Dual N-Channel 30-V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY			
	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
Channel-1	30	0.011 at V_{GS} = 10 V	10
		0.016 at V_{GS} = 4.5 V	8.2
Channel-2		0.0085 at V_{GS} = 10 V	14
		0.0095 at V_{GS} = 4.5 V	13

SCHOTTKY PRODUCT SUMMARY		
V_{DS} (V)	V_{SD} (V) Diode Forward Voltage	I_F (A)
30	0.53 V at 3 A	2

FEATURES

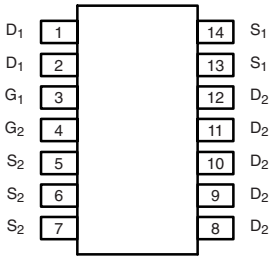
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

APPLICATIONS

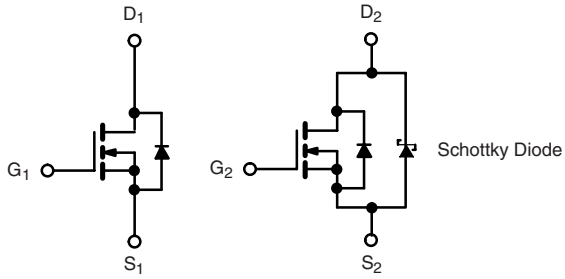
- DC/DC Converters
  - Game Stations
  - Video Equipment

SO-14



Top View

Ordering Information: Si4310BDY-T1-E3 (Lead (Pb)-free)
Si4310BDY-T1-GE3 (Lead (Pb)-free and Halogen-free)



ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted								
			Channel-1		Channel-2		
Parameter		Symbol	10 s	Steady State	10 s	Steady State	Unit
Drain-Source Voltage		V_{DS}	30				V
Gate-Source Voltage		V_{GS}	± 20		± 20		
Continuous Drain Current (T_J = 150 °C)[a]	T_A = 25 °C	I_D	10	7.5	14	9.8	A
	T_A = 70 °C		8	6	11	7.8	
Pulsed Drain Current		I_{DM}	40		50		
Continuous Source Current (Diode Conduction)[a]		I_S	1.8	1.04	2.73	1.33	
Maximum Power Dissipation[a]	T_A = 25 °C	P_D	2	1.14	3.0	1.47	W
	T_A = 70 °C		1.28	0.73	1.9	0.94	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150				°C

THERMAL RESISTANCE RATINGS									
			Channel-1		Channel-2		Schottky		
Parameter		Symbol	Typ.	Max.	Typ.	Max.	Typ.	Max.	Unit
Maximum Junction-to-Ambient[a]	t ≤ 10 s	R_{thJA}	53	62.5	34	35	40	48	°C/W
	Steady State		92	110	70	72	76	93	
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	35	42	17	24	21	26	

Notes:
a. Surface Mounted on 1" x 1" FR4 board.

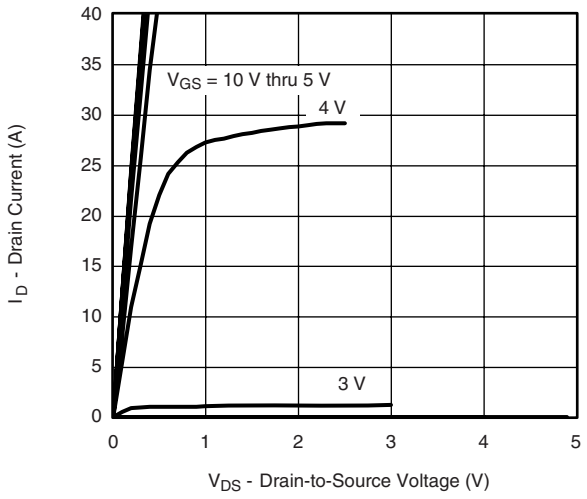
MOSFET SPECIFICATIONS T_J = 25 °C, unless otherwise noted							
Parameter	**Symbol**	**Test Conditions**		**Min.**	**Typ.[a]**	**Max.**	**Unit**
Static							
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	Ch-1	1.0		3.0	V
			Ch-2	1.0		3.0	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V	Ch-1			100	nA
			Ch-2			100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V	Ch-1			1	µA
			Ch-2			100	
		V_{DS} = 30 V, V_{GS} = 0 V, T_J = 85 °C	Ch-1			15	
			Ch-2			4000	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	Ch-1	20			A
			Ch-2	30			
Drain-Source On-State Resistance[b]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 10 A	Ch-1		0.009	0.011	Ω
		V_{GS} = 10 V, I_D = 14 A	Ch-2		0.0065	0.0085	
		V_{GS} = 4.5 V, I_D = 8.2 A	Ch-1		0.013	0.016	
		V_{GS} = 4.5 V, I_D = 13 A	Ch-2		0.0075	0.0095	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 10 A	Ch-1		30		S
		V_{DS} = 15 V, I_D = 14 A	Ch-2		60		
Diode Forward Voltage[b]	V_{SD}	I_S = 1.8 V, V_{GS} = 0 V	Ch-1		0.76	1.1	V
		I_S = 2.73 V, V_{GS} = 0 V	Ch-2		0.485	0.53	
Dynamic[a]							
Input Capacitance	C_{iss}	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz	Ch-1	790	1580	2370	pF
			Ch-2	1530	3060	4590	
Output Capacitance	C_{oss}		Ch-1	145	290	435	
			Ch-2	300	600	900	
Reverse Transfer Capacitance	C_{rss}		Ch-1	70	140	210	
			Ch-2	115	225	340	
Total Gate Charge	Q_g	Channel-1 V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 10 A Channel-2 V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 14 A	Ch-1		12	18	nC
			Ch-2		19	30	
Gate-Source Charge	Q_{gs}		Ch-1		5.3		
			Ch-2		10		
Gate-Drain Charge	Q_{gd}		Ch-1		4.3		
			Ch-2		5		
Gate Resistance	R_g	f = 1 MHz	Ch-1	0.90	1.8	2.7	Ω
			Ch-2	0.3	0.95	1.4	
Turn-On Delay Time	$t_{d(on)}$	Channel-1 V_{DD} = 15 V, R_L = 15 Ω $I_D \cong$ 1 A, V_{GEN} = 10 V, R_g = 6 Ω Channel-2 V_{DD} = 15 V, R_L = 15 Ω $I_D \cong$ 1 A, V_{GEN} = 10 V, R_g = 6 Ω	Ch-1		13	20	ns
			Ch-2		17	26	
Rise Time	t_r		Ch-1		10	15	
			Ch-2		12	20	
Turn-Off Delay Time	$t_{d(off)}$		Ch-1		33	50	
			Ch-2		53	80	
Fall Time	t_f		Ch-1		10	15	
			Ch-2		17	26	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 1.8 A, dI/dt = 100 A/µs	Ch-1		25	40	
		I_F = 2.73 V, dI/dt = 100 A/µs	Ch-2		31	50	

Notes:
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

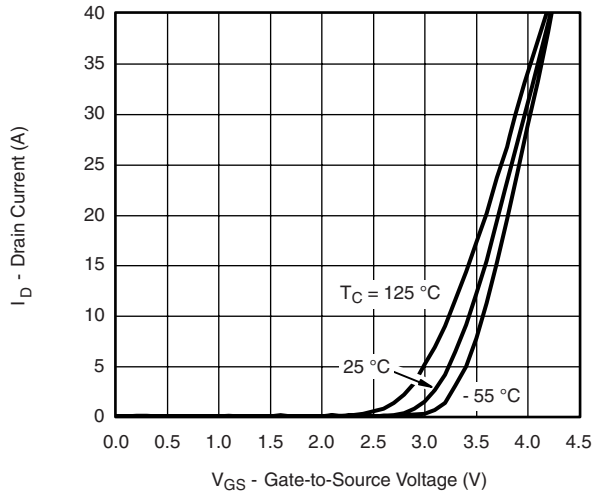
SCHOTTKY SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Forward voltage Drop	V_F	I_F = 3 A		0.485	0.53	V
		I_F = 3 A, T_J = 125 °C		0.42	0.42	
Maximum Reverse Leakage Current	I_{rm}	V_R = 30 V		0.008	0.100	mA
		V_R = 30 V, T_J = 75 °C		0.4	5	
		V_R = 30 V, T_J = 125 °C		0.5	20	
Junction Capacitance	C_T	V_R = 15 V		102		pF

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.

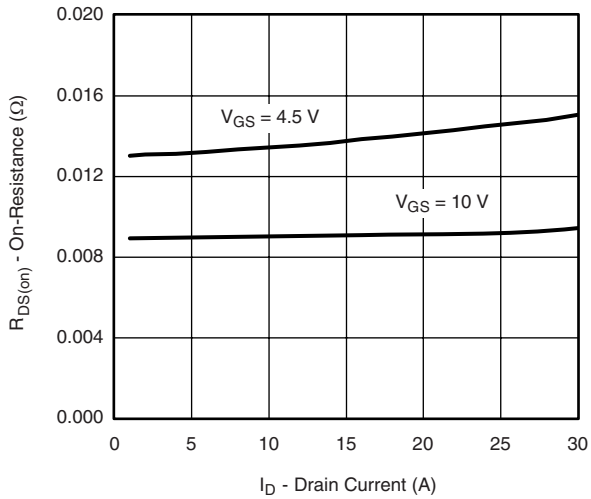
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



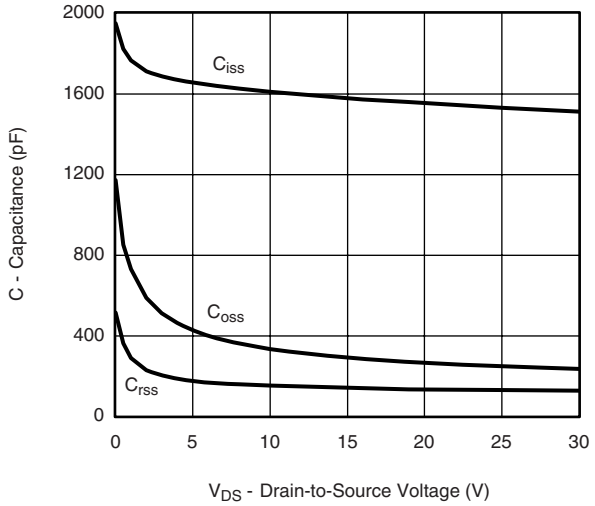
Output Characteristics



Transfer Characteristics

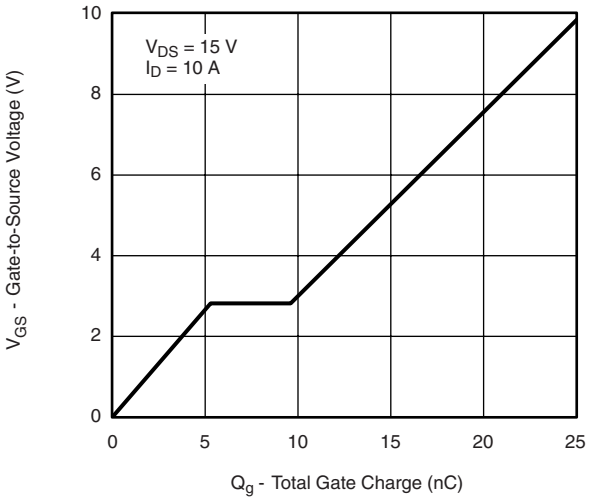


On-Resistance vs. Drain Current

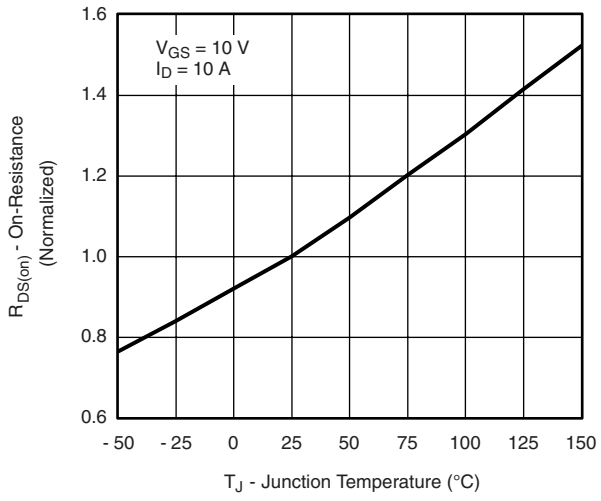


Capacitance

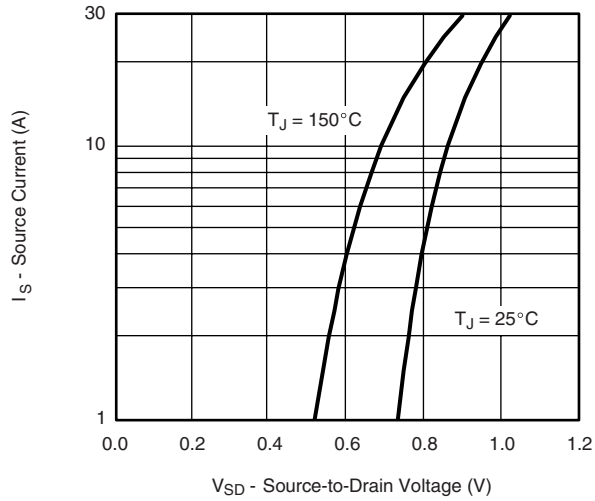
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



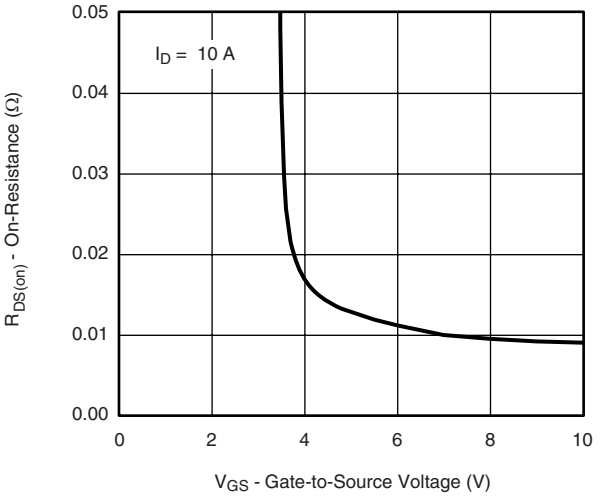
Gate Charge



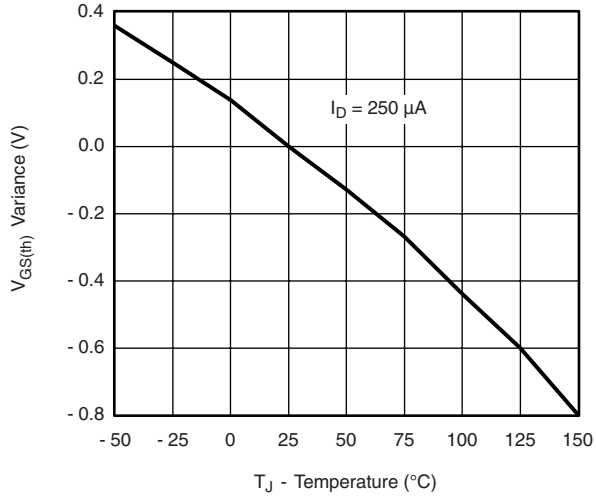
On-Resistance vs. Junction Temperature



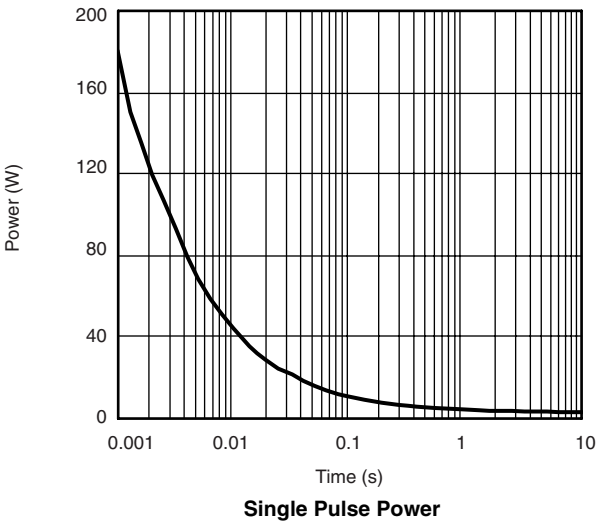
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

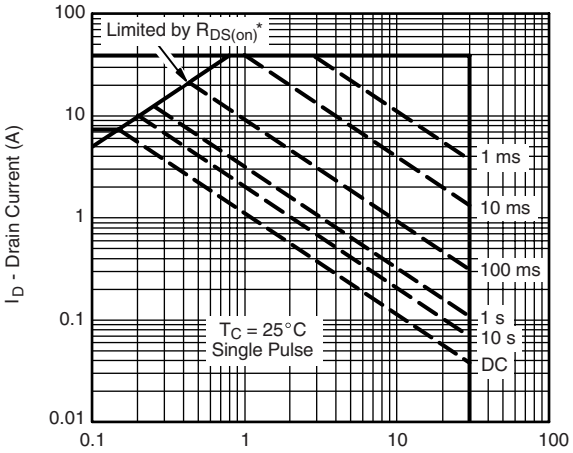


Threshold Voltage



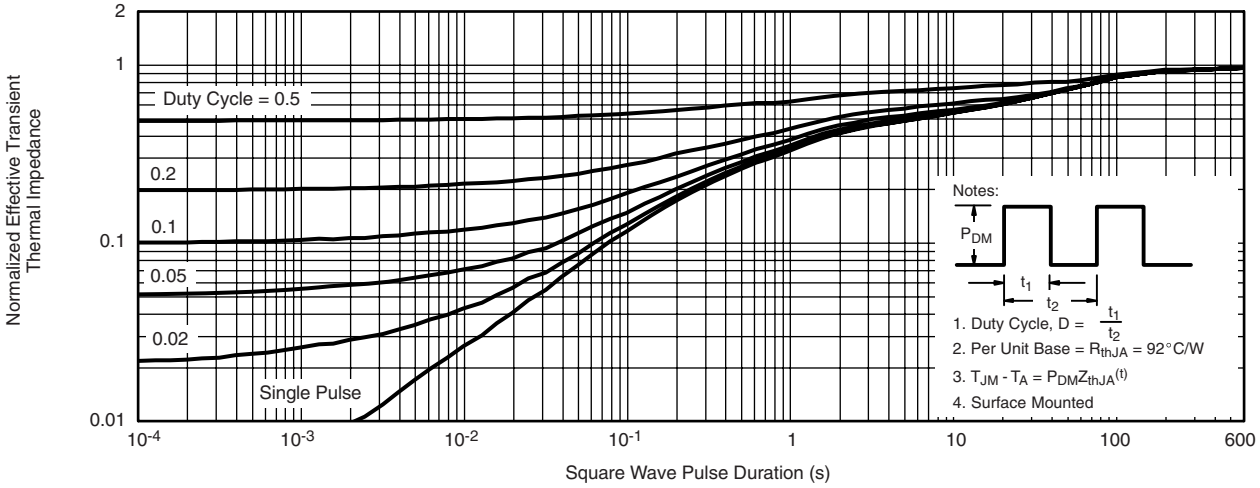
Single Pulse Power

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

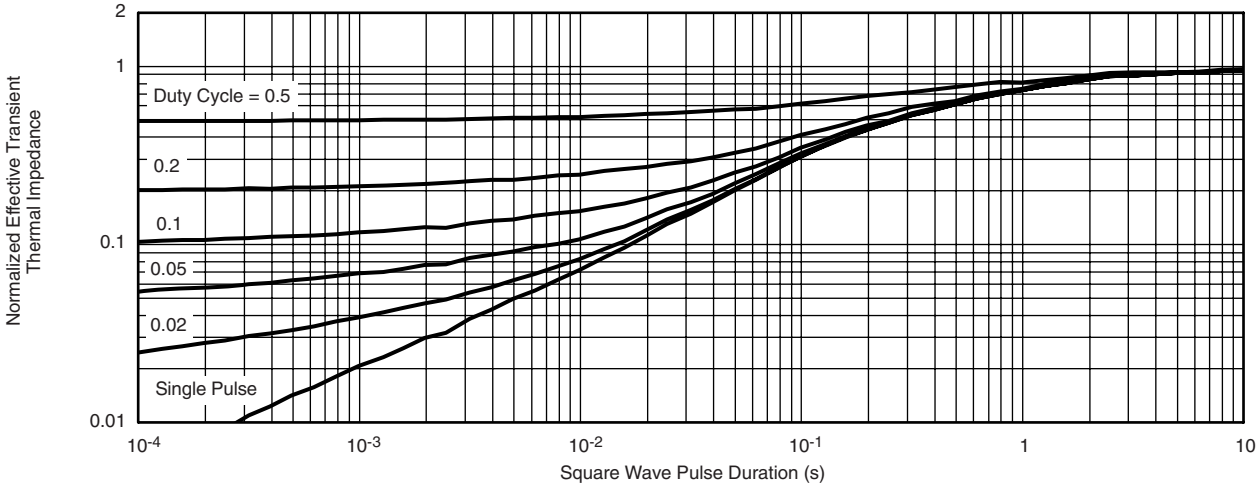


* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

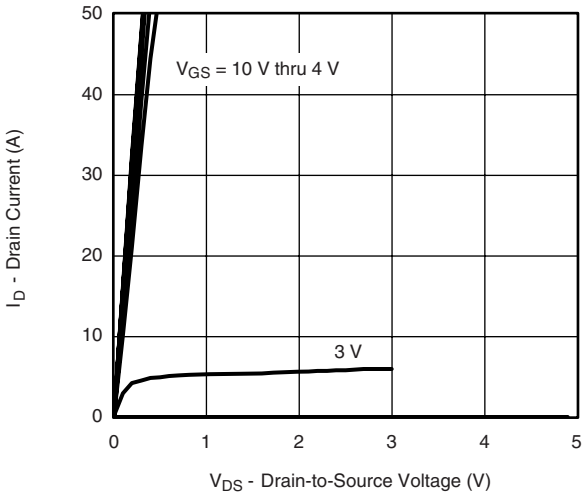


Normalized Thermal Transient Impedance, Junction-to-Ambient

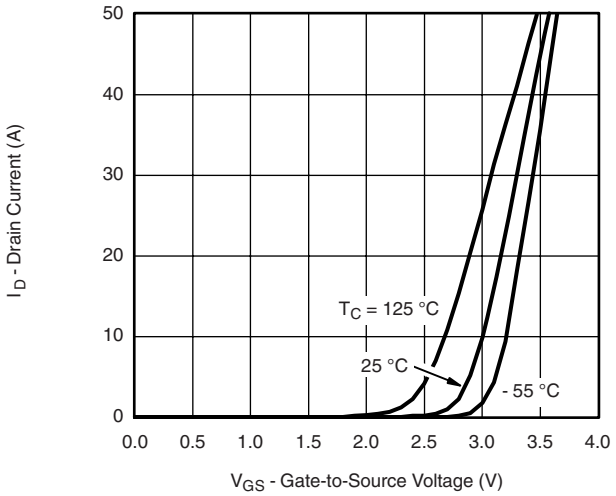


Normalized Thermal Transient Impedance, Junction-to-Foot

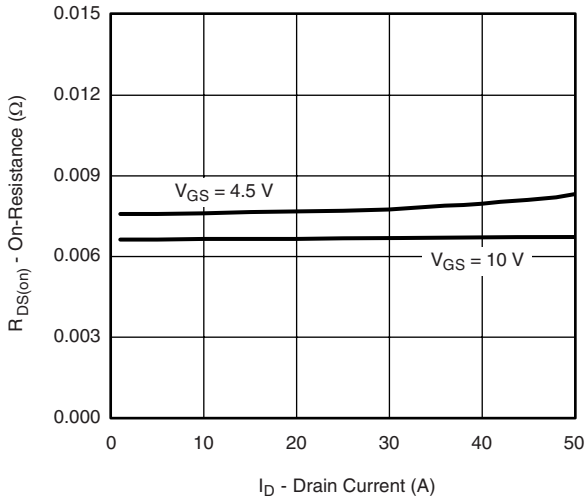
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



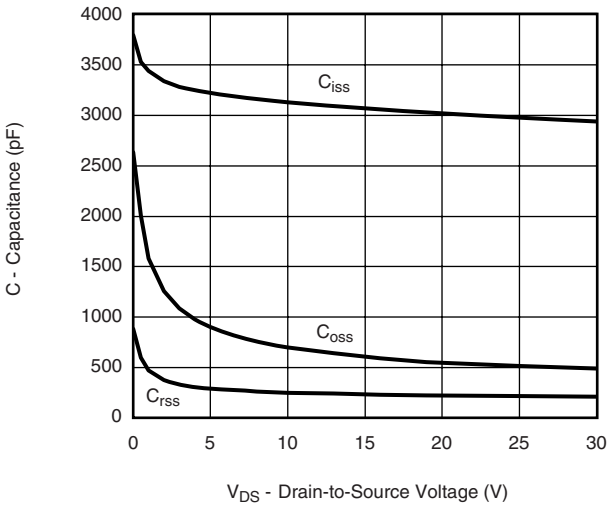
Output Characteristics



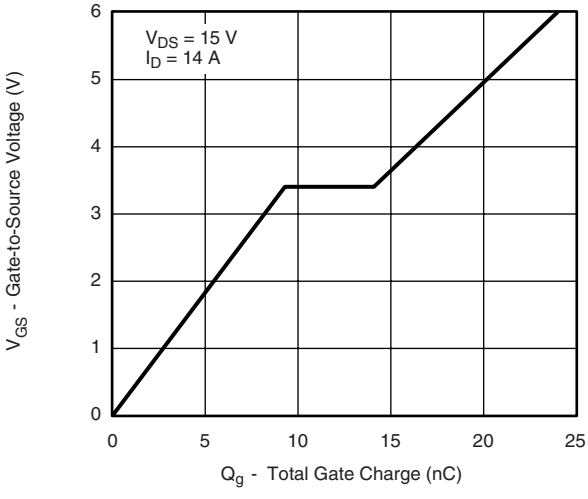
Transfer Characteristics



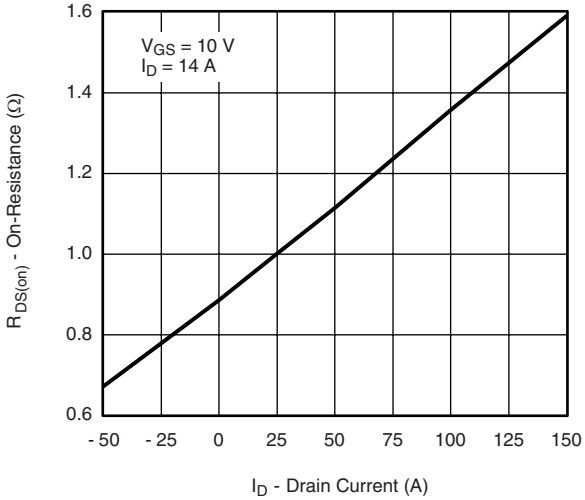
On-Resistance vs. Drain Current



Capacitance

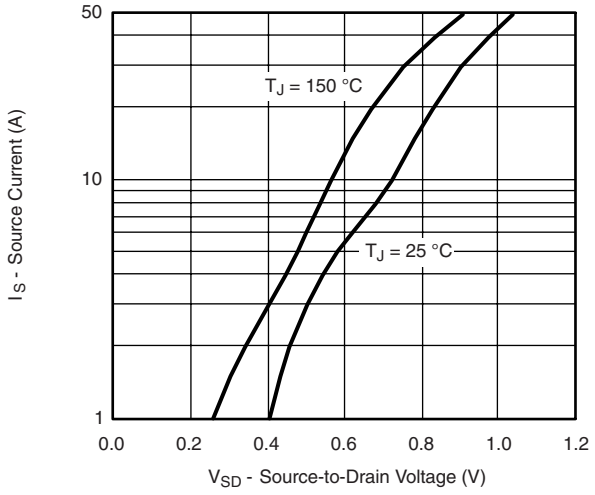


Gate Charge

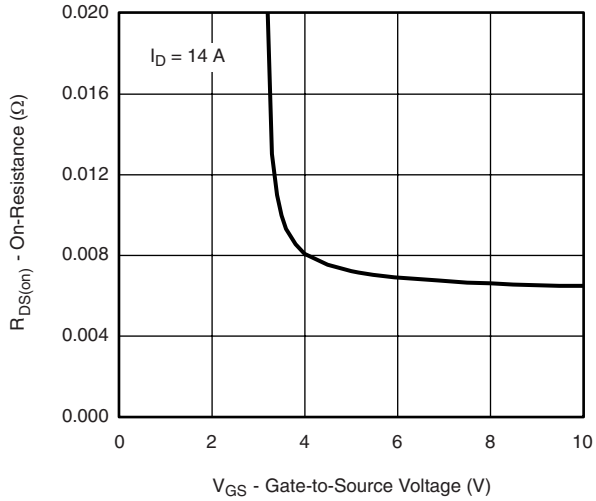


On-Resistance vs. Junction Temperature

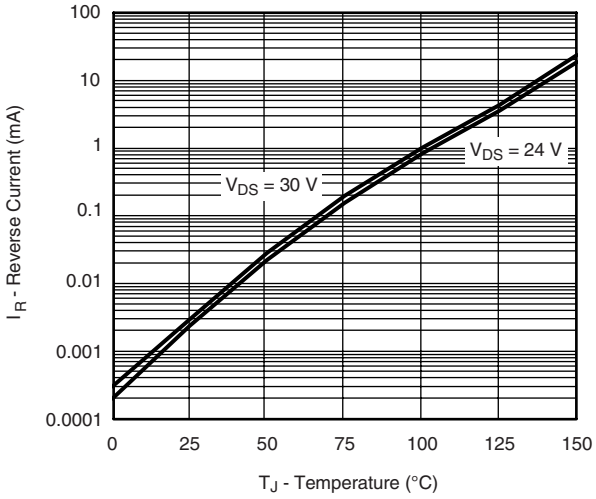
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



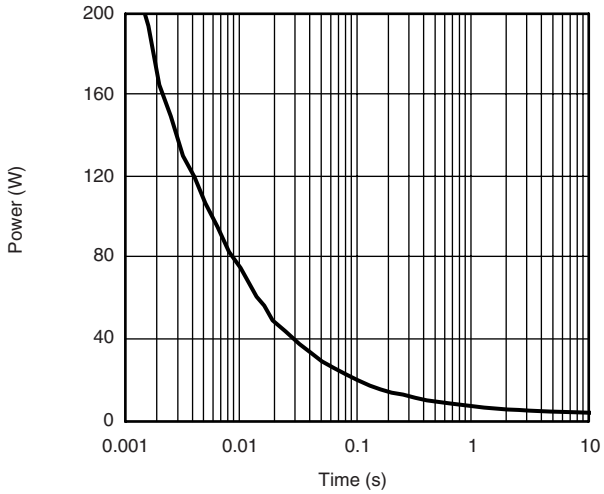
Source-Drain Diode Forward Voltage



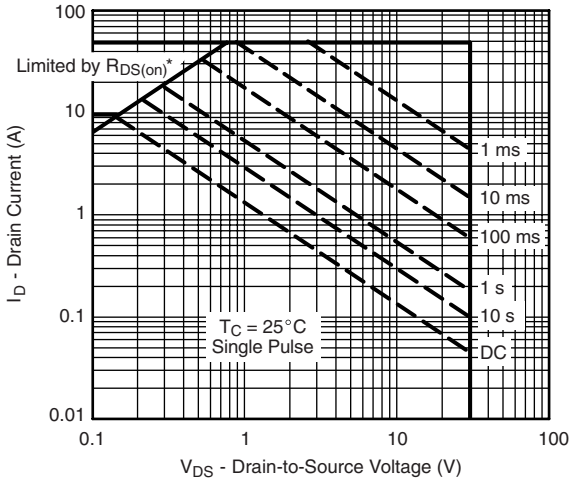
On-Resistance vs. Gate-to-Source Voltage



Reverse Current vs. Junction Temperature



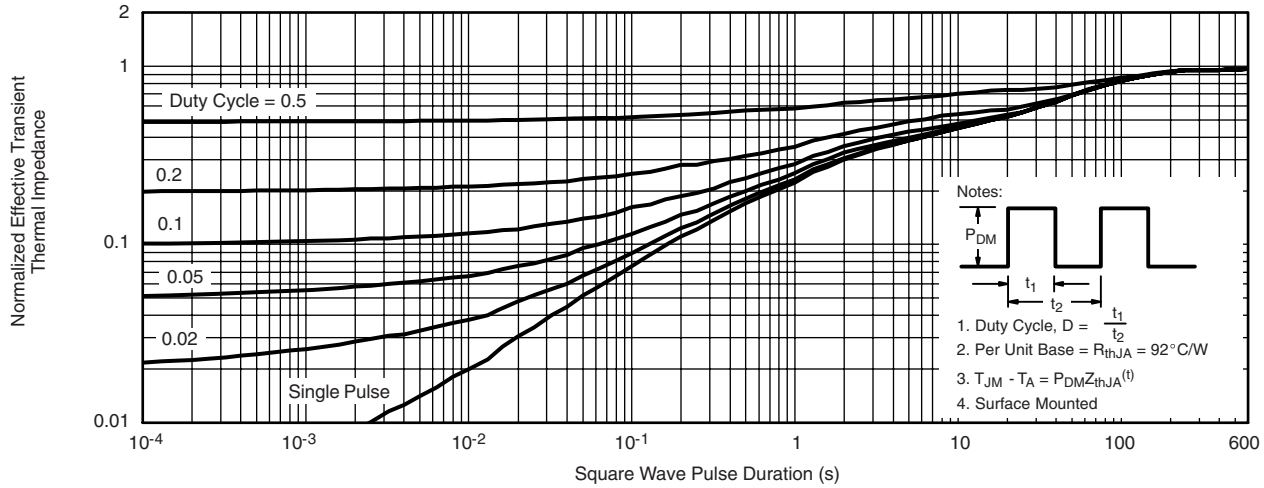
Single Pulse Power



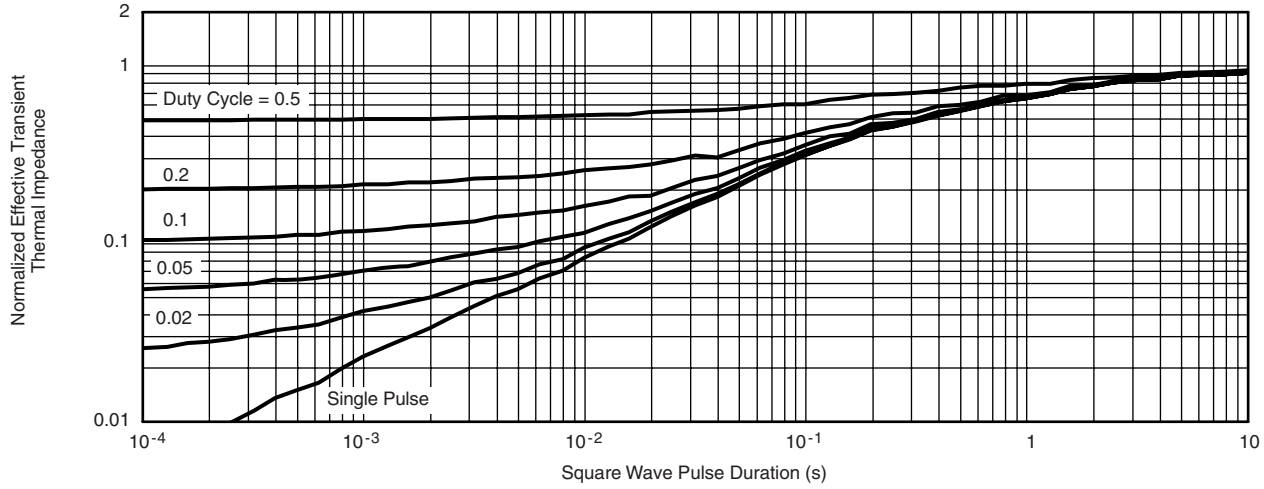
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

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

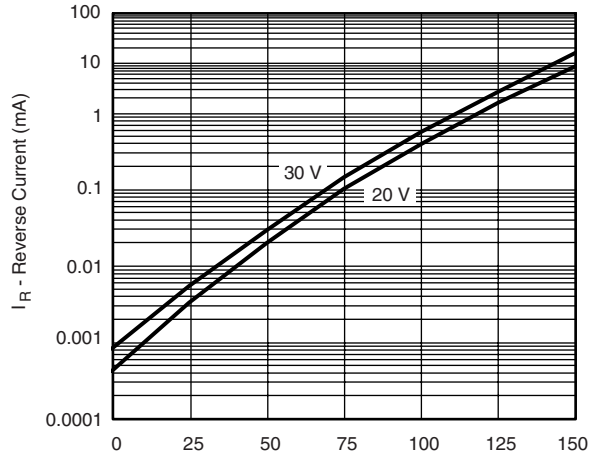


Normalized Thermal Transient Impedance, Junction-to-Ambient

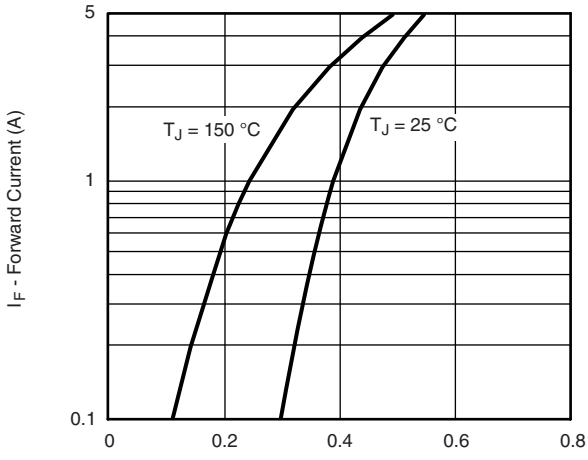


Normalized Thermal Transient Impedance, Junction-to-Foot

SCHOTTKY TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

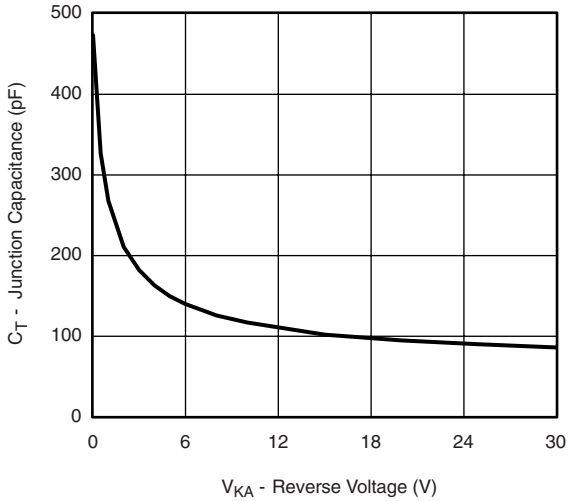


Reverse Current vs. Junction Temperature

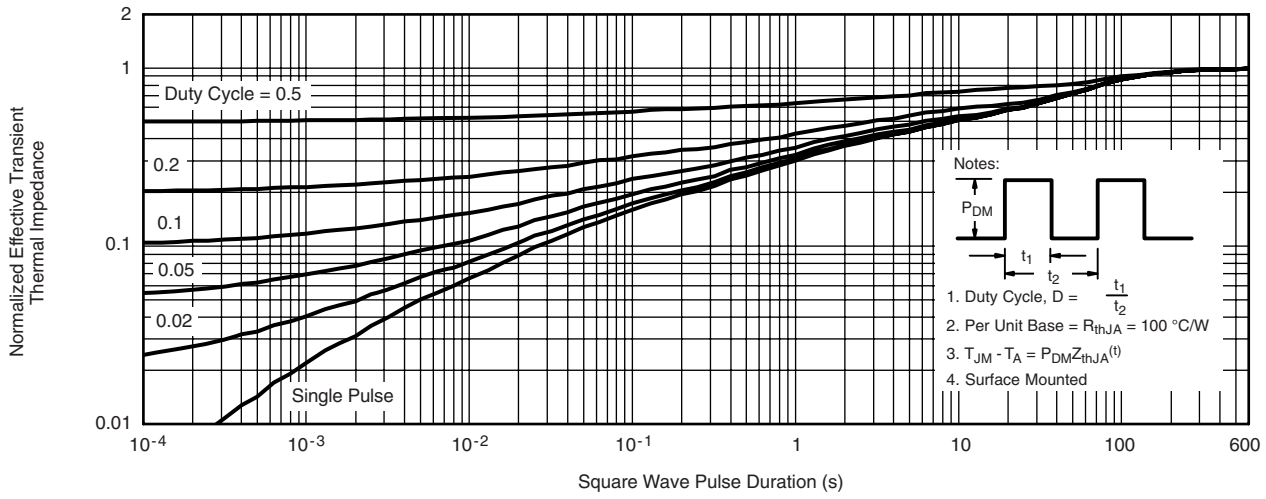


Forward Voltage Drop

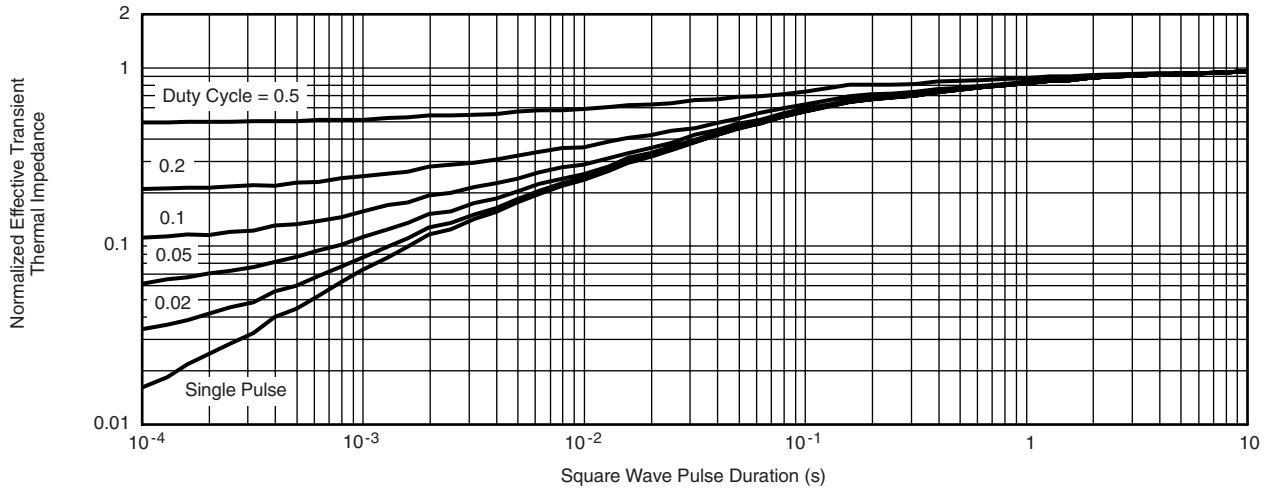
SCHOTTKY TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Capacitance



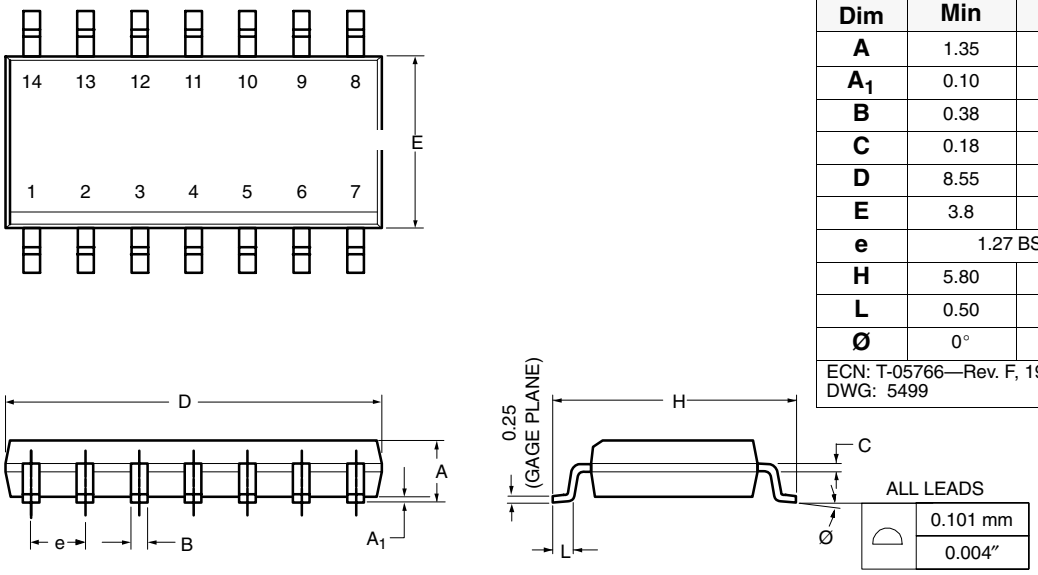
Normalized Thermal Transient Impedance, Junction-to-Ambient



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?73064.

SOIC (NARROW): 14-LEAD



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A_1	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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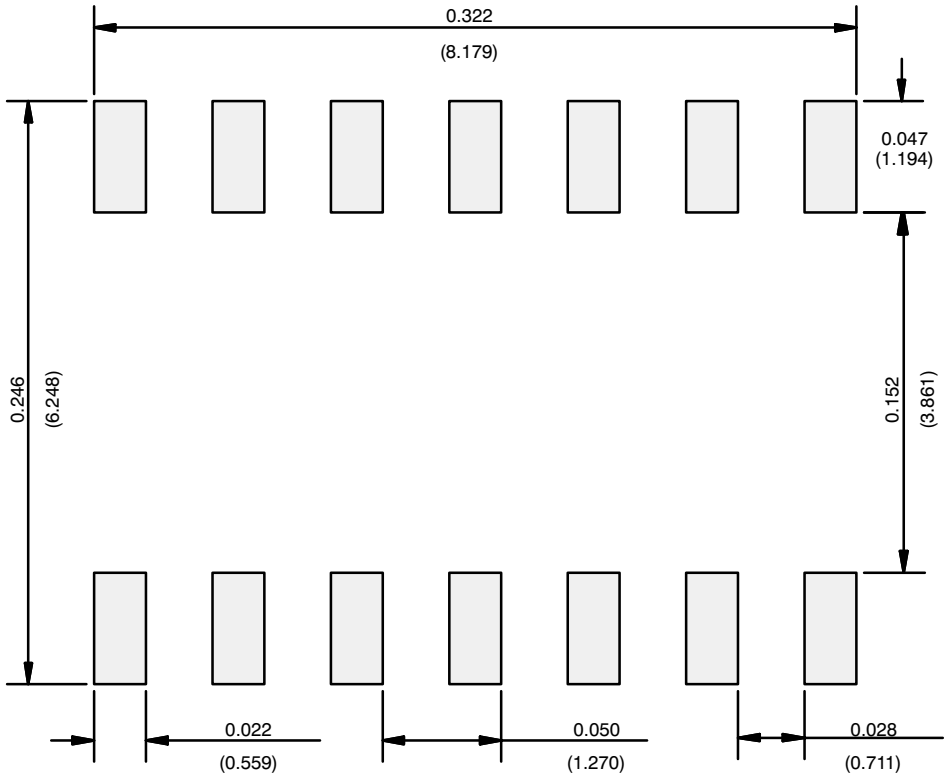
RECOMMENDED MINIMUM PADS FOR SO-14



Recommended Minimum Pads
Dimensions in Inches/(mm)

Return to Index

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