



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

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
30	0.0115 at $V_{GS} = 10$ V	12 ^e	13.7 nC
	0.0145 at $V_{GS} = 4.5$ V	12 ^e	

FEATURES

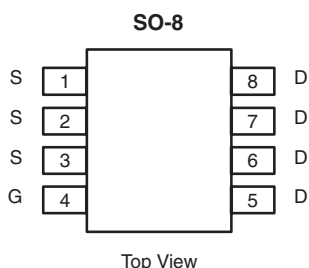
- Halogen-free According to IEC 61249-2-21 Definition
- SkyFET[®] Monolithic TrenchFET[®] Power MOSFET and Schottky Diode
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC



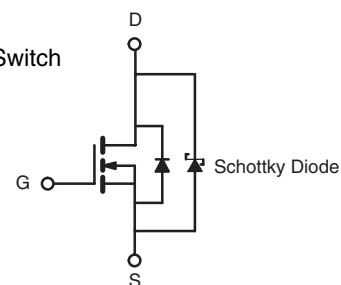
RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Notebook PC
- System Power
- Buck Converter
- Synchronous Rectifier Switch



Ordering Information: Si4646DY-T1-E3 (Lead (Pb)-free)
Si4646DY-T1-GE3 (Lead (Pb)-free and Halogen-free)



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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	A
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Pulsed Drain Current	I_{DM}	50	mJ
Continuous Source-Drain Diode Current	I_S	$T_C = 25$ °C	
		$T_A = 25$ °C	
Single Pulse Avalanche Current	I_{AS}	20	mJ
Single Pulse Avalanche Energy	E_{AS}	20	
Maximum Power Dissipation	P_D	$T_C = 25$ °C	W
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient ^{b, d}	$t \leq 10$ s	R_{thJA}	33	42	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	16	20	

Notes:

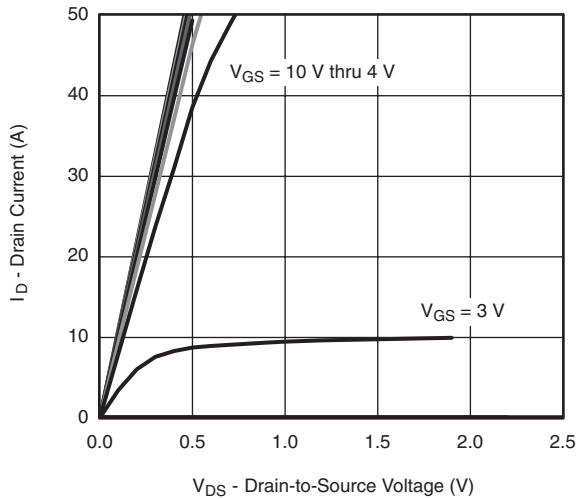
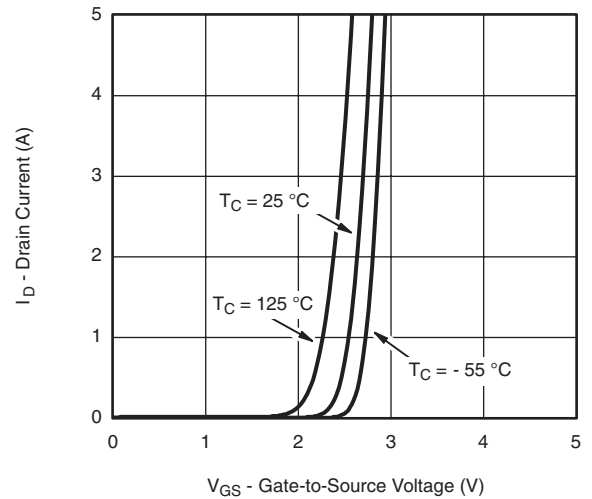
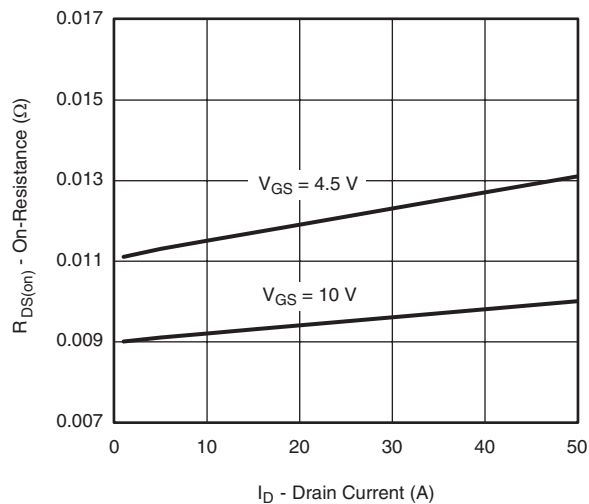
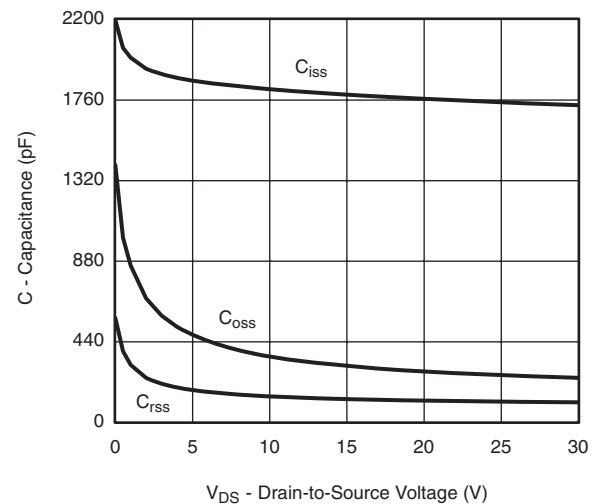
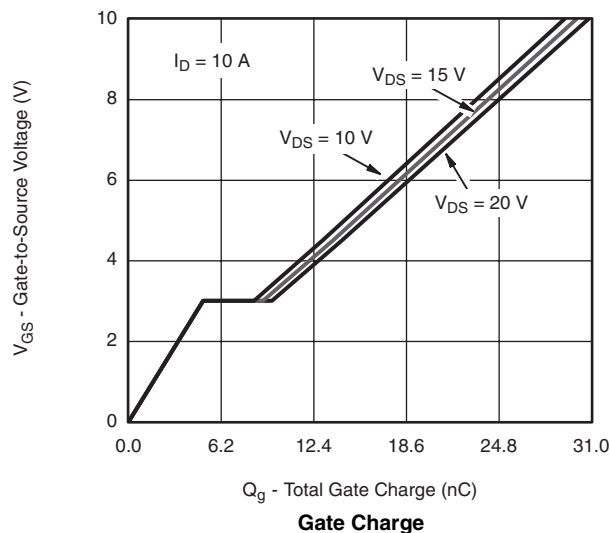
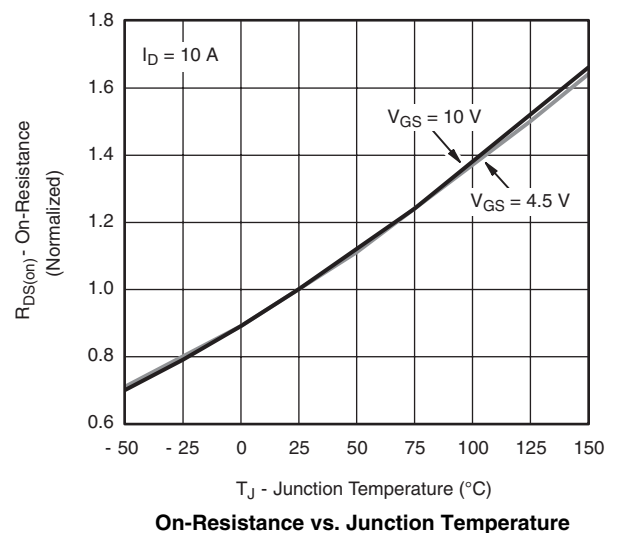
- Based on $T_C = 25$ °C.
- Surface Mounted on 1" x 1" FR4 board.
- $t = 10$ s.
- Maximum under Steady State conditions is 90 °C/W.
- Package limited.

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 = 1 mA	30			V
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 1 mA	1.2		2.5	
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 30 V, V _{GS} = 0 V		0.035	0.2	mA
		V _{DS} = 30 V, V _{GS} = 0 V, T _J = 100 °C		3.5	35	
On -State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	20			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 10 A		0.0092	0.0115	Ω
		V _{GS} = 4.5 V, I _D = 7 A		0.0115	0.0145	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 10 A		38		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 15 V, V _{GS} = 0 V, f = 1 MHz		1790		pF
Output Capacitance	C _{oss}			310		
Reverse Transfer Capacitance	C _{rss}			130		
Total Gate Charge	Q _g	V _{DS} = 15 V, V _{GS} = 10 V, I _D = 10 A		30	45	nC
		V _{DS} = 15 V, V _{GS} = 4.5 V, I _D = 10 A		13.7	21	
Gate-Source Charge	Q _{gs}			5		
Gate-Drain Charge	Q _{gd}			4		
Gate Resistance	R _g	f = 1 MHz	0.3	1.2	2.4	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω		23	45	ns
Rise Time	t _r			13	25	
Turn-Off Delay Time	t _{d(off)}			29	55	
Fall Time	t _f			12	24	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω		11	22	
Rise Time	t _r			10	20	
Turn-Off Delay Time	t _{d(off)}			22	45	
Fall Time	t _f			8	16	
Drain-Source Body Diode and Schottky Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			5.6	A
Pulse Diode Forward Current ^a	I _{SM}				50	
Body Diode Voltage	V _{SD}	I _S = 2 A		0.53	0.7	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 10 A, dI/dt = 100 A/μs, T _J = 25 °C		17	30	ns
Body Diode Reverse Recovery Charge	Q _{rr}			5.5	10	nC
Reverse Recovery Fall Time	t _a			8		ns
Reverse Recovery Rise Time	t _b			9		

Notes:

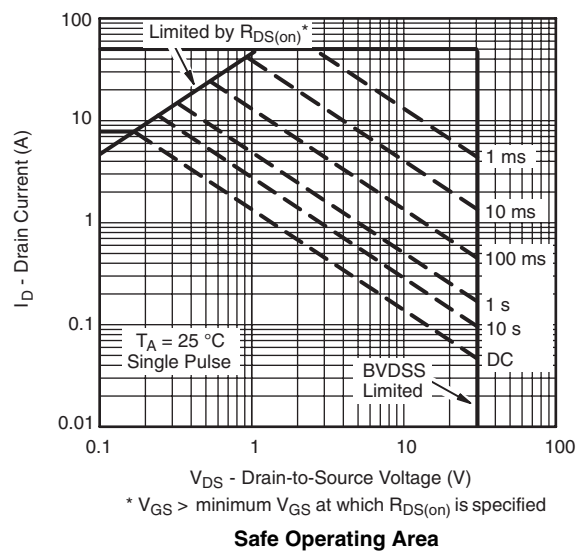
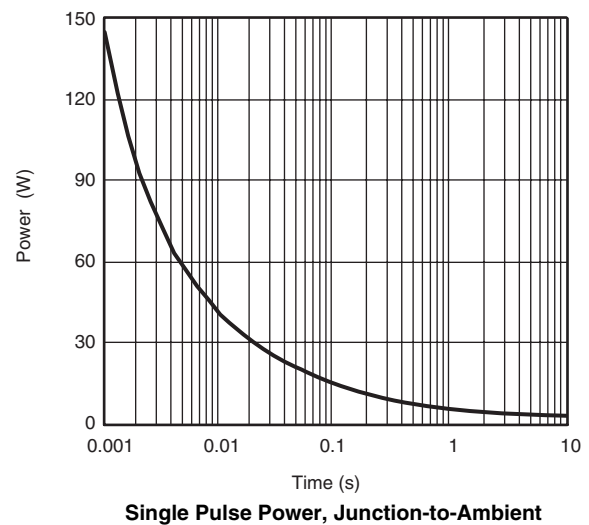
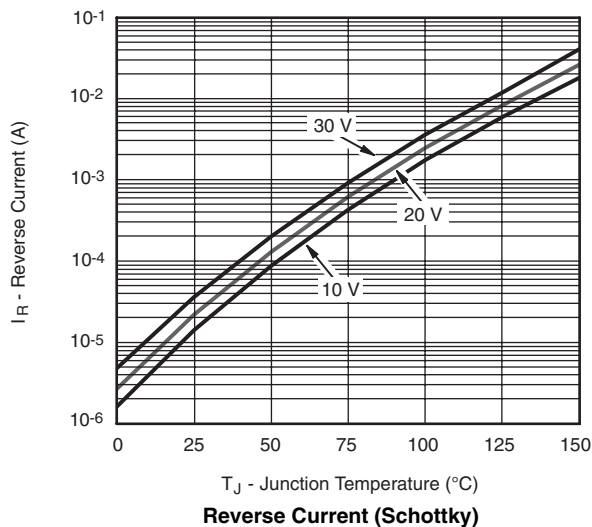
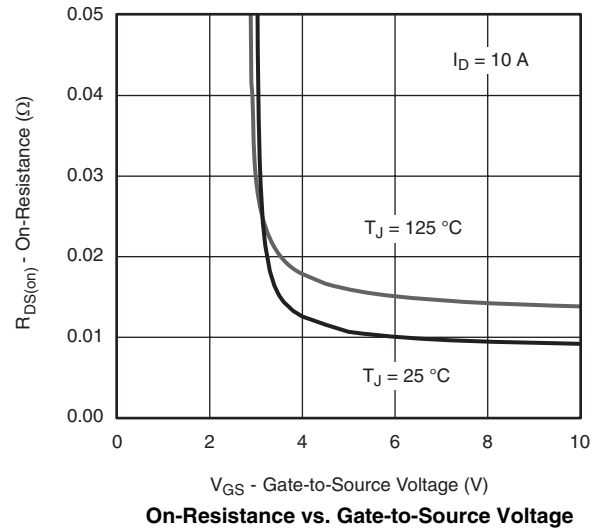
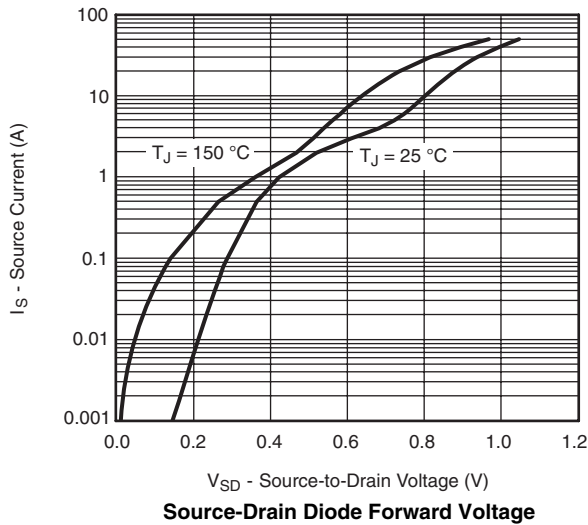
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

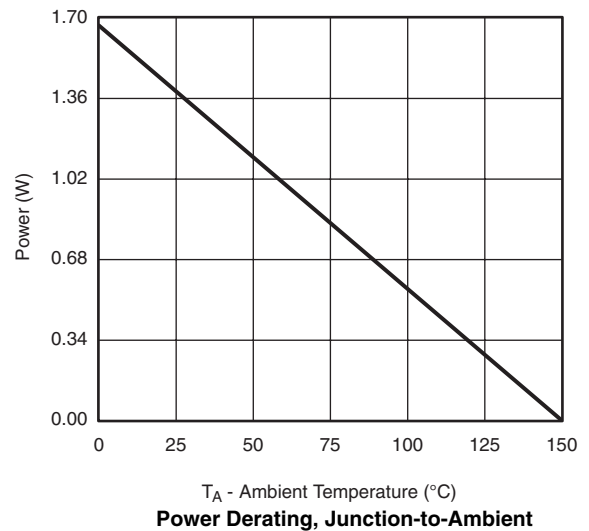
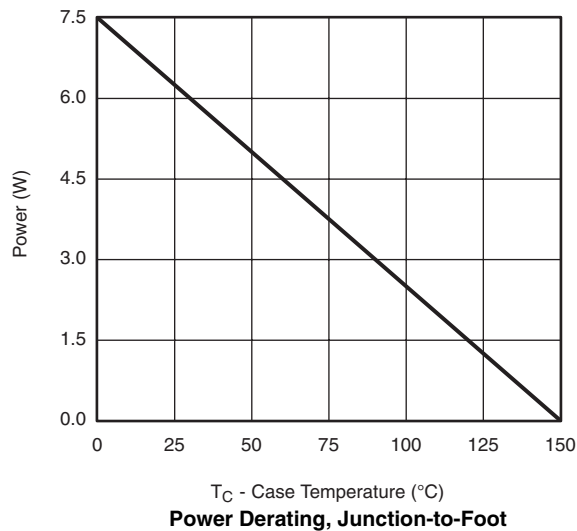
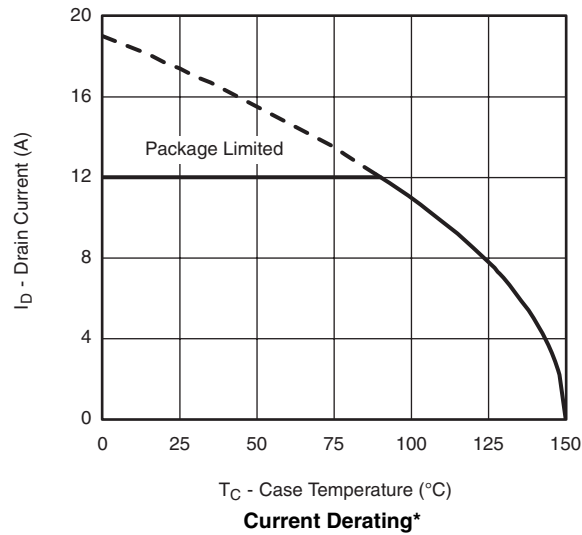
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature

Si4646DY

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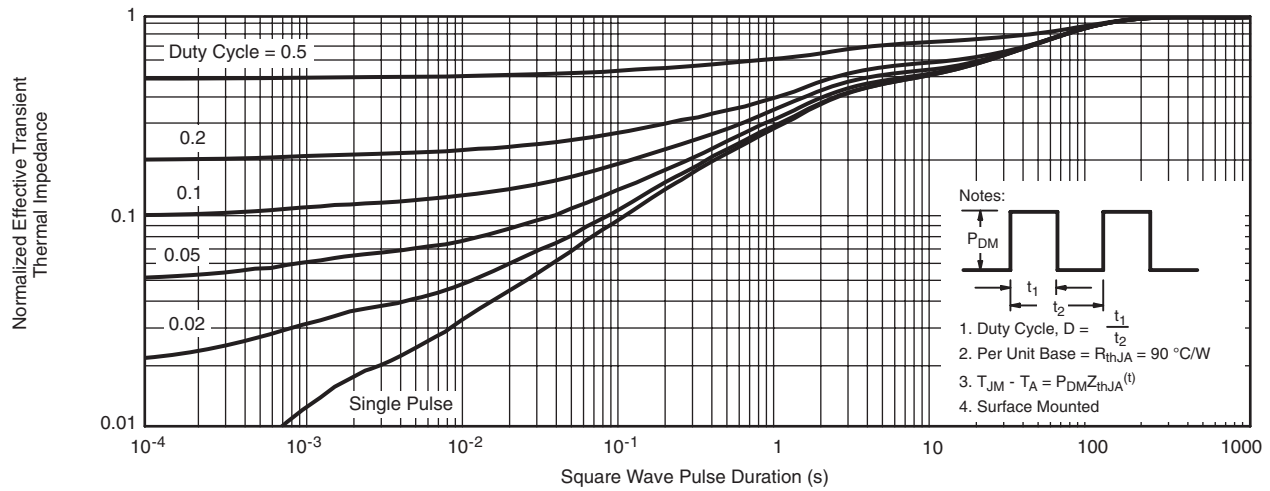
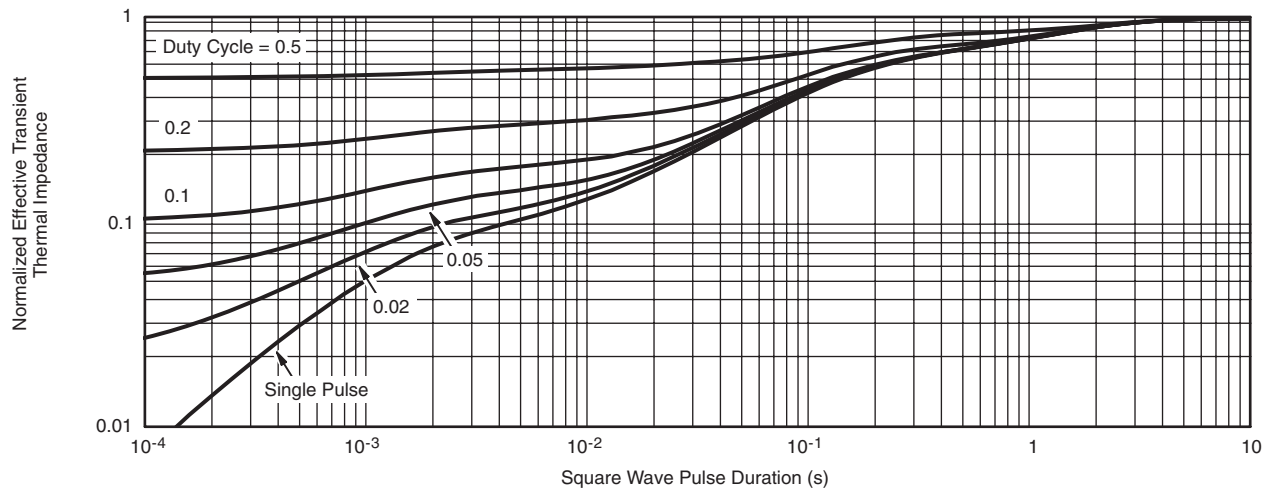
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified


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.

Si4646DY

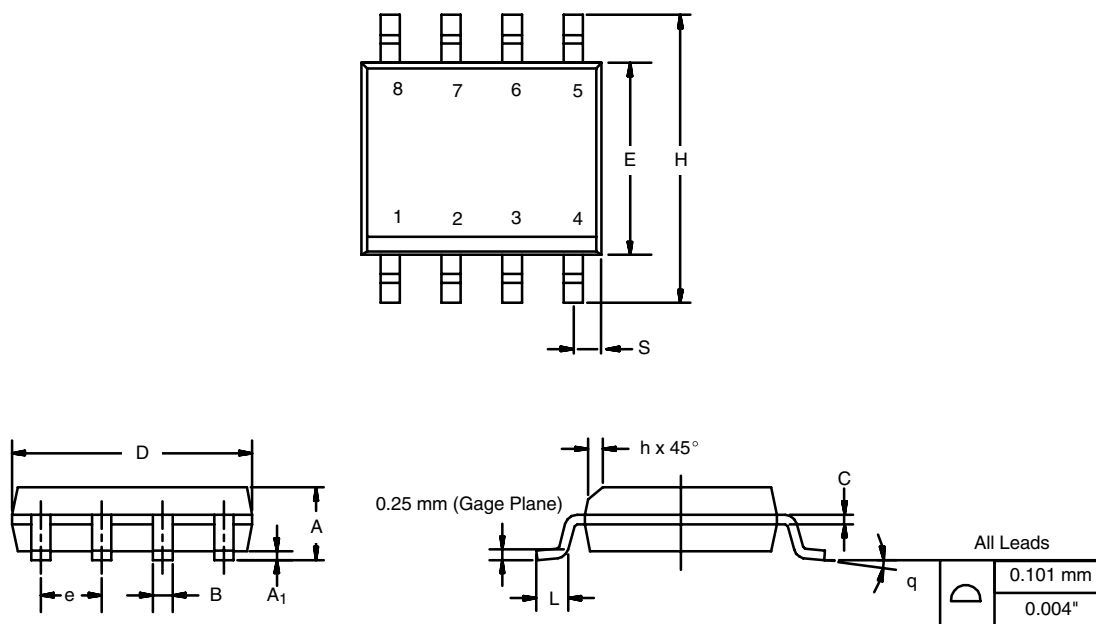
Vishay Siliconix

**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?68762.

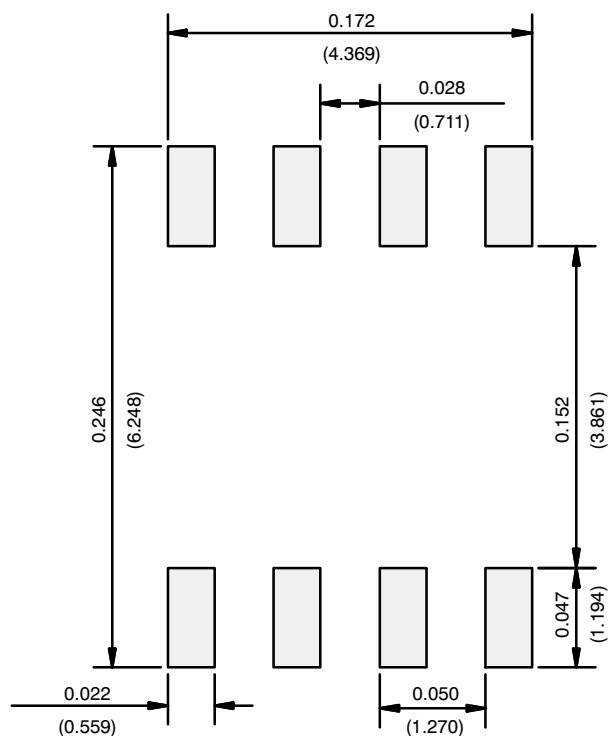
SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



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	0.35	0.51	0.014	0.020
C	0.19	0.25	0.0075	0.010
D	4.80	5.00	0.189	0.196
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.50	0.93	0.020	0.037
q	0°	8°	0°	8°
S	0.44	0.64	0.018	0.026
ECN: C-06527-Rev. I, 11-Sep-06				
DWG: 5498				

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

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