



# **Dual P-Channel 12-V (D-S) MOSFET**

PRODUCT SUMMARY				
V <sub>DS</sub> (V)	$R_{DS(on)}\left(\Omega\right)$	I <sub>D</sub> (A)		
	0.014 at V <sub>GS</sub> = - 4.5 V	- 9.8		
- 12	0.017 at V <sub>GS</sub> = - 2.5 V	- 8.9		
	0.022 at V <sub>GS</sub> = - 1.8 V	- 7.8		

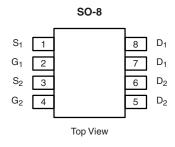
#### **FEATURES**

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



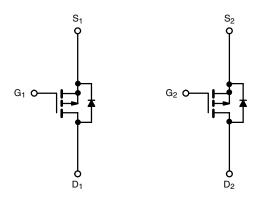
#### **APPLICATIONS**

· Load Switching



Ordering Information: Si4933DY-T1-E3 (Lead (Pb)-free)

Si4933DY-T1-GE3 (Lead (Pb)-free and Halogen-free)



P-Channel MOSFET P-Channel MOSFET

<b>ABSOLUTE MAXIMUM RATINGS</b>	T <sub>A</sub> = 25 °C, unles	ss otherwise n	oted		
Parameter		Symbol	10 s	Steady State	Unit
Drain-Source Voltage		V <sub>DS</sub>	- 12		V
Gate-Source Voltage		V <sub>GS</sub>	± 8		
Continuous Dunin Courset /T 450 90\8	T <sub>A</sub> = 25 °C	- I <sub>D</sub>	- 9.8	- 7.4	^
Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup>	T <sub>A</sub> = 70 °C		- 7.8	- 5.9	
Pulsed Drain Current		I <sub>DM</sub>	- 30		Α
Continuous Source Current (Diode Conduction) <sup>a</sup>		I <sub>S</sub>	- 1.7	- 0.9	
Maximum Power Dissipation <sup>a</sup>	T <sub>A</sub> = 25 °C	P <sub>D</sub>	2.0	1.1	W
	T <sub>A</sub> = 70 °C		1.3	0.7	
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>a</sup>	t ≤ 10 s	R <sub>thJA</sub>	45	62.5	°C/W
	Steady State		85	110	
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	26	35	

#### Notes

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

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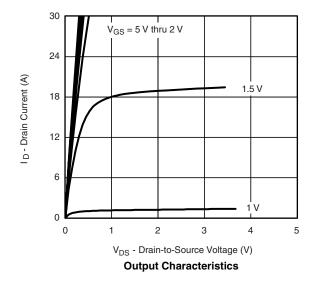
SPECIFICATIONS $T_J = 25$ °	C, unless	otherwise noted					
Parameter	Symbol	Test Conditions	Min. Typ.		Max.	Unit	
Static							
Gate Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_{D} = -500 \mu A$	- 0.40		- 1.0	V	
Gate-Body Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 8 \text{ V}$			± 100	nA	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = - 12 V, V <sub>GS</sub> = 0 V			- 1		
		$V_{DS} = -12 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 ^{\circ}\text{C}$			- 5	μΑ	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = - 5 V, V <sub>GS</sub> = - 4.5 V	- 30			Α	
		$V_{GS} = -4.5 \text{ V}, I_D = -9.8 \text{ A}$		0.0115	0.014	Ω	
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	$V_{GS} = -2.5 \text{ V}, I_D = -8.9 \text{ A}$		0.014	0.017		
		V <sub>GS</sub> = - 1.8 V, I <sub>D</sub> = - 5.0 A		0.018	0.022		
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = - 10 V, I <sub>D</sub> = - 9.8 A		40		S	
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	I <sub>S</sub> = - 1.7 A, V <sub>GS</sub> = 0 V		- 0.7	- 1.2	V	
Dynamic <sup>b</sup>							
Total Gate Charge	$Q_g$			46	70		
Gate-Source Charge	$Q_{gs}$	$Q_{gs}$ $V_{DS} = 6 \text{ V}, V_{GS} = -4.5 \text{ V}, I_D = -9.8 \text{ A}$		6.0		nC	
Gate-Drain Charge	$Q_{gd}$			13			
Turn-On Delay Time	t <sub>d(on)</sub>			35	55		
Rise Time	t <sub>r</sub>	$V_{DD} = 6 \text{ V}, R_L = 6 \Omega$		47	70		
Turn-Off Delay Time	t <sub>d(off)</sub>	$\text{I}_\text{D}\cong\text{-1}$ A, $\text{V}_\text{GEN}=\text{-4.5}$ V, $\text{R}_\text{g}=\text{6}~\Omega$		320	480	ns	
Fall Time	t <sub>f</sub>			260	390		
Source-Drain Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = - 1.7 A, dl/dt = 100 A/μs		210	315		

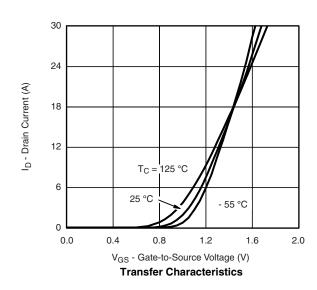
#### Notes:

- 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







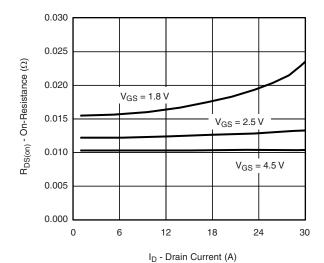




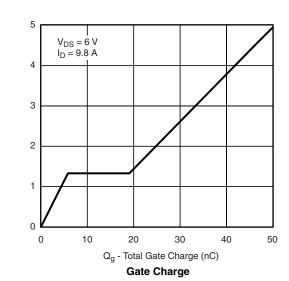
V<sub>GS</sub> - Gate-to-Source Voltage (V)

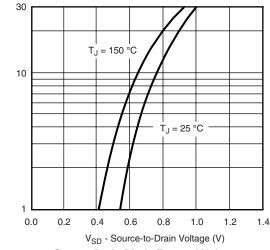
Is - Source Current (A)

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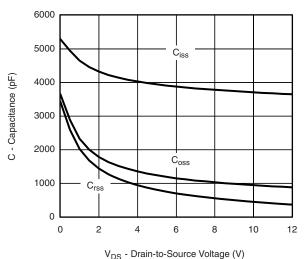


On-Resistance vs. Drain Current

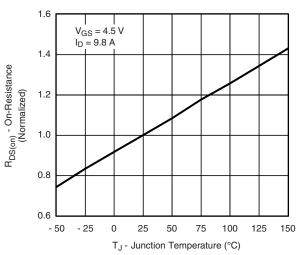




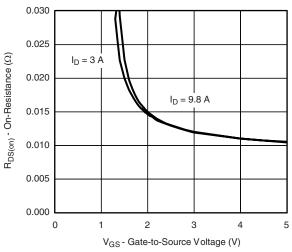
Source-Drain Diode Forward Voltage



Capacitance



On-Resistance vs. Junction Temperature

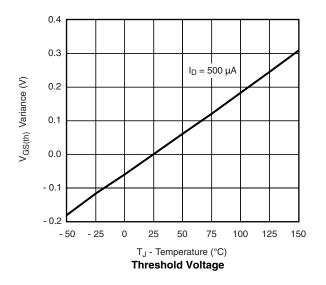


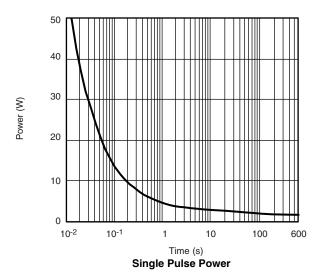
On-Resistance vs. Gate-to-Source Voltage

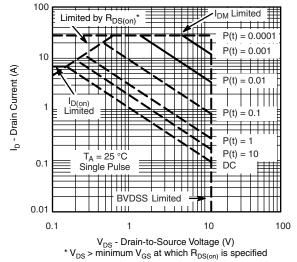
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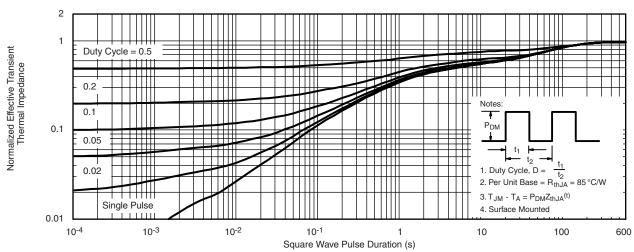
# TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted







# Safe Operating Area, Junction-to-Ambient

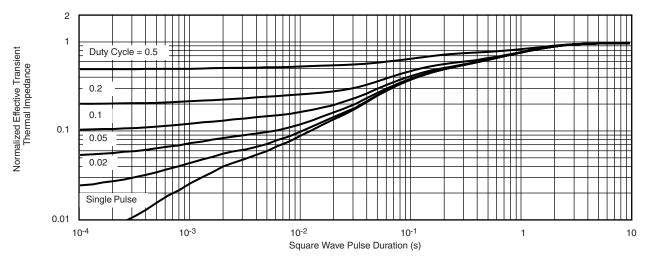


Normalized Thermal Transient Impedance, Junction-to-Ambient





# TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Foot

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