

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

### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
- 12	0.018 at $V_{GS} = - 4.5$ V	- 8.9
	0.022 at $V_{GS} = - 2.5$ V	- 8.1
	0.028 at $V_{GS} = - 1.8$ V	- 3.6

### FEATURES

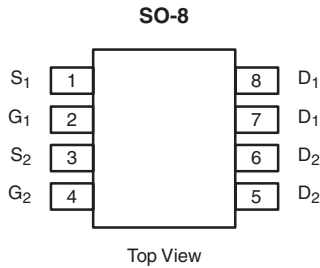
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- Advanced High Cell Density Process
- Compliant to RoHS Directive 2002/95/EC



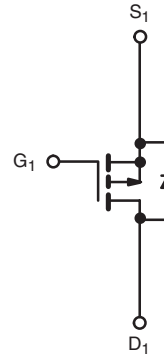
**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

### APPLICATIONS

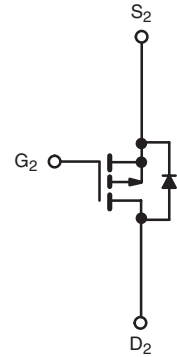
- Load Switching



**Ordering Information:** Si4931DY-T1-E3 (Lead (Pb)-free)  
Si4931DY-T1-GE3 (Lead (Pb)-free and Halogen-free)



P-Channel MOSFET



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### ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ , unless otherwise noted

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Parameter		Symbol	10 s	Steady State	Unit
Drain-Source Voltage		$V_{DS}$	- 12		V
Gate-Source Voltage		$V_{GS}$	$\pm 8$		
Continuous Drain Current ( $T_J = 150\text{ }^{\circ}\text{C}$ ) <sup>a</sup>	$T_A = 25\text{ }^{\circ}\text{C}$	$I_D$	- 8.9	- 6.7	A
	$T_A = 70\text{ }^{\circ}\text{C}$		- 7.1	- 5.4	
Pulsed Drain Current		$I_{DM}$	- 30		
Continuous Source Current (Diode Conduction) <sup>a</sup>		$I_S$	- 1.7	- 0.9	W
Maximum Power Dissipation <sup>a</sup>	$T_A = 25\text{ }^{\circ}\text{C}$	$P_D$	2.0	1.1	
	$T_A = 70\text{ }^{\circ}\text{C}$		1.3	0.7	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 55 to 150		$^{\circ}\text{C}$

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	46	62.5	$^\circ\text{C/W}$
		80	110	
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	24	32	

Notes:

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

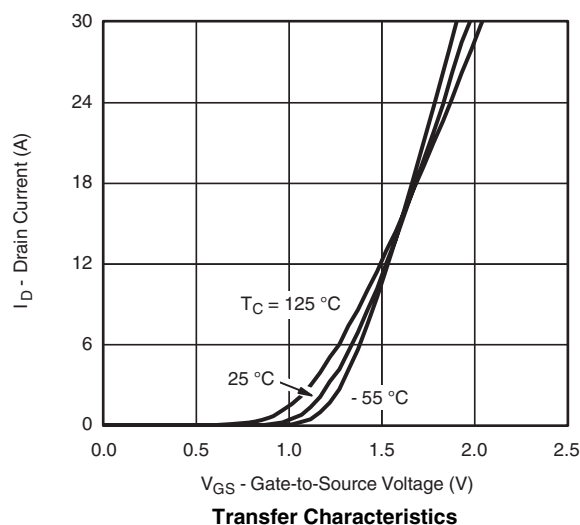
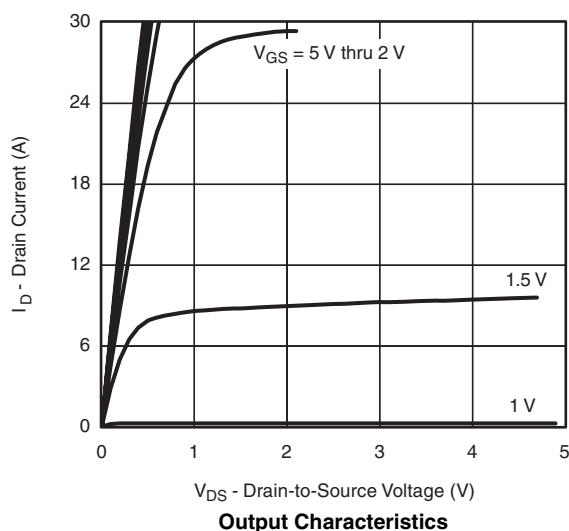
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = -350\text{ }\mu\text{A}$	- 0.4		- 1.0	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 8\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -12\text{ V}$ , $V_{GS} = 0\text{ V}$			- 1	$\mu\text{A}$
		$V_{DS} = -12\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 55\text{ }^{\circ}\text{C}$			- 5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = -5\text{ V}$ , $V_{GS} = -4.5\text{ V}$	- 30			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}$ , $I_D = -8.9\text{ A}$		0.0145	0.018	$\Omega$
		$V_{GS} = -2.5\text{ V}$ , $I_D = -8.1\text{ A}$		0.018	0.022	
		$V_{GS} = -1.8\text{ V}$ , $I_D = -3.6\text{ A}$		0.023	0.028	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -6\text{ V}$ , $I_D = -8.9\text{ A}$		26		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = -1.7\text{ A}$ , $V_{GS} = 0\text{ V}$		- 0.7	- 1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = -6\text{ V}$ , $V_{GS} = -4.5\text{ V}$ , $I_D = -8.9\text{ A}$		34.5	52	nC
Gate-Source Charge	$Q_{gs}$			5.1		
Gate-Drain Charge	$Q_{gd}$			9.6		
Gate Resistance	$R_g$			9		$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}$ , $R_L = 6\text{ }\Omega$ $I_D \cong -1\text{ A}$ , $V_{GEN} = -4.5\text{ V}$ , $R_g = 6\text{ }\Omega$		25	40	ns
Rise Time	$t_r$			46	70	
Turn-Off Delay Time	$t_{d(off)}$			230	345	
Fall Time	$t_f$			155	235	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = -1.7\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$		128	200	

Notes:

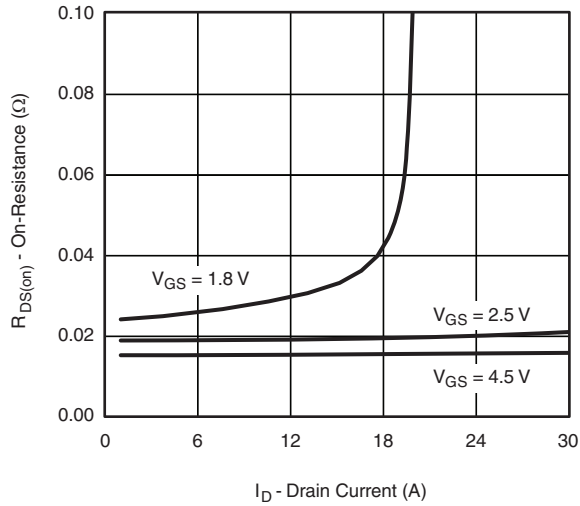
a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

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

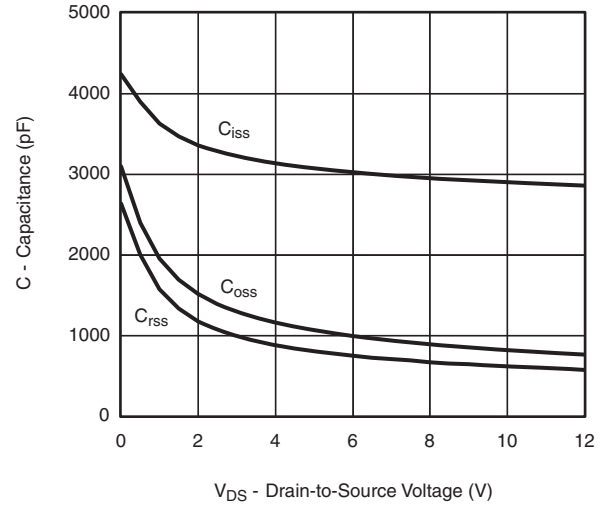
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**TYPICAL CHARACTERISTICS**  $25\text{ }^{\circ}\text{C}$  unless otherwise noted

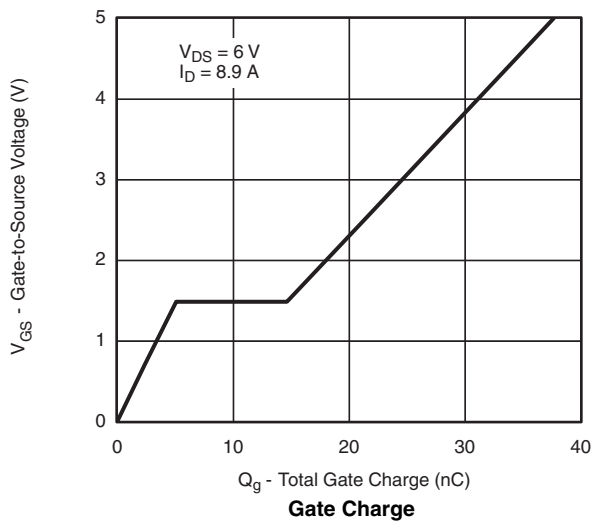
## TYPICAL CHARACTERISTICS 25 °C unless otherwise noted



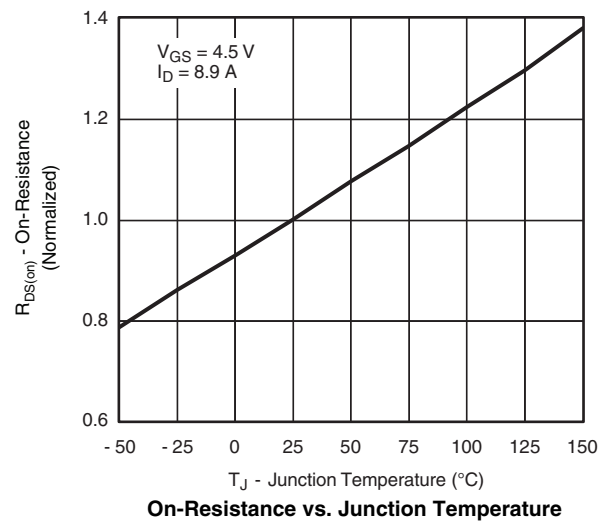
On-Resistance vs. Drain Current



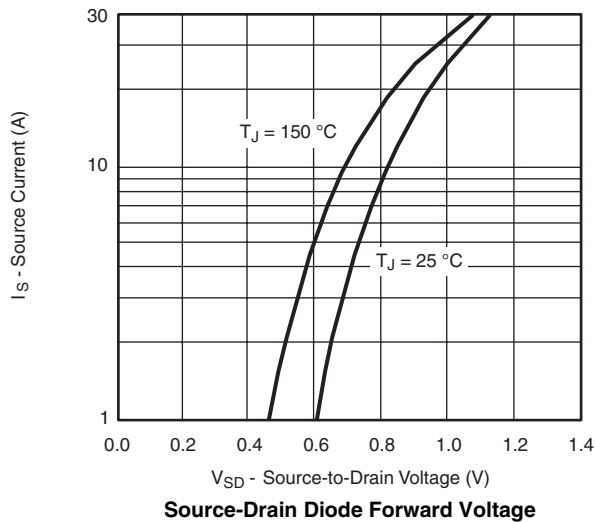
Capacitance



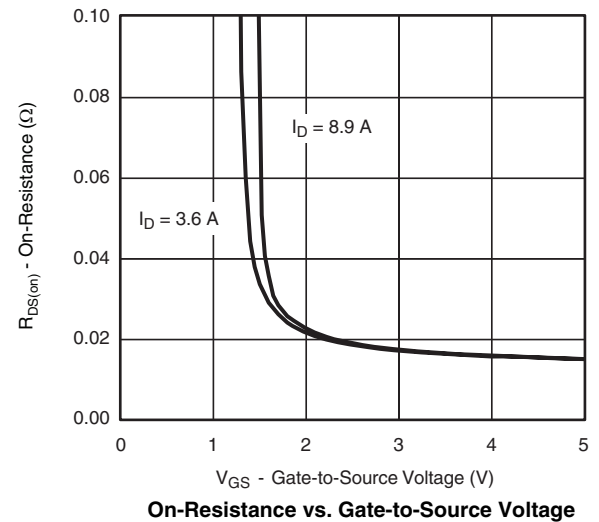
Gate Charge



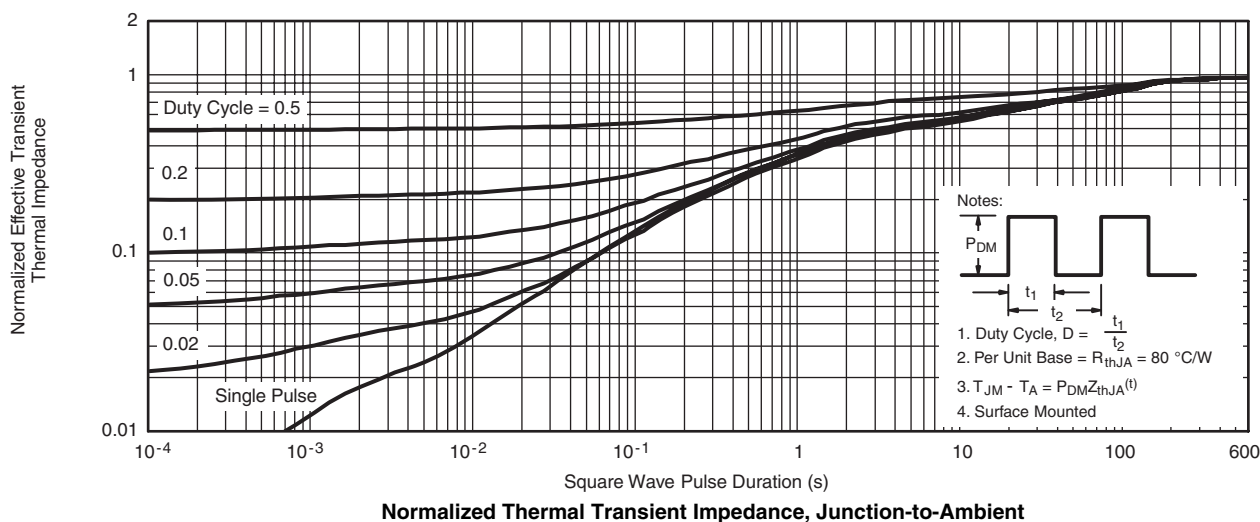
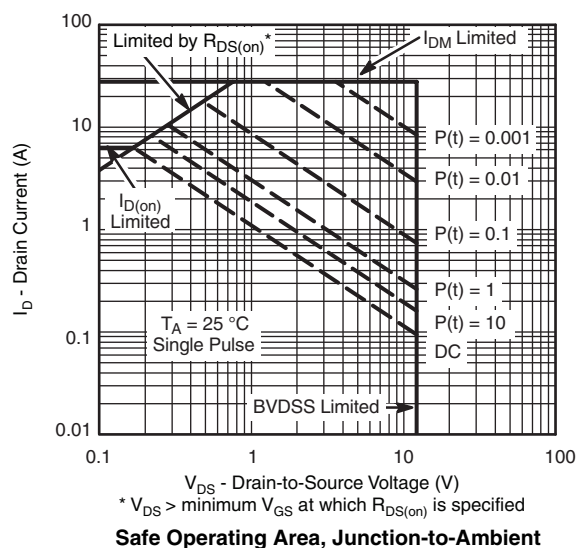
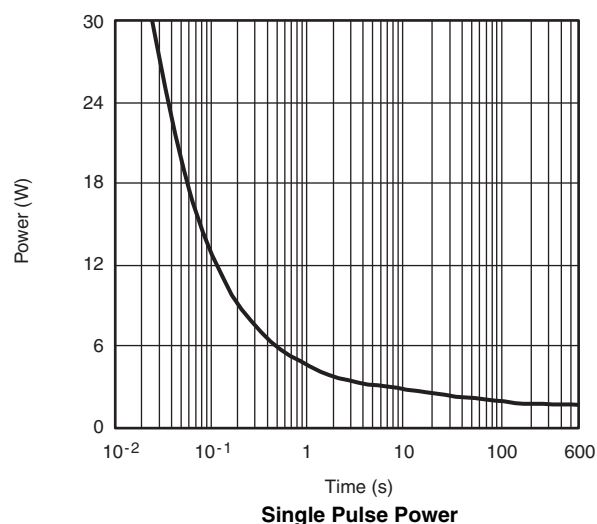
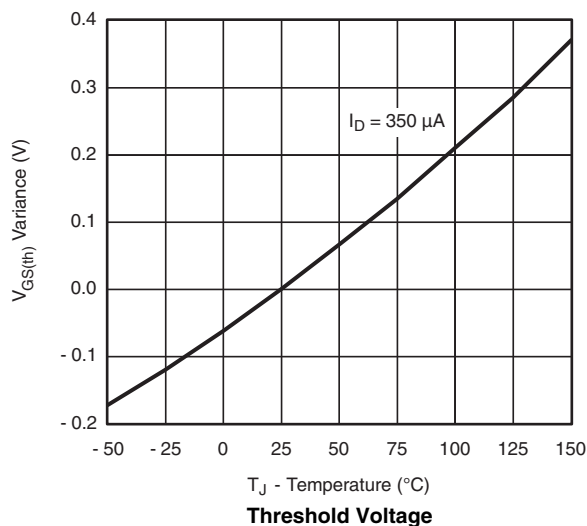
On-Resistance vs. Junction Temperature



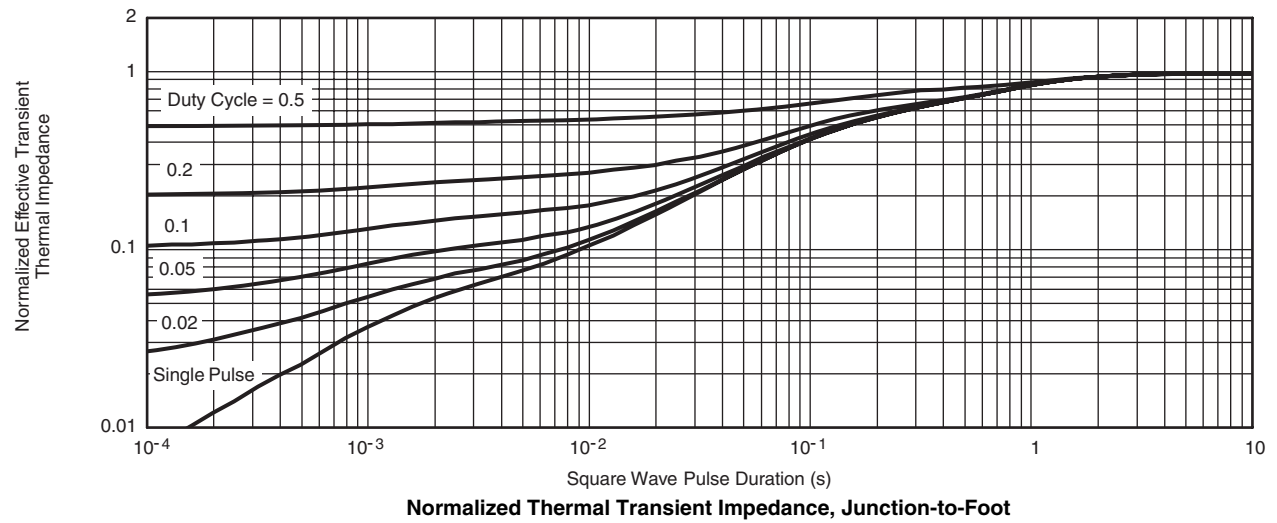
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

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## 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 <sub>1</sub>	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)

[Return to Index](#)



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