

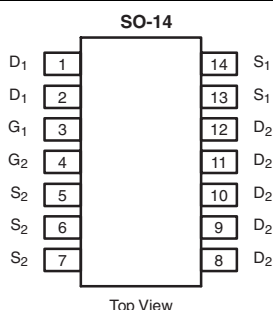
Dual N-Channel 20-V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY

	V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
Channel-1	20	0.0094 at V _{GS} = 10 V	14.1	9.6
		0.0125 at V _{GS} = 4.5 V	12.2	
Channel-2	20	0.008 at V _{GS} = 10 V	20	14.1
		0.0095 at V _{GS} = 4.5 V	18.9	

SCHOTTKY PRODUCT SUMMARY

V _{DS} (V)	V _{SD} (V) Diode Forward Voltage	I _F (A)
20	0.55 V at 2.5 A	2



Ordering Information: Si4340CDY-T1-E3 (Lead (Pb)-free)
Si4340CDY-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

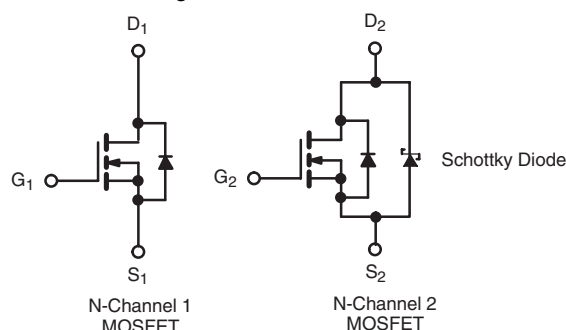
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- DC/DC Converters
 - Game Stations
 - Notebook PC Logic



ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted

Parameter		Symbol	Channel-1	Channel-2	Unit
Drain-Source Voltage		V _{DS}	20	20	V
Gate-Source Voltage		V _{GS}	± 20	± 16	
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	I _D	14.1	20	A
	T _C = 70 °C		11.2	16.5	
	T _A = 25 °C		11.5 ^{b, c}	15.2 ^{b, c}	
	T _A = 70 °C		9.2 ^{b, c}	12.2 ^{b, c}	
Pulsed Drain Current		I _{DM}	40	50	
Source-Drain Current Diode Current	T _C = 25 °C	I _S	2.5	4.5	
	T _A = 25 °C		1.7 ^{b, c}	2.5 ^{b, c}	
Single Pulse Avalanche Current	L = 0.1 mH	I _{AS}	5		mJ
Single Pulse Avalanche Energy		E _{AS}	1.25		
Maximum Power Dissipation	T _C = 25 °C	P _D	3	5.4	W
	T _C = 70 °C		1.9	3.5	
	T _A = 25 °C		2 ^{b, c}	3 ^{b, c}	
	T _A = 70 °C		1.3 ^{b, c}	1.9 ^{b, c}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150		°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Channel-1		Channel-2		Unit
		Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient ^{b, d}	R _{thJA}	53	62.5	35	42	°C/W
Maximum Junction-to-Foot (Drain)	R _{thJF}	35	42	18	23	

Notes:

a. Based on T_C = 25 °C.

b. Surface Mounted on 1" x 1" FR4 board.

c. t = 10 s.

d. Maximum under Steady State conditions for channel 1 is 110 °C/W and channel 2 is 87 °C/W.

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	Ch-1	20			V	
		V _{GS} = 0 V, I _D = 250 μA	Ch-2	20				
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA	Ch-1		20		mV/°C	
		I _D = 25 mA	Ch-2		22			
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J	I _D = 250 μA	Ch-1		- 5.5			
		I _D = 25 mA	Ch-2		- 2.5			
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	Ch-1	1		3	V	
		V _{DS} = V _{GS} , I _D = 250 μA	Ch-2	0.8		2.2		
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	Ch-1			100	nA	
		V _{DS} = 0 V, V _{GS} = ± 16 V	Ch-2			100		
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V	Ch-1			1	μA	
		V _{DS} = 20 V, V _{GS} = 0 V	Ch-2			100		
		V _{DS} = 20 V, V _{GS} = 0 V, T _J = 85 °C	Ch-1			15		
		V _{DS} = 20 V, V _{GS} = 0 V, T _J = 85 °C	Ch-2			10 000		
On-State Drain Current ^b	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	Ch-1	20			A	
		V _{DS} ≥ 5 V, V _{GS} = 10 V	Ch-2	30				
Drain-Source On-State Resistance ^b	R _{DS(on)}	V _{GS} = 10 V, I _D = 11.5 A	Ch-1		0.0077	0.0094	Ω	
		V _{GS} = 10 V, I _D = 15.2 A	Ch-2		0.0065	0.008		
		V _{GS} = 4.5 V, I _D = 10 A	Ch-1		0.010	0.0125		
		V _{GS} = 4.5 V, I _D = 14 A	Ch-2		0.0075	0.0095		
Forward Transconductance ^b	g _{fs}	V _{DS} = 10 V, I _D = 11.5 A	Ch-1		45		S	
		V _{DS} = 10 V, I _D = 15.2 A	Ch-2		73			
Dynamic ^a								
Input Capacitance	C _{iss}	Channel-1 V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	Ch-1		1300		pF	
			Ch-2		1900			
Output Capacitance	C _{oss}	Channel-2 V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	Ch-1		330			
			Ch-2		500			
Reverse Transfer Capacitance	C _{rss}	Channel-1 V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	Ch-1		150			
			Ch-2		160			
Total Gate Charge	Q _g	V _{DS} = 10 V, V _{GS} = 10 V, I _D = 11.5 A	Ch-1		21	32	nC	
		V _{DS} = 10 V, V _{GS} = 10 V, I _D = 15.2 A	Ch-2		31	47		
Gate-Source Charge	Q _{gs}	Channel-1 V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 11.5 A	Ch-1		9.6	15		
			Ch-2		14.1	22		
Gate-Drain Charge	Q _{gd}	Channel-2 V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 15.2 A	Ch-1		4			
			Ch-2		5			
Gate Resistance	R _g	f = 1 MHz	Ch-1		0.65	1.2	Ω	
			Ch-2		1.4	2.8		

Notes:

- a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.



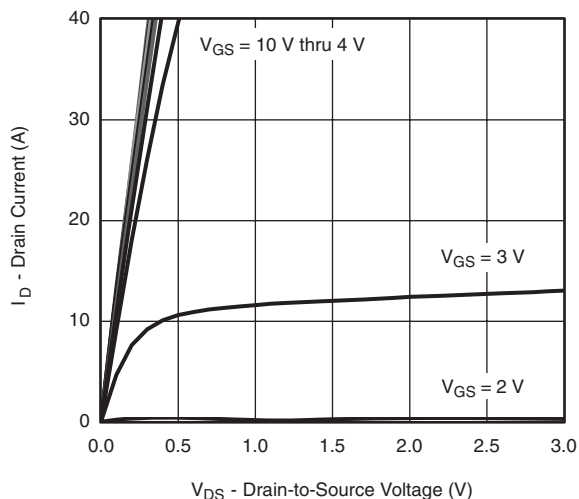
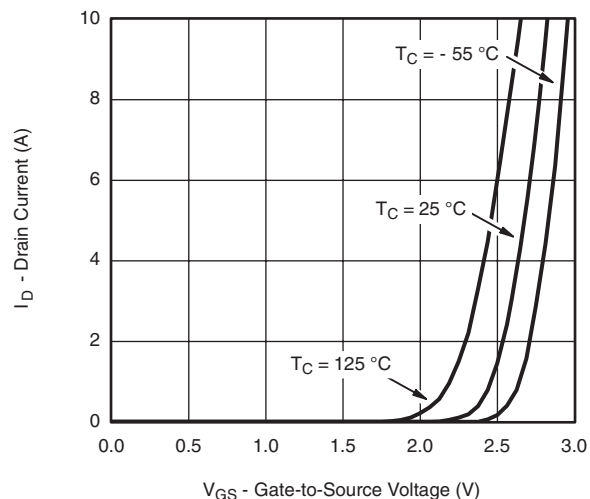
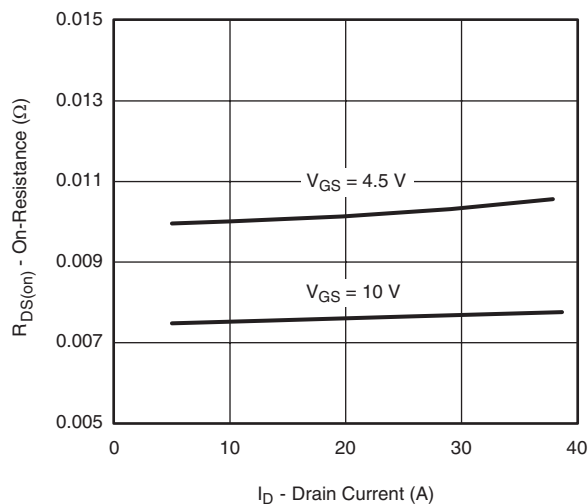
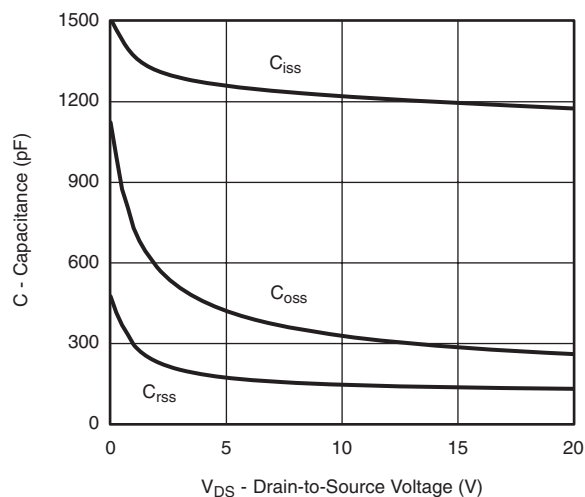
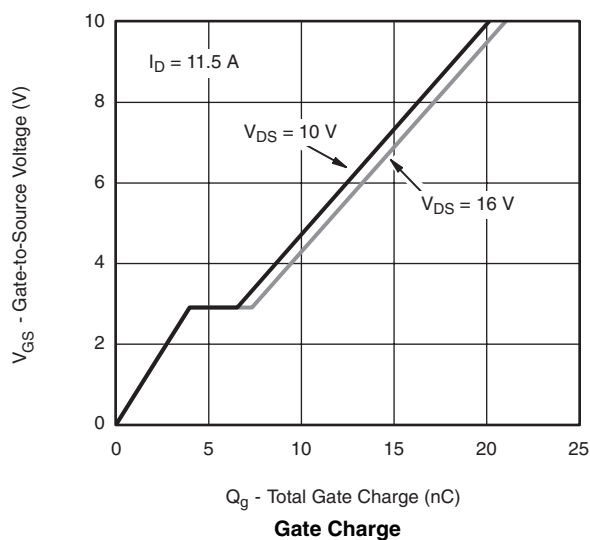
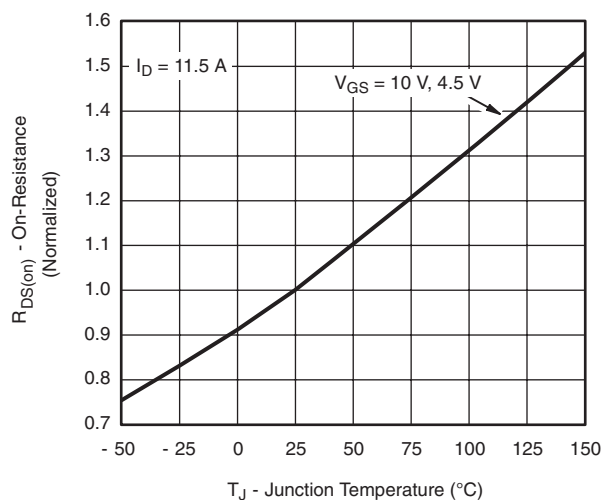
SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Dynamic ^a							
Turn-On Delay Time	$t_{d(on)}$	Channel-1 $V_{DD} = 10\text{ V}$, $R_L = 1.1\text{ }\Omega$ $I_D \cong 9.2\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\text{ }\Omega$	Ch-1		20	30	ns
			Ch-2		22	35	
Rise Time	t_r		Ch-1		10	15	
			Ch-2		10	15	
Turn-Off Delay Time	$t_{d(off)}$	Ch-1		20	30		
		Ch-2		32	50		
Fall Time	t_f	Ch-1		10	15		
		Ch-2		10	15		
Turn-On Delay Time	$t_{d(on)}$	Channel-1 $V_{DD} = 10\text{ V}$, $R_L = 1.1\text{ }\Omega$ $I_D \cong 9.2\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\text{ }\Omega$	Ch-1		10	15	
			Ch-2		10	15	
Rise Time	t_r		Ch-1		10	15	
			Ch-2		10	15	
Turn-Off Delay Time	$t_{d(off)}$	Ch-1		20	30		
		Ch-2		25	40		
Fall Time	t_f	Ch-1		10	15		
		Ch-2		10	15		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$	Ch-1			2.5	A
			Ch-2			4.5	
Pulse Diode Forward Current ^a	I_{SM}		Ch-1			40	
			Ch-2			50	
Body Diode Voltage	V_{SD}	$I_S = 9.2\text{ A}$	Ch-1		0.8	1.2	V
		$I_S = 2.5\text{ A}$	Ch-2		0.45	0.55	
Body Diode Reverse Recovery Time	t_{rr}	Channel-1 $I_F = 9.2\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^{\circ}\text{C}$	Ch-1		30	60	ns
			Ch-2		30	60	
Body Diode Reverse Recovery Charge	Q_{rr}		Ch-1		15	25	nC
			Ch-2		20	30	
Reverse Recovery Fall Time	t_a	Channel-2 $I_F = 2.5\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^{\circ}\text{C}$	Ch-1		12		ns
			Ch-2		14		
Reverse Recovery Rise Time	t_b		Ch-1		18		
			Ch-2		16		

Notes:

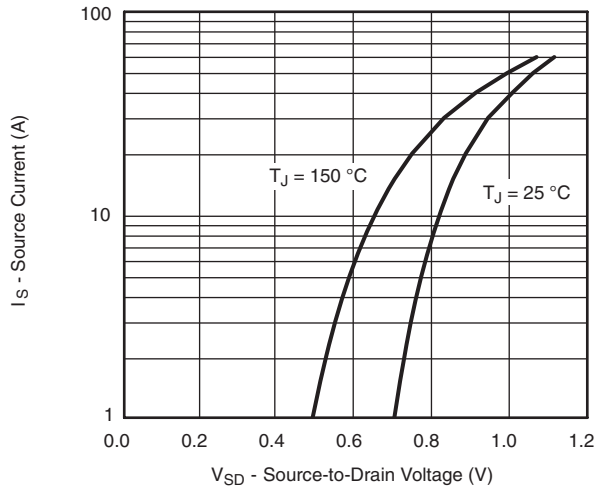
a. Guaranteed by design, not subject to production testing.

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

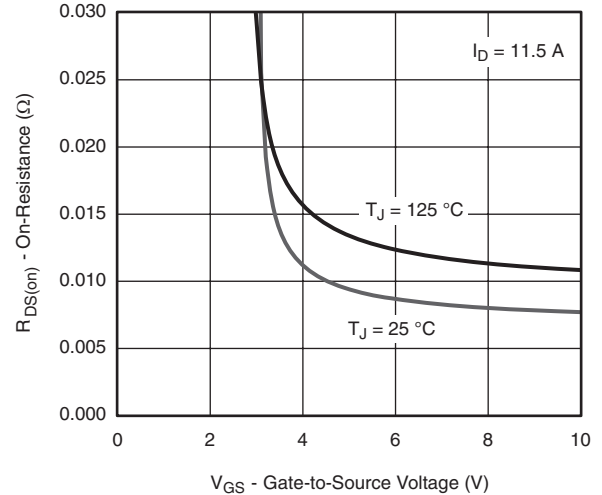
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted**Output Characteristics****Transfer Characteristics****On-Resistance vs. Drain Current****Capacitance****Gate Charge****On-Resistance vs. Junction Temperature**

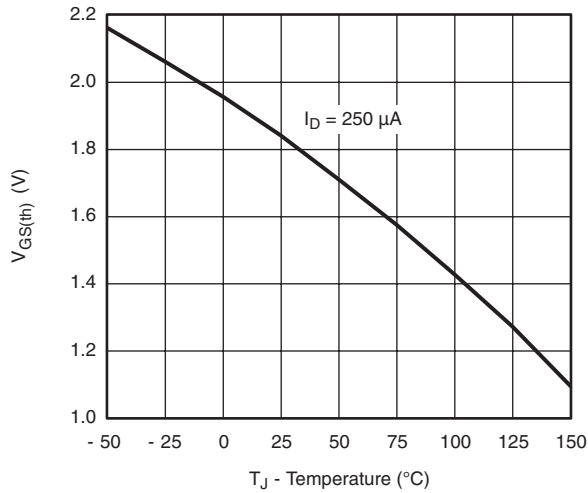
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



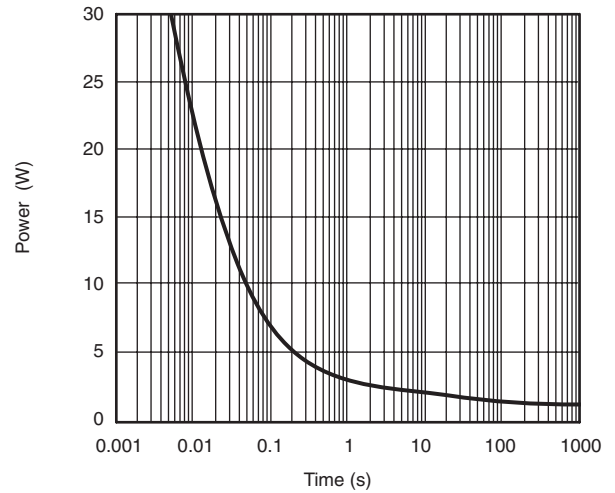
Source-Drain Diode Forward Voltage



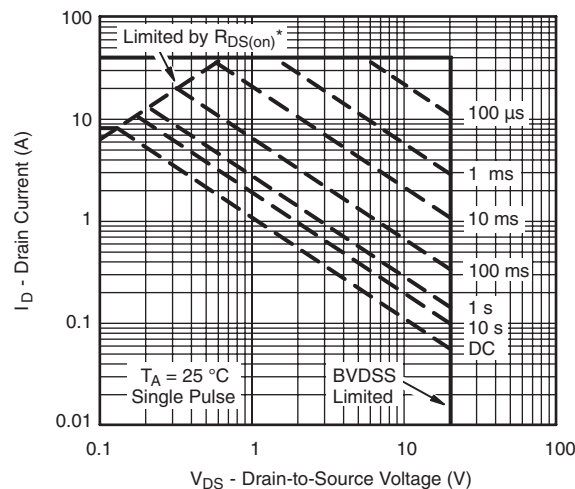
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



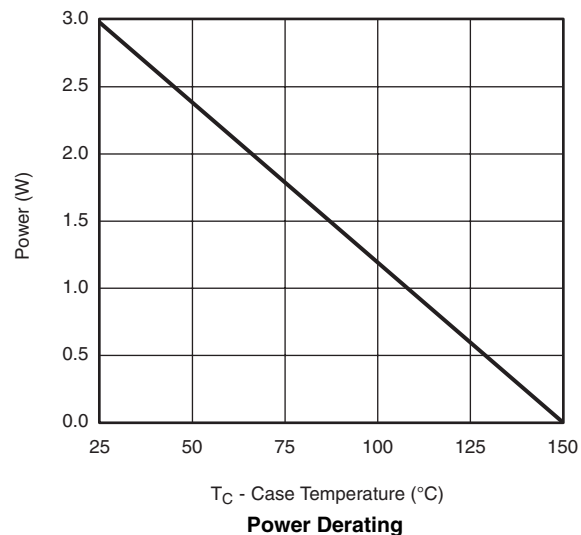
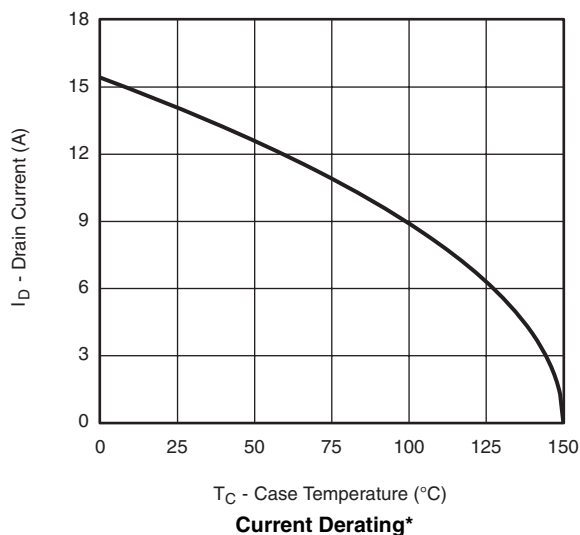
Single Pulse Power



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

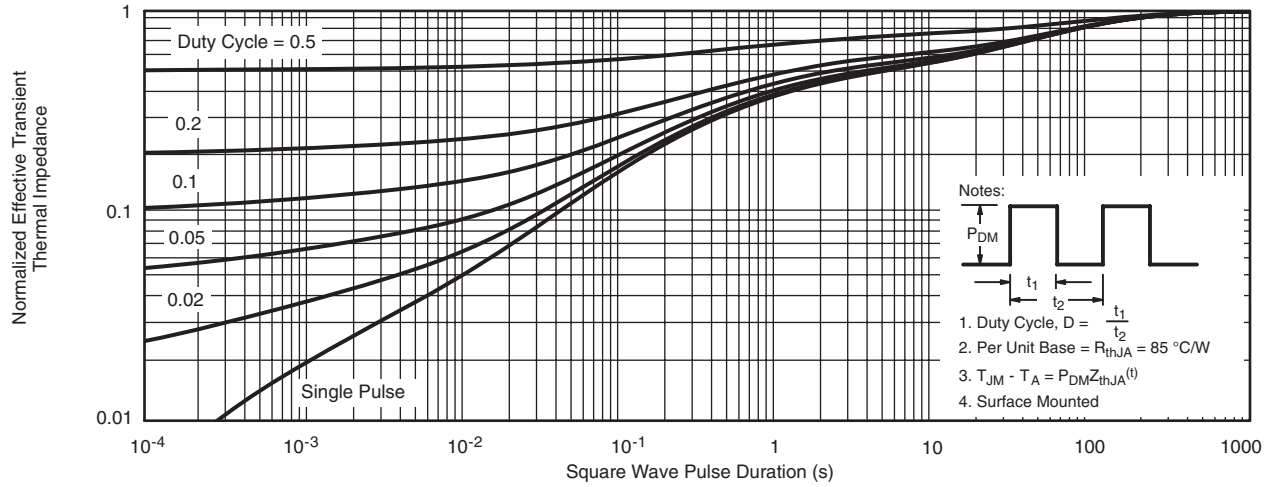
Safe Operating Area, Junction-to-Ambient

CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

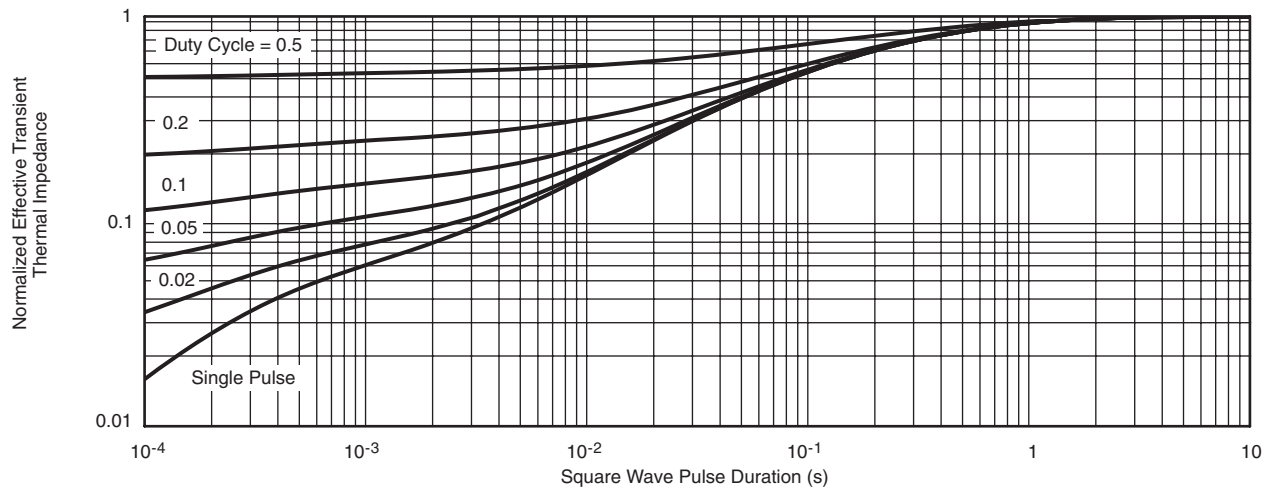


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

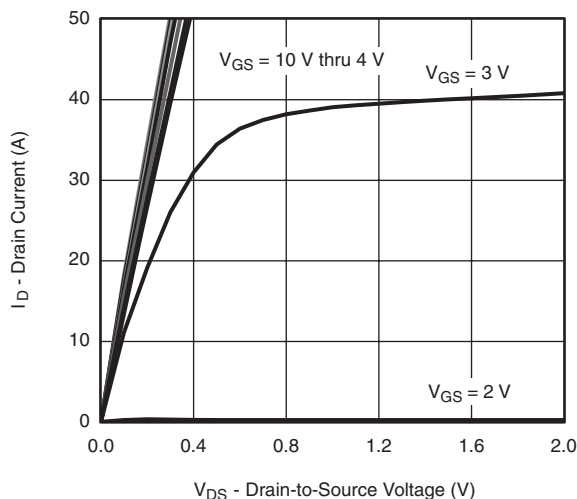
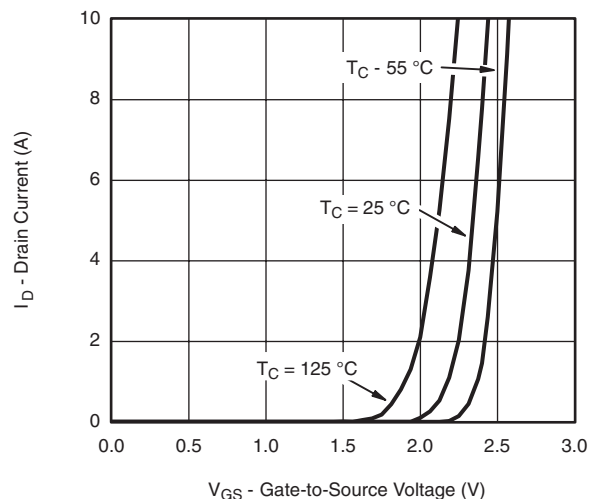
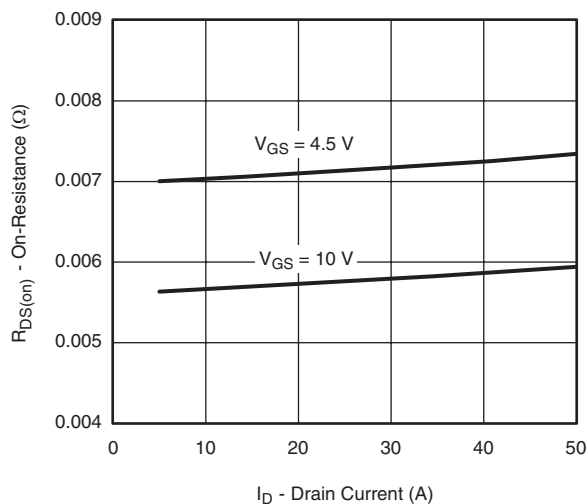
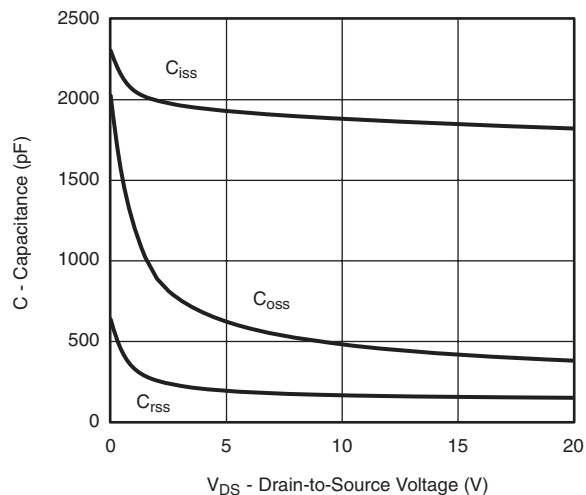
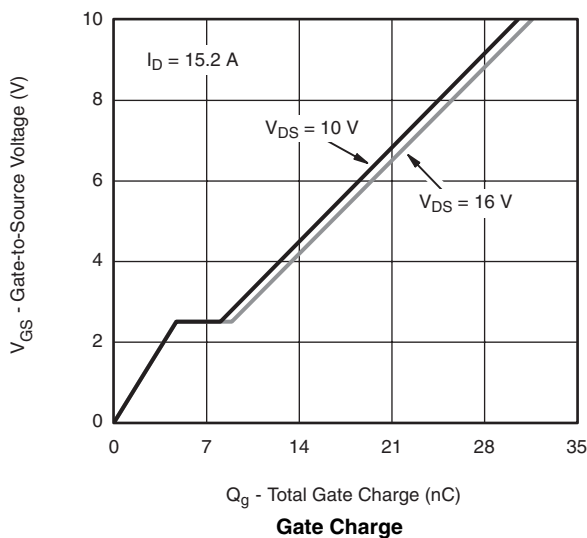
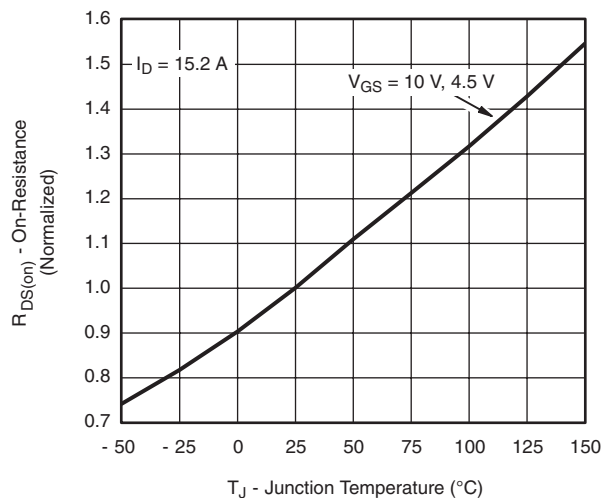
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



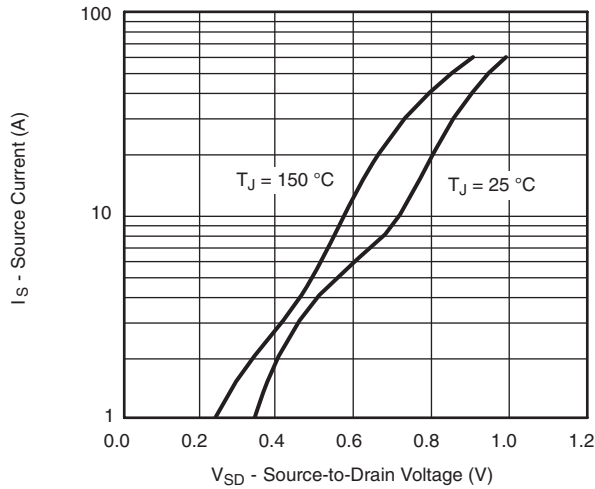
Normalized Thermal Transient Impedance, Junction-to-Ambient



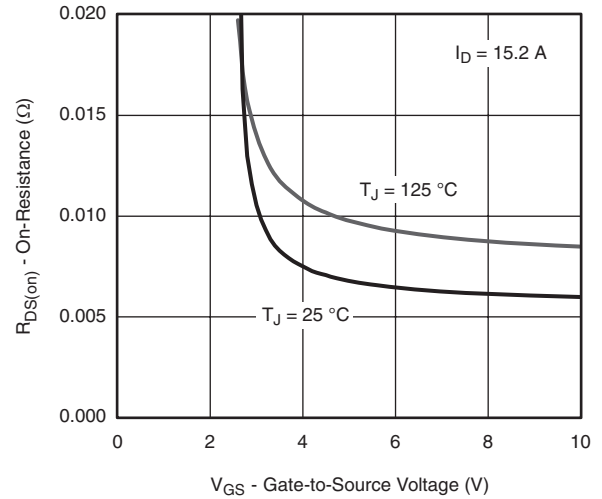
Normalized Thermal Transient Impedance, Junction-to-Foot

CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted**Output Characteristics****Transfer Characteristics****On-Resistance vs. Drain Current****Capacitance****Gate Charge****On-Resistance vs. Junction Temperature**

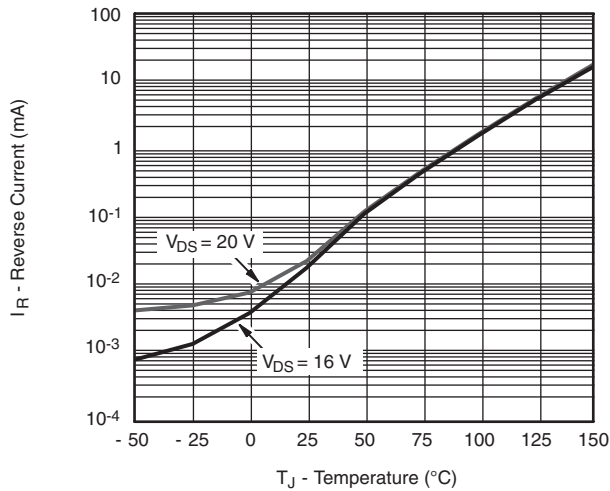
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



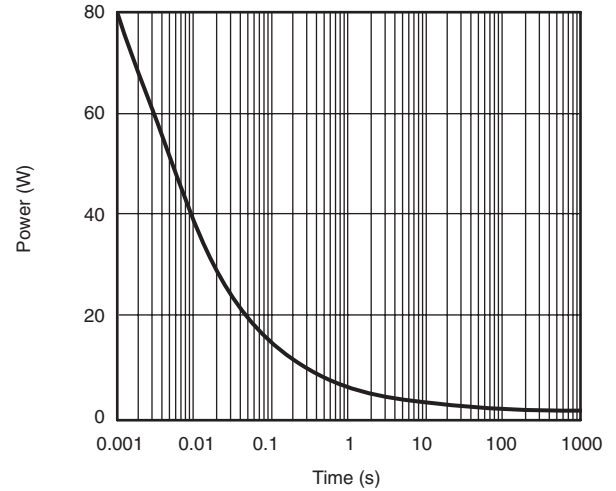
Source-Drain Diode Forward Voltage



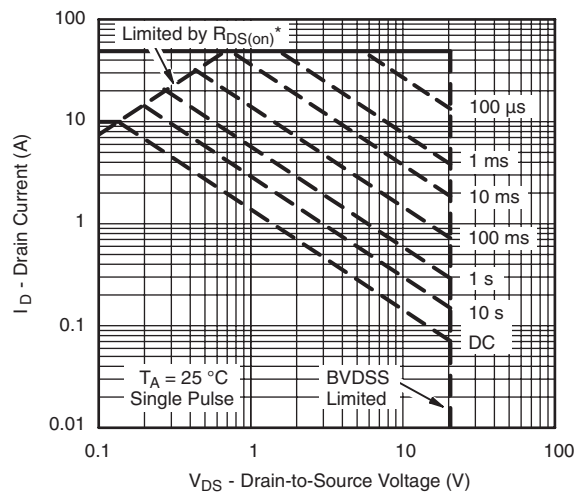
On-Resistance vs. Gate-to-Source Voltage



Reverse Current vs. Junction Temperature

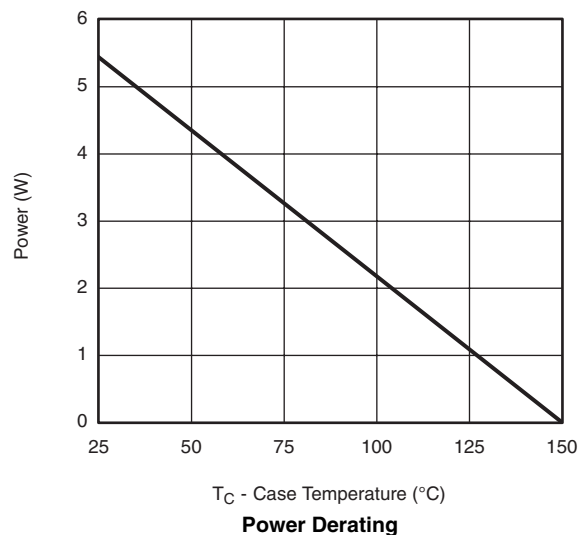
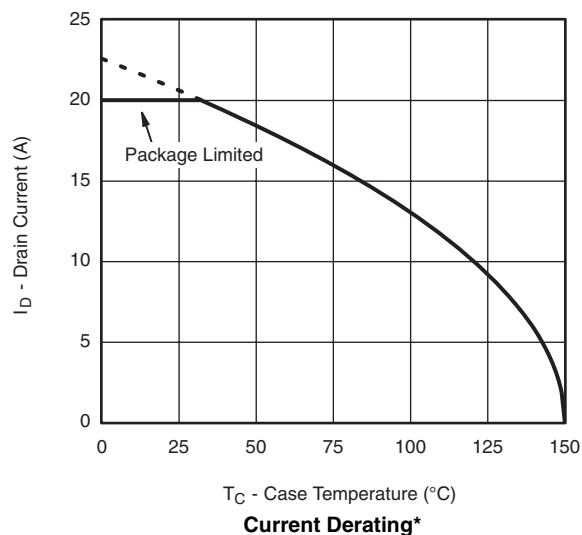


Single Pulse Power



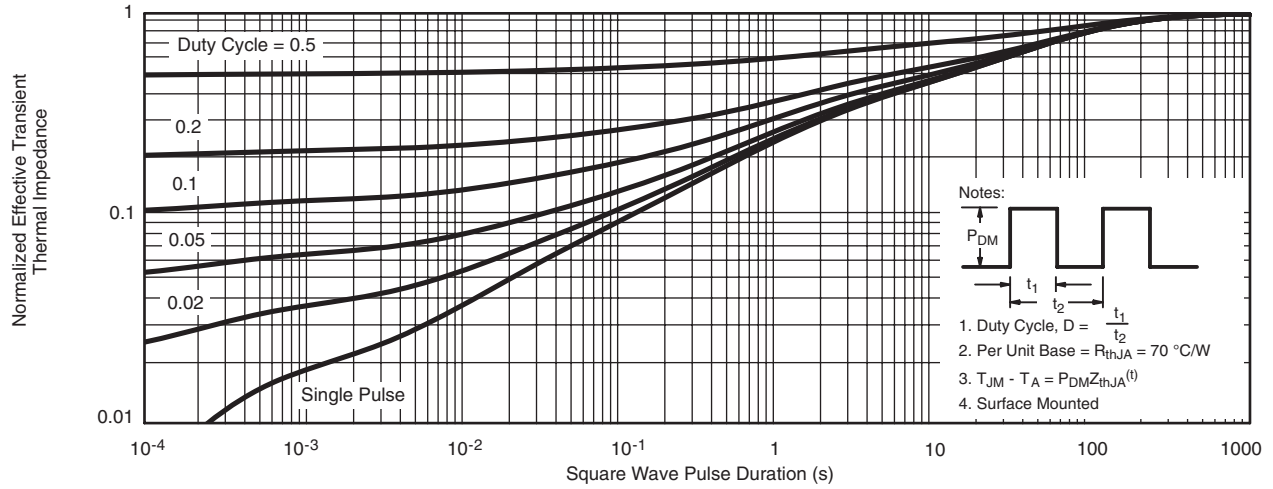
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

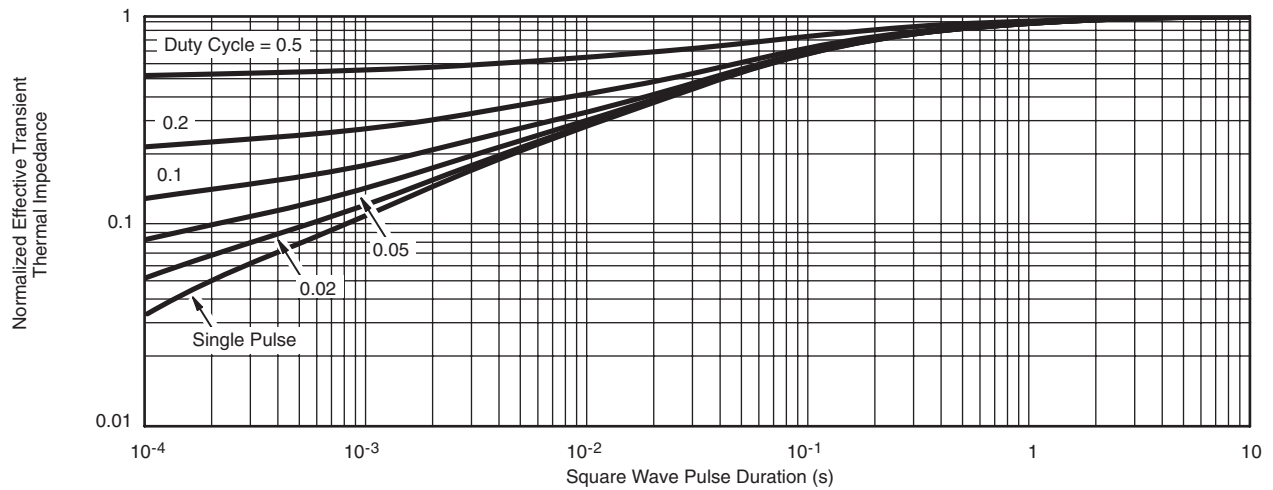
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient

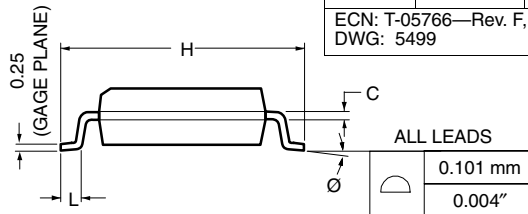
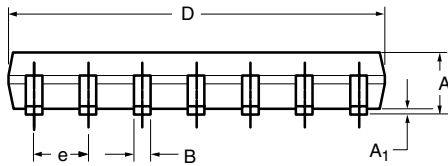
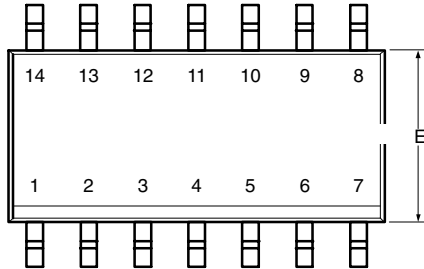


Normalized Thermal Transient Impedance, Junction-to-Foot

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?68398.



SOIC (NARROW): 14-LEAD



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A₁	0.10	0.20	0.004	0.008
B	0.38	0.51	0.015	0.020
C	0.18	0.23	0.007	0.009
D	8.55	8.75	0.336	0.344
E	3.8	4.00	0.149	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
L	0.50	0.93	0.020	0.037
Ø	0°	8°	0°	8°

ECN: T-05766—Rev. F, 19-Sep-05
DWG: 5499



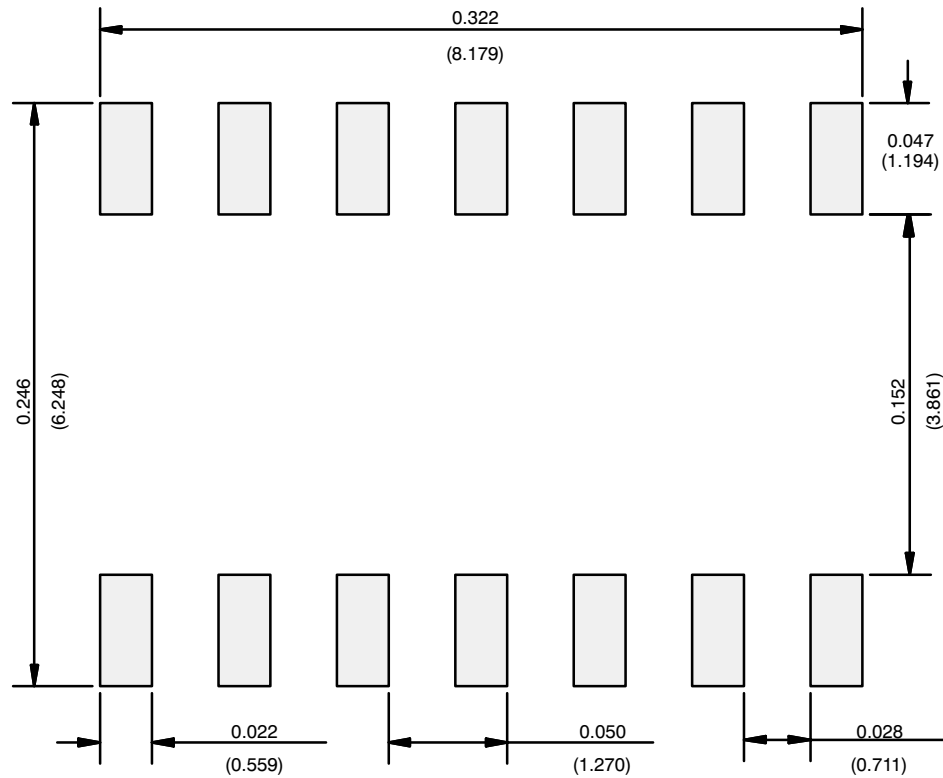
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RECOMMENDED MINIMUM PADS FOR SO-14



Recommended Minimum Pads
Dimensions in Inches/(mm)

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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.