



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

PRODUCT SUMMARY				
V <sub>DS</sub> (V)	$R_{DS(on)}(\Omega)$	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)	
30	0.00375 at V <sub>GS</sub> = 10 V	34	35.7 nC	
	0.0047 at V <sub>GS</sub> = 4.5 V	30	33.7 110	

# SO-8 S 1 8 D S 2 7 D S 3 6 D Top View

Ordering Information: Si4642DY-T1-E3 (Lead (Pb)-free)

Si4642DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

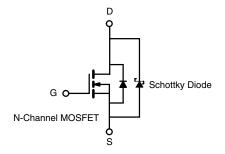
#### **FEATURES**

- Halogen-free According to IEC 61249-2-21 Available
- SkyFET<sup>®</sup> Monolithic TrenchFET<sup>®</sup> Power MOSFET and Schottky Diode
- 100 % R<sub>g</sub> and UIS Tested



#### **APPLICATIONS**

- Notebook CPU Core
- Buck Converter
- Synchronous Rectifier Switch



Parameter		Symbol	Limit	Unit	
Drain-Source Voltage	$V_{DS}$	30	V		
Gate-Source Voltage	$V_{GS}$	± 20	1 v		
	T <sub>C</sub> = 25 °C		34		
Continuous Drain Current (T <sub>.I</sub> = 150 °C)	T <sub>C</sub> = 70 °C	I <sub>D</sub>	27	٨	
Continuous Diain Current (1) = 130 °C)	T <sub>A</sub> = 25 °C		22.7 <sup>b, c</sup>		
	T <sub>A</sub> = 70 °C		18 <sup>b, c</sup>		
Pulsed Drain Current		I <sub>DM</sub>	70	Α	
Continuous Source-Drain Diode Current	T <sub>C</sub> = 25 °C	1-	7		
Continuous Source-Drain Diode Current	T <sub>A</sub> = 25 °C	I <sub>S</sub>	3.1 <sup>b, c</sup>		
Single Pulse Avalanche Current		I <sub>AS</sub>	45		
Single Pulse Avalanche Energy	L = 0.1 mH	E <sub>AS</sub>	101	mJ	
	T <sub>C</sub> = 25 °C		7.8		
Maximum Power Dissipation	T <sub>C</sub> = 70 °C	P <sub>D</sub>	5	W	
waximum Fower Dissipation	T <sub>A</sub> = 25 °C	' D	3.5 <sup>b, c</sup>		
	T <sub>A</sub> = 70 °C		2.2 <sup>b, c</sup>	1	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C		

THERMAL RESISTANCE RATINGS						
Parameter	Symbol	Тур.	Max.	Unit		
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 10 s	R <sub>thJA</sub>	29	35	°C/W	
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	13	16		

#### 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 is 80 °C/W.

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Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit
Static		<u> </u>			l l	
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V, } I_D = 1 \text{ mA}$	30			V
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}$ , $I_D = 1 \text{ mA}$	1.5		3	
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V		0.05	0.2	mA
		V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 100 °C		5.5	50	
On -State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$	40			Α
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A		0.0031	0.00375	Ω
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 15 A		0.0039	0.0047	
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 20 A		108		S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>			5540		pF
Output Capacitance	C <sub>oss</sub>	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		790		
Reverse Transfer Capacitance	C <sub>rss</sub>	1		346		
Total Gate Charge	Qg	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A		74	110	nC
				35.7	54	
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 15 \text{ V}, V_{GS} = 4.5 \text{ V}, I_{D} = 20 \text{ A}$		16.8		
Gate-Drain Charge	$Q_{gd}$			10.7		
Gate Resistance	$R_g$	f = 1 MHz		1.5	2.3	Ω
Turn-On Delay Time	t <sub>d(on)</sub>			76	115	
Rise Time	t <sub>r</sub>	$V_{DD} = 15 \text{ V}, R_L = 3 \Omega$		180	270	
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong 5 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_G = 1 \Omega$		53	80	
Fall Time	t <sub>f</sub>	]		50	75	
Turn-On Delay Time	t <sub>d(on)</sub>			17	26	ns
Rise Time	t <sub>r</sub>	$V_{DD} = 15 \text{ V}, R_L = 3 \Omega$		24	36	
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong 5 \text{ A}, V_{GEN} = 10 \text{ V}, R_G = 1 \Omega$		46	70	
Fall Time	t <sub>f</sub>			9	15	
<b>Drain-Source Body Diode and Schottky</b>	Characterist					
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			7	А
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				70	A
Body Diode Voltage	$V_{SD}$	I <sub>S</sub> = 2 A		0.44	0.53	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>			36	55	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$	] 		34	52	nC
Reverse Recovery Fall Time	t <sub>a</sub>	$I_F = 13 \text{ A, dl/dt} = 100 \text{ A/}\mu\text{s, T}_J = 25 ^{\circ}\text{C}$		19		
Reverse Recovery Rise Time	t <sub>b</sub>	1		17		ns

#### Notes:

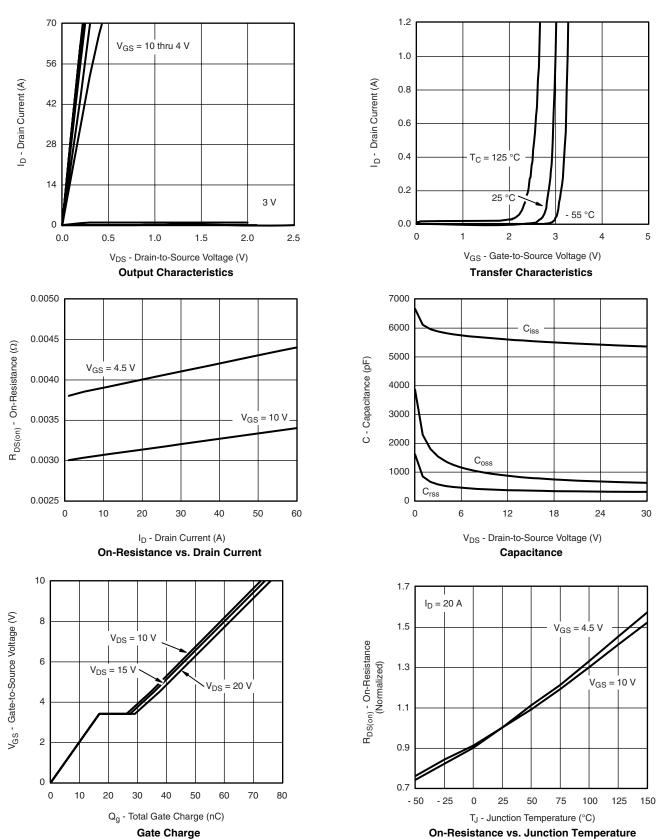
- a. Pulse test; pulse width  $\leq 300~\mu s,$  duty cycle  $\leq 2~\%.$
- b. Guaranteed by design, not subject to production testing.

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.





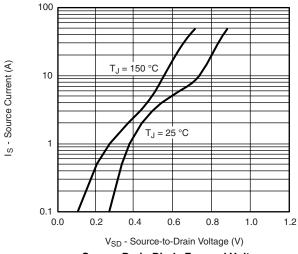
#### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



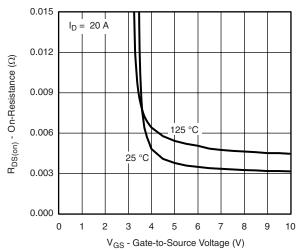
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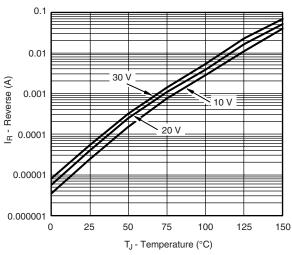
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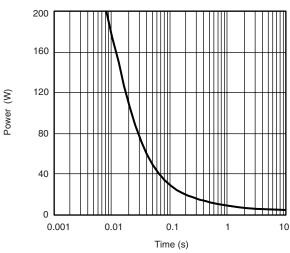
Source-Drain Diode Forward Voltage



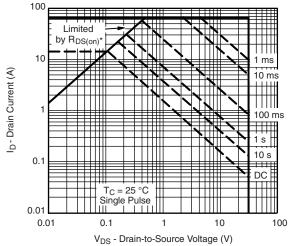
On-Resistance vs. Gate-to-Source Voltage



Reverse Current (Schottky)



Single Pulse Power, Junction-to-Ambient

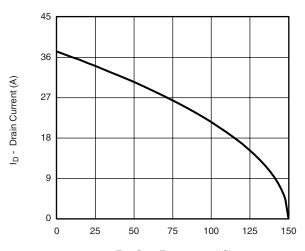


\* V<sub>GS</sub> > minimum V<sub>GS</sub> at which R<sub>DS(on)</sub> is specified

Safe Operating Area

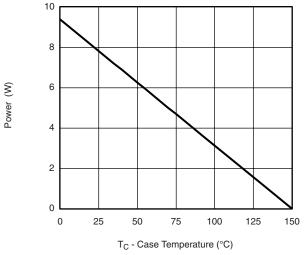


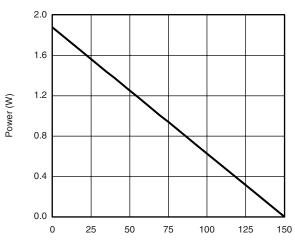
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 $T_{\mbox{\scriptsize C}}$  - Case Temperature (°C)

#### **Current Derating\***





T<sub>A</sub> - Ambient Temperature (°C) **Power Derating, Junction-to-Ambient** 

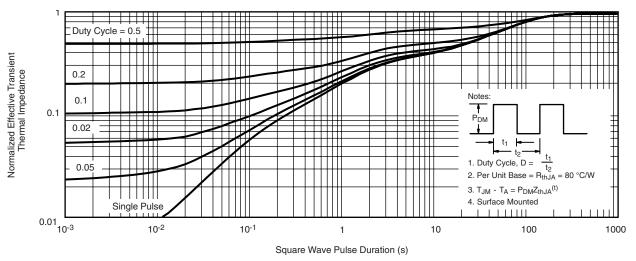
Power Derating, Junction-to-Foot

<sup>\*</sup> 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.

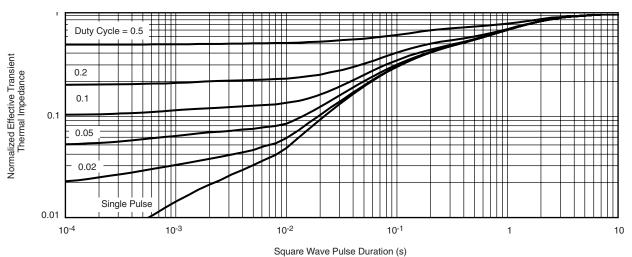
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#### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



#### Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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