

P-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
- 20	0.032 at $V_{GS} = - 4.5$ V	- 7.1	16.5
	0.040 at $V_{GS} = - 2.5$ V	- 6.4	
	0.053 at $V_{GS} = - 1.8$ V	- 5.5	

FEATURES

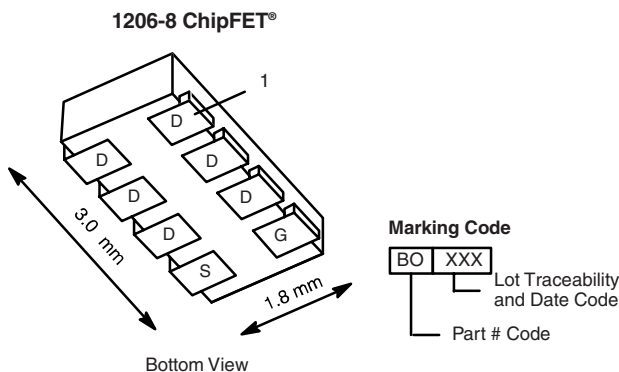
- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET® Power MOSFET
- Ultra-Low On-Resistance
- Thermally Enhanced ChipFET® Package
- 40 % Smaller Footprint than TSOP-6



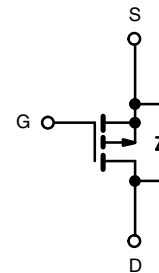
RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Load Switch, PA Switch, and Battery Switch for Portable Devices



Ordering Information: Si5401DC-T1-E3 (Lead (Pb)-free)
Si5401DC-T1-GE3 (Lead (Pb)-free and Halogen-free)



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

Parameter	Symbol	5 s	Steady State	Unit
Drain-Source Voltage	V_{DS}	- 20		V
Gate-Source Voltage	V_{GS}	± 8		
Continuous Drain Current ($T_J = 150^\circ\text{C}$) ^a	I_D	- 7.1	- 5.2	A
		- 5.1	- 3.7	
Pulsed Drain Current	I_{DM}	- 20		
Continuous Source Current ^a	I_S	- 2.1	- 1.1	
Maximum Power Dissipation ^a	P_D	2.5	1.3	W
		1.3	0.7	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150		$^\circ\text{C}$
Soldering Recommendations (Peak Temperature) ^{b, c}		260		

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	R_{thJA}	40	50	$^\circ\text{C/W}$
		80	95	
Maximum Junction-to-Foot (Drain)	R_{thJF}	15	20	

Notes:

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

b. See Reliability Manual for profile. The ChipFET is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.

c. Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.

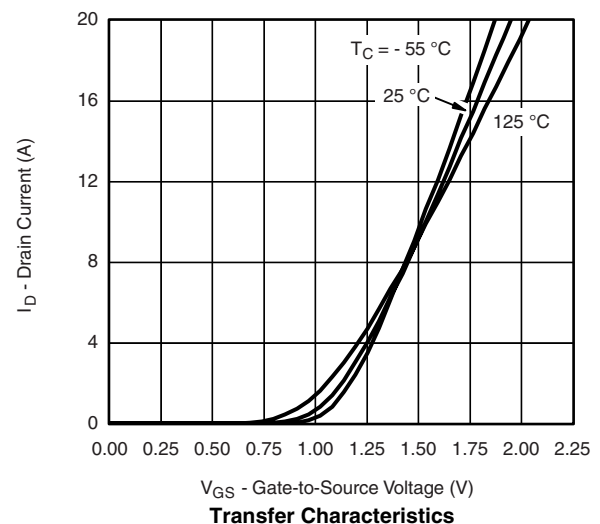
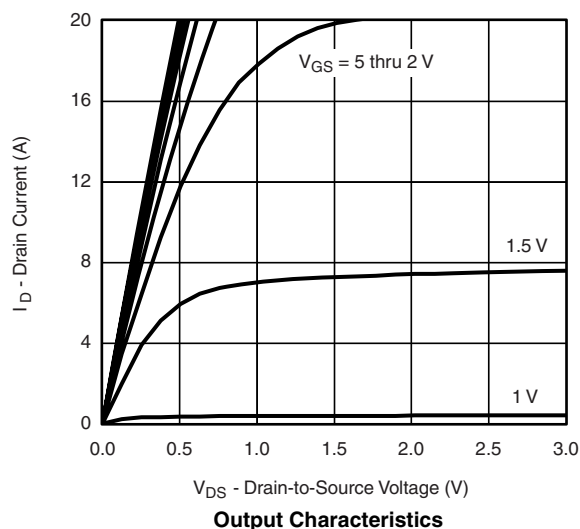
SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\ \mu\text{A}$	-0.40		-1.0	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\ \text{V}$, $V_{GS} = \pm 8\ \text{V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\ \text{V}$, $V_{GS} = 0\ \text{V}$			-1	μA
		$V_{DS} = -20\ \text{V}$, $V_{GS} = 0\ \text{V}$, $T_J = 85^\circ\text{C}$			-5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\ \text{V}$, $V_{GS} = -4.5\ \text{V}$	-20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\ \text{V}$, $I_D = -5.2\ \text{A}$		0.026	0.032	Ω
		$V_{GS} = -2.5\ \text{V}$, $I_D = -4.6\ \text{A}$		0.033	0.040	
		$V_{GS} = -1.8\ \text{V}$, $I_D = -1.9\ \text{A}$		0.044	0.053	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\ \text{V}$, $I_D = -5.2\ \text{A}$		20		S
Diode Forward Voltage ^a	V_{SD}	$I_S = -1.1\ \text{A}$, $V_{GS} = 0\ \text{V}$		-0.8	-1.2	V
Dynamic^b						
Total Gate Charge	Q_g	$V_{DS} = -10\ \text{V}$, $V_{GS} = -4.5\ \text{V}$, $I_D = -5.2\ \text{A}$		16.5	25	nC
Gate-Source Charge	Q_{gs}			1.7		
Gate-Drain Charge	Q_{gd}			3.5		
Gate Resistance	R_g	$f = 1\ \text{MHz}$		9		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\ \text{V}$, $R_L = 10\ \Omega$ $I_D \cong -1\ \text{A}$, $V_{GEN} = -4.5\ \text{V}$, $R_g = 6\ \Omega$		10	15	ns
Rise Time	t_r			25	40	
Turn-Off Delay Time	$t_{d(off)}$			115	175	
Fall Time	t_f			70	105	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = -1.1\ \text{A}$, $dI/dt = 100\ \text{A}/\mu\text{s}$		30	60	ns
Reverse Recovery Charge	Q_{rr}			140		

Notes:

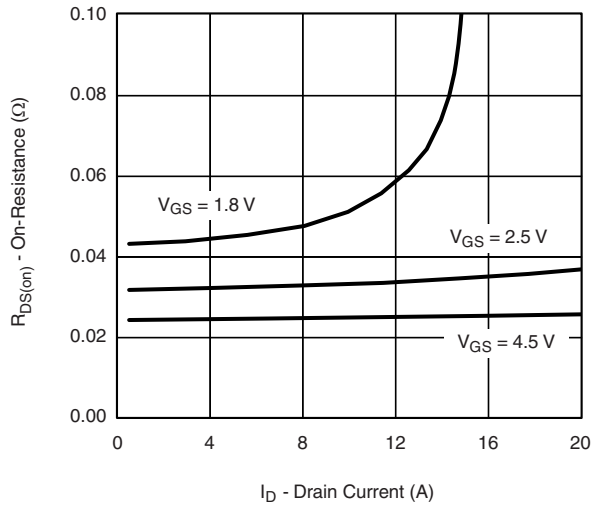
a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

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

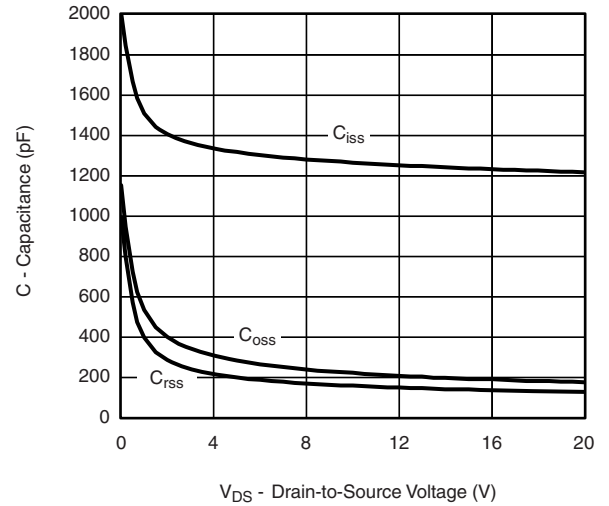
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS 25°C , unless otherwise noted

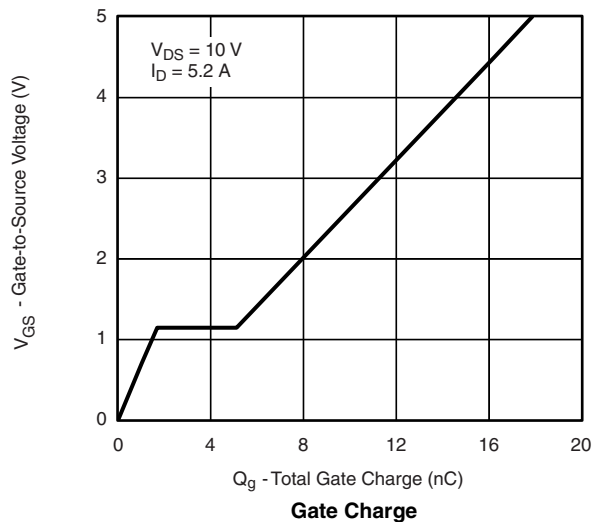
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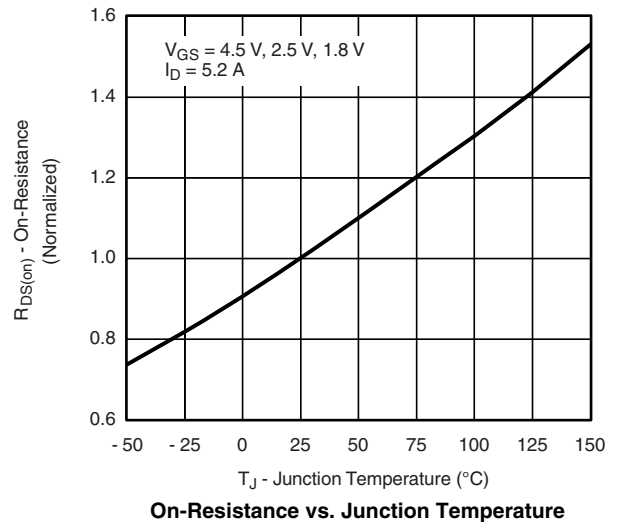
On-Resistance vs. Drain Current



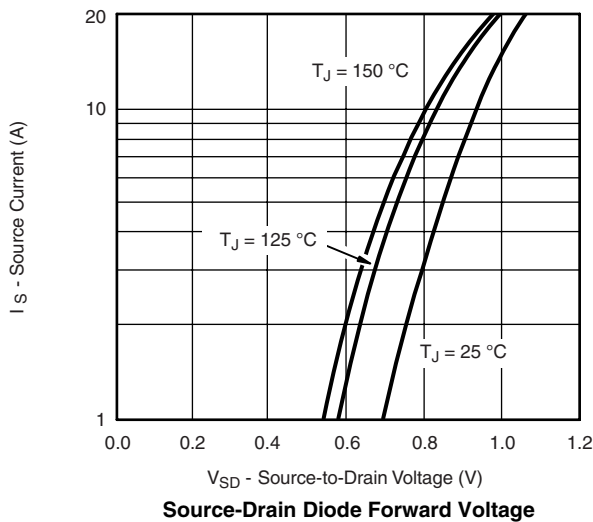
Capacitance



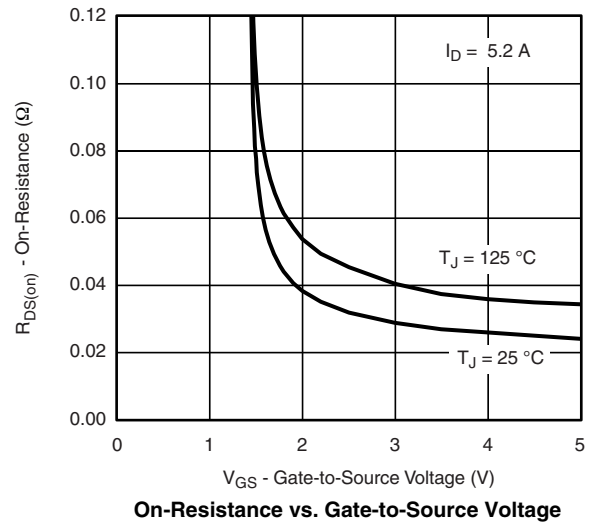
Gate Charge



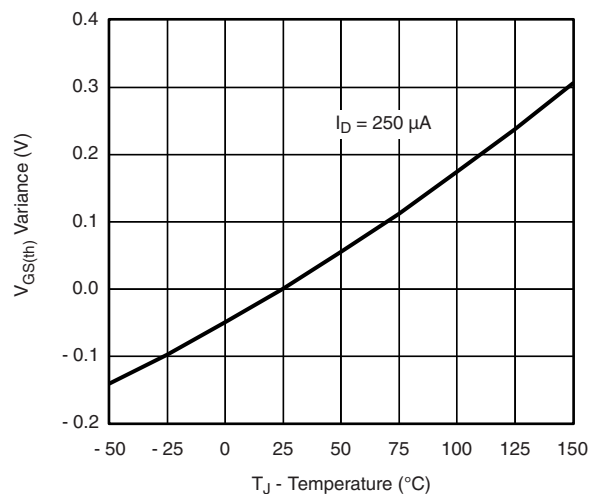
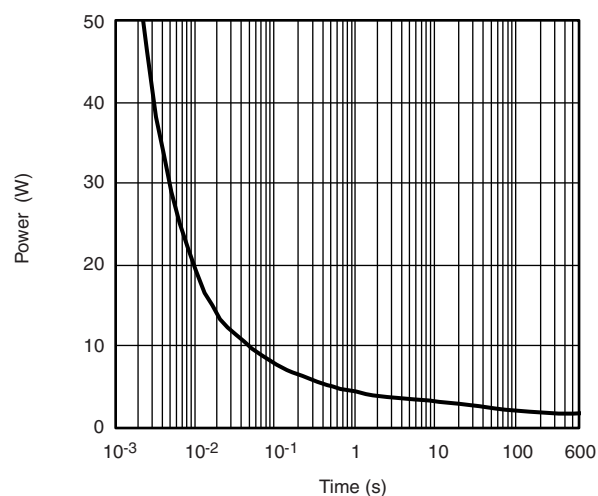
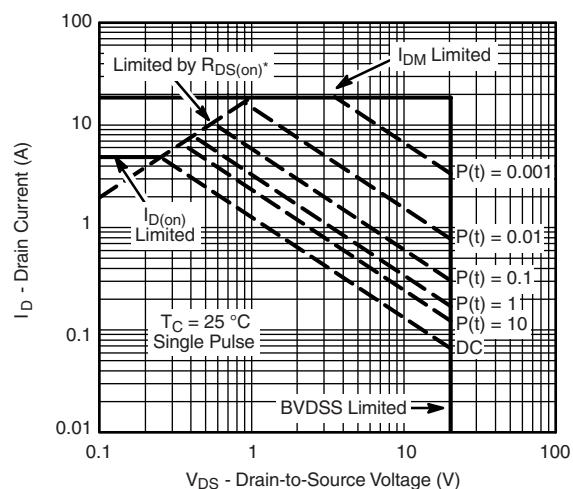
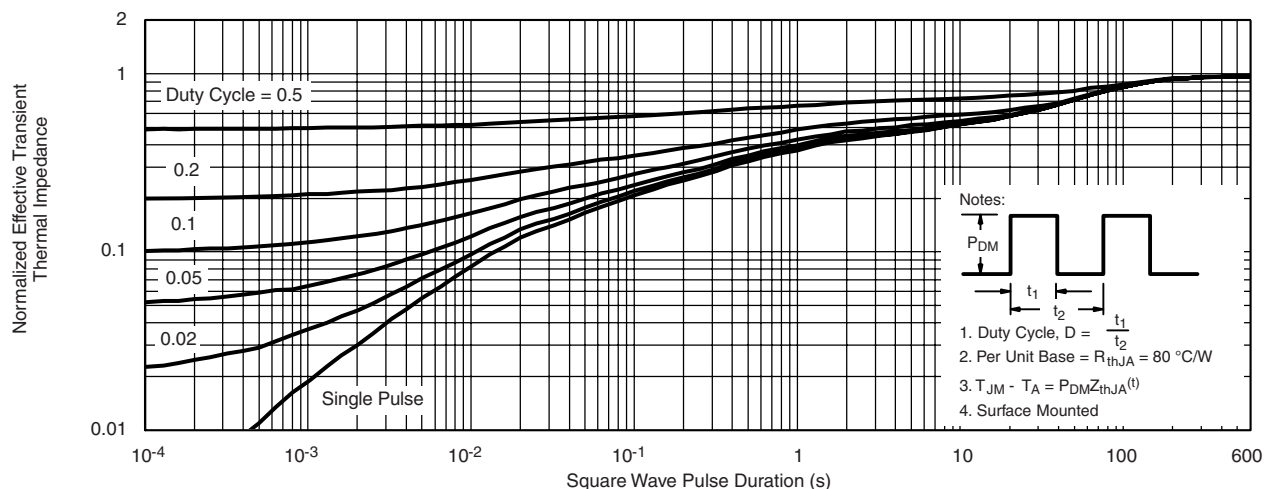
On-Resistance vs. Junction Temperature



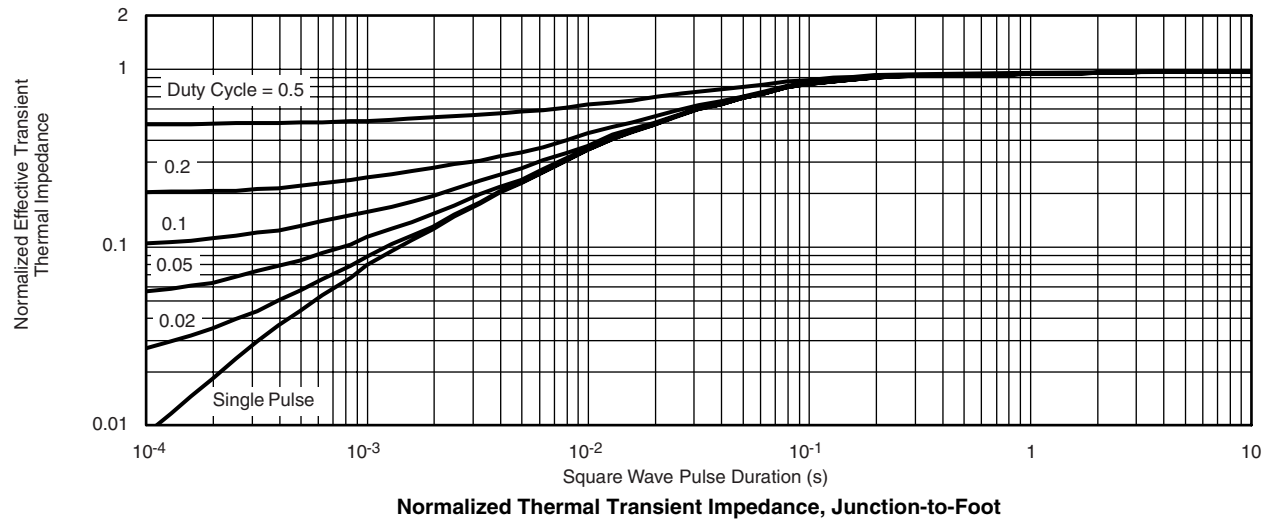
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted**Threshold Voltage****Single Pulse Power*** $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified**Safe Operating Area****Normalized Thermal Transient Impedance, Junction-to-Ambient**

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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