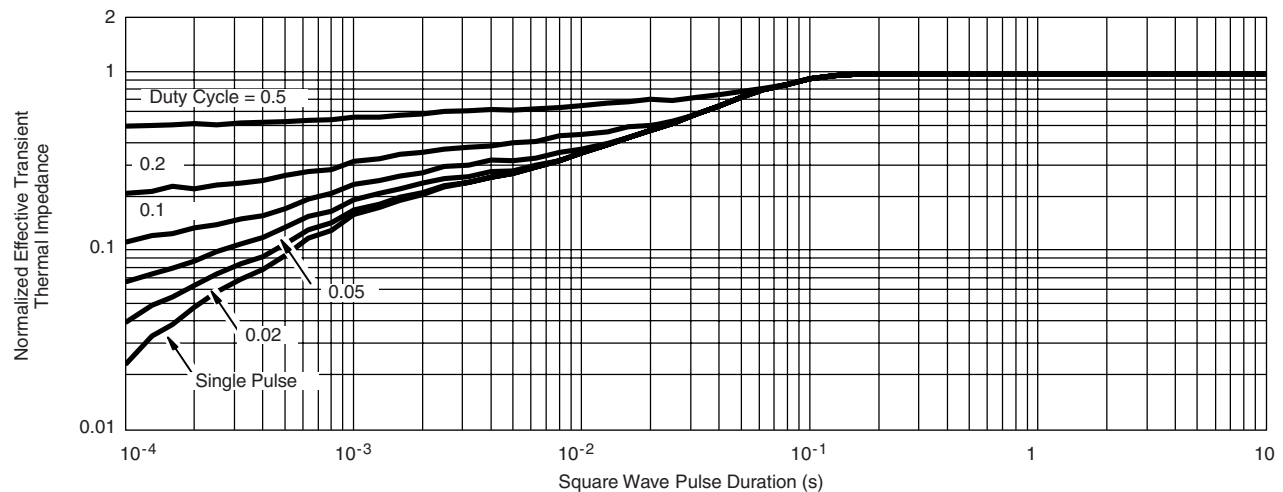
THERMAL RATINGS



Maximum Avalanche and Drain Current
vs. Case Temperature



* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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 <http://www.vishay.com/ppg?72430>.



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.

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.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)

Email: org@lifeelectronics.ru

www.lifeelectronics.ru