

RoHS

COMPLIANT HALOGEN

FREE

Vishay Siliconix

## N-Channel 30-V (D-S) MOSFET

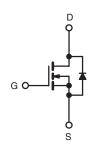
PRODUCT SUMMARY						
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)	Q <sub>g</sub> (Typ.)			
30	0.020 at V <sub>GS</sub> = 10 V	12 <sup>a</sup>	4.7 nC			
30	0.027 at V <sub>GS</sub> = 4.5 V	10.4	4.7 110			

### **FEATURES**

- Halogen-free According to IEC 61249-2-21
  Definition
- TrenchFET<sup>®</sup> Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested
- Compliant to RoHS Directive 2002/95/EC

### **APPLICATIONS**

- Load Switch
- Low Current dc-to-dc
- Notebook
- Notebook



N-Channel MOSFET

SO-8 D 8 S 1 2 7 S D 3 6 D S G 5 4 D Top View

Ordering Information: Si4176DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

Parameter		Symbol	Limit	Unit	
Drain-Source Voltage		V <sub>DS</sub>	30	V	
Gate-Source Voltage		V <sub>GS</sub>	± 20		
	T <sub>C</sub> = 25 °C		12 <sup>a</sup>		
Continuous Drain Current (T <sub>.1</sub> = 150 °C)	T <sub>C</sub> = 70 °C		9.7		
	T <sub>A</sub> = 25 °C	'D	8.3 <sup>b, c</sup>		
	T <sub>A</sub> = 70 °C		6.6 <sup>b, c</sup>	A	
Pulsed Drain Current		I <sub>DM</sub>	40	A	
Continuous Source-Drain Diode Current	T <sub>C</sub> = 25 °C	la	4.2		
Continuous Source-Drain Diode Current	T <sub>A</sub> = 25 °C	Is –	2 <sup>b, c</sup>		
Single Pulse Avalanche Current	L = 0.1 mH	I <sub>AS</sub>	10		
Single Pulse Avalanche Energy	Energy L = 0.1 mH		5	mJ	
	T <sub>C</sub> = 25 °C		5		
Maximum Bawar Dissinction	T <sub>C</sub> = 70 °C	P <sub>D</sub>	3.2	w	
Maximum Power Dissipation	T <sub>A</sub> = 25 °C	'D	2.4 <sup>b, c</sup>	vv	
	T <sub>A</sub> = 70 °C	1	1.5 <sup>b, c</sup>		
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C	

THERMAL RESISTANCE RATINGS							
Parameter		Symbol	Typical	Maximum	Unit		
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 10 s	R <sub>thJA</sub>	42	53	°C/W		
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	19	25	0/10		

Notes:

a. Package Limited.

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

c. t = 10 s.

d. Maximum under Steady State conditions is 85 °C/W.

# Si4176DY

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Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit	
Static	- 1						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 V, I_{D} = 250 \mu A$	30			V	
V <sub>DS</sub> Temperature Coefficient	$\Delta V_{DS}/T_{J}$	L _ 250 A		28		mV/°C	
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I <sub>D</sub> = 250 μA		- 5.5			
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}$ , $I_D = 250 \ \mu A$	1.2		2.2	V	
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 V, V_{GS} = \pm 20 V$			± 100	nA	
	I <sub>DSS</sub>	$V_{DS} = 30 \text{ V}, \text{ V}_{GS} = 0 \text{ V}$			1	μA	
Zero Gate Voltage Drain Current		$V_{DS} = 30$ V, $V_{GS} = 0$ V, $T_{J} = 55$ °C			10		
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 5$ V, $V_{GS}$ = 10 V	20			Α	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 8.3 A		0.016			
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	$V_{GS} = 4.5 \text{ V}, \text{ I}_{D} = 7.2 \text{ A}$		0.022	0.027	Ω	
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 8.3 A		23		S	
Dynamic <sup>b</sup>				1	L	1	
Input Capacitance	C <sub>iss</sub>			490		pF	
Output Capacitance	C <sub>oss</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz		110			
Reverse Transfer Capacitance	C <sub>rss</sub>			61			
Total Gate Charge	Qg	$V_{DS} = 15 \text{ V}, V_{GS} = 10 \text{ V}, I_{D} = 8.3 \text{ A}$		9.6	15		
				4.7	7.1		
Gate-Source Charge	Q <sub>gs</sub>	$V_{DS}$ = 15 V, $V_{GS}$ = 4.5 V, $I_{D}$ = 8.3 A		1.65			
Gate-Drain Charge	Q <sub>gd</sub>			1.75			
Gate Resistance	Rg	f = 1 MHz	0.5	2.6	5.2	Ω	
Turn-On Delay Time	t <sub>d(on)</sub>			15	25	-	
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 2.2 $\Omega$		15	25		
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong 6.7 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$		13	20		
Fall Time	t <sub>f</sub>			10	15		
Turn-On Delay Time	t <sub>d(on)</sub>			10	15	ns	
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 2.2 $\Omega$		10	15	-	
Turn-Off Delay Time	t <sub>d(off)</sub>	$\text{I}_\text{D}\cong$ 6.7 A, $\text{V}_\text{GEN}$ = 10 V, $\text{R}_\text{g}$ = 1 $\Omega$		15	25		
Fall Time	t <sub>f</sub>			10	15		
Drain-Source Body Diode Characteristi	cs					1	
Continuous Source-Drain Diode Current	ا <sub>S</sub>	T <sub>C</sub> = 25 °C			4.2	•	
Pulse Diode Forward Current	I <sub>SM</sub>				40	A	
Body Diode Voltage	V <sub>SD</sub>	$I_{S} = 6.7 \text{ A}, V_{GS} = 0 \text{ V}$		0.8	1.2	V	
Body Diode Reverse Recovery Time	t <sub>rr</sub>			15	30	ns	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			8	16	nC	
Reverse Recovery Fall Time	t <sub>a</sub>	$I_F = 6.7 \text{ A}, \text{ dl/dt} = 100 \text{ A/}\mu\text{s}, \text{ T}_J = 25 ^\circ\text{C}$		8.5			
Reverse Recovery Rise Time	t <sub>b</sub>	-		6.5		ns	

Notes:

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

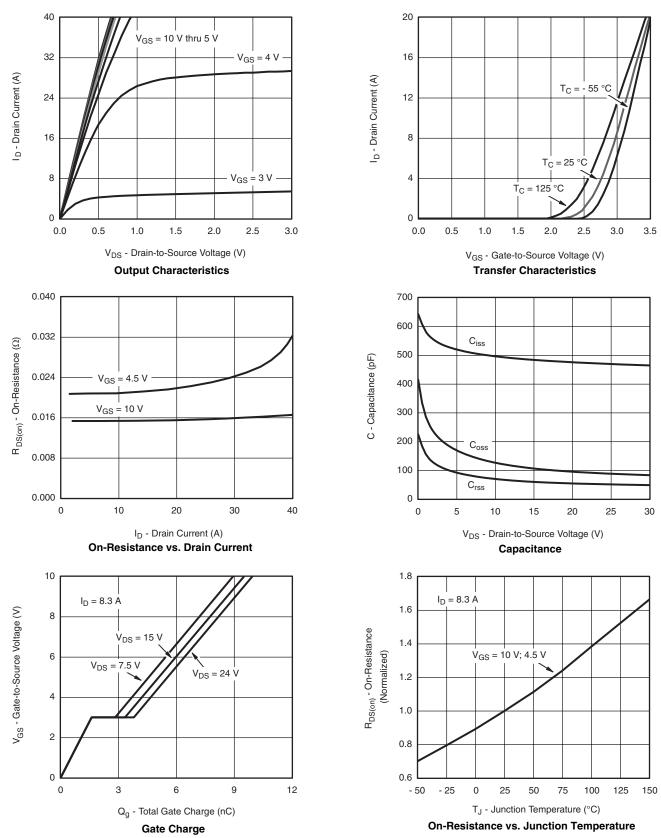
b. Guaranteed by design, not subject to production testing.

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.



### Si4176DY Vishay Siliconix

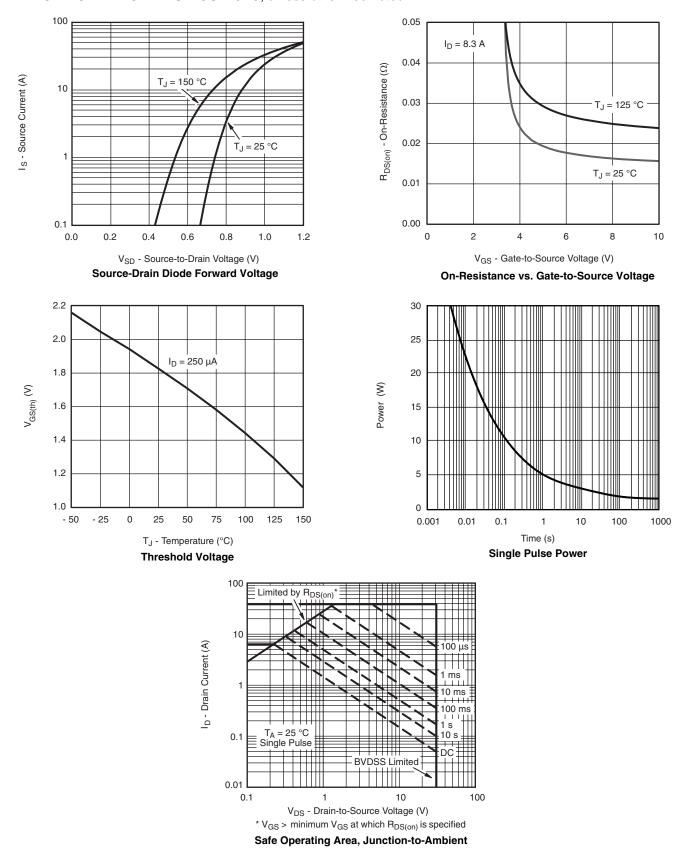
### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

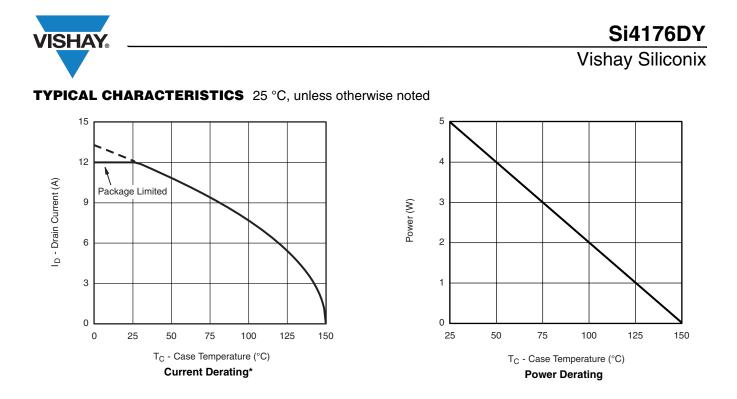


Document Number: 65539 S09-2430-Rev. A, 16-Nov-09 Vishay Siliconix



### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted





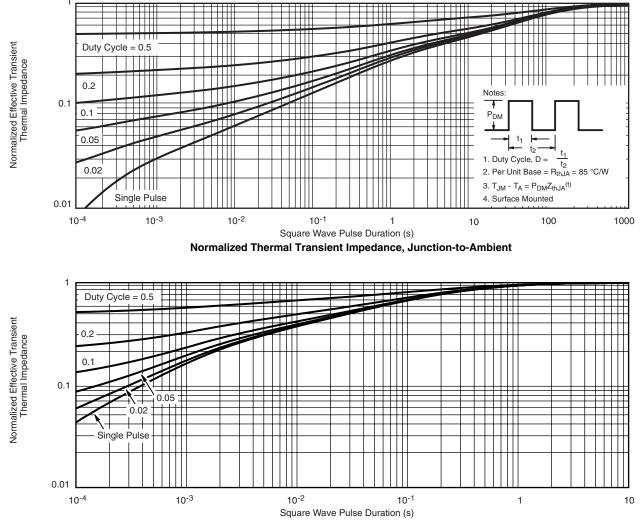
\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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

Document Number: 65539

S09-2430-Rev. A, 16-Nov-09

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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 <u>www.vishay.com/ppg?65539</u>.



# Package Information

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# SOIC (NARROW): 8-LEAD JEDEC Part Number: MS-012





	MILLIM	IETERS	INCHES		
DIM	Min	Мах	Min	Max	
A	1.35	1.75	0.053	0.069	
A <sub>1</sub>	0.10	0.20	0.004	0.008	
В	0.35	0.51	0.014	0.020	
С	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	
е	1.27	BSC	0.050 BSC		
н	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					

# **Application Note 826**

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**RECOMMENDED MINIMUM PADS FOR SO-8** 



Recommended Minimum Pads Dimensions in Inches/(mm)

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