

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

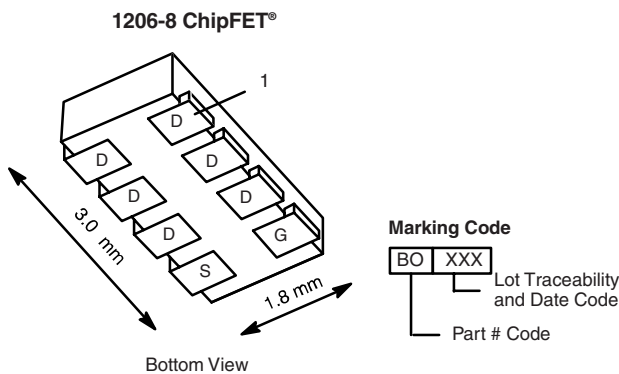
- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET[®] Power MOSFET
- Ultra-Low On-Resistance
- Thermally Enhanced ChipFET[®] Package
- 40 % Smaller Footprint than TSOP-6



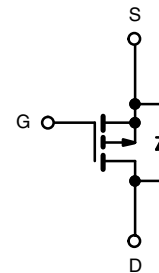
RoHS
COMPLIANT
HALOGEN
FREE
Available

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)



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T _A = 25 °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 °C) ^a	I _D	T _A = 25 °C	- 7.1	- 5.2	A
		T _A = 85 °C	- 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	T _A = 25 °C	2.5	1.3	W
		T _A = 85 °C	1.3	0.7	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150		°C	
Soldering Recommendations (Peak Temperature) ^{b, c}		260			

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient ^a	R _{thJA}	t ≤ 5 s	40	50	°C/W
		Steady State	80	95	
Maximum Junction-to-Foot (Drain)	R _{thJF}	15	20		

Notes:

- Surface Mounted on 1" x 1" FR4 board.
- 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.
- Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.

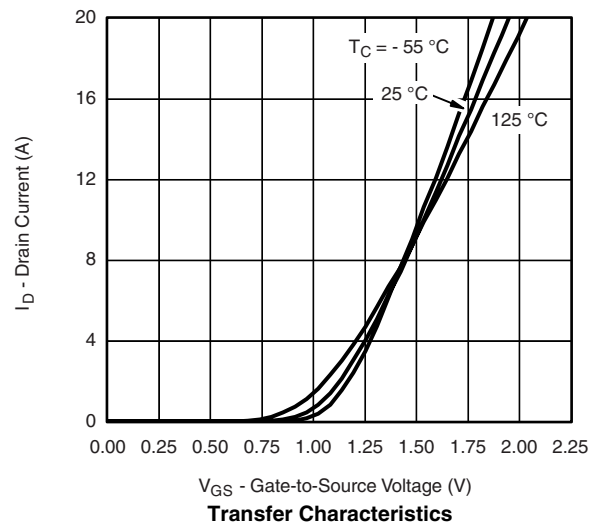
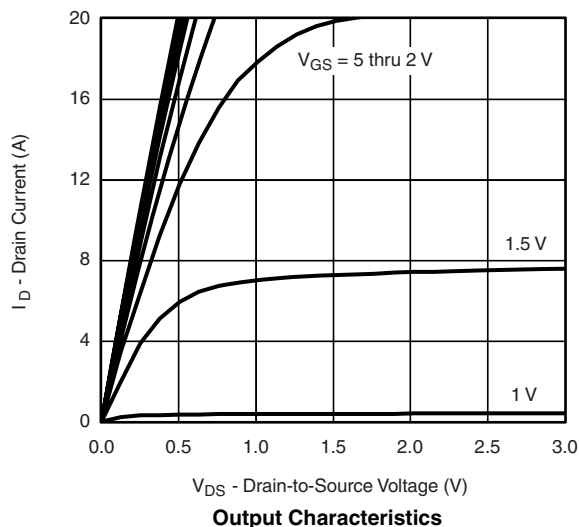
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.40		-1.0	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			-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	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 6\text{ }\Omega$		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	nC
Reverse Recovery Charge	Q_{rr}			140		

Notes:

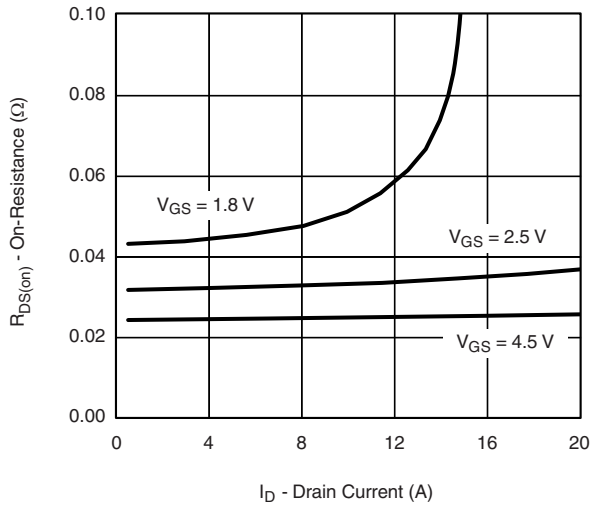
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

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.

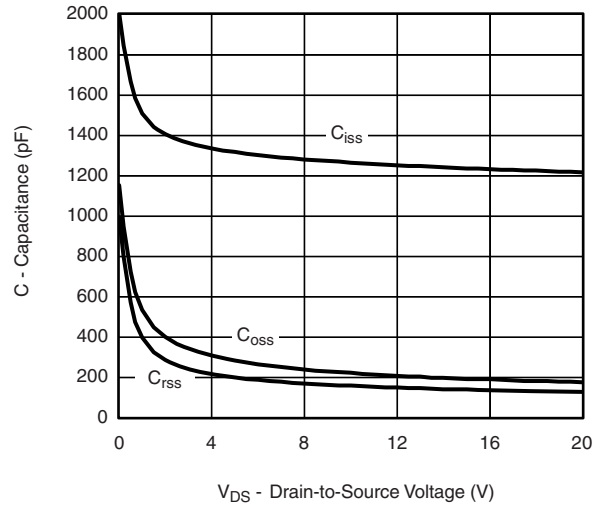
TYPICAL CHARACTERISTICS $25\text{ }^\circ\text{C}$, unless otherwise noted



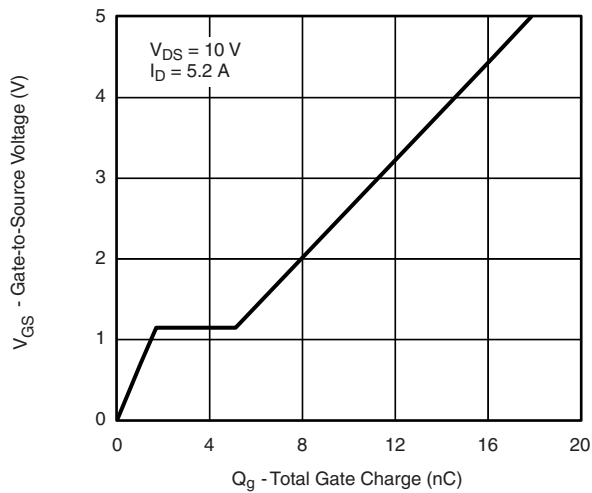
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



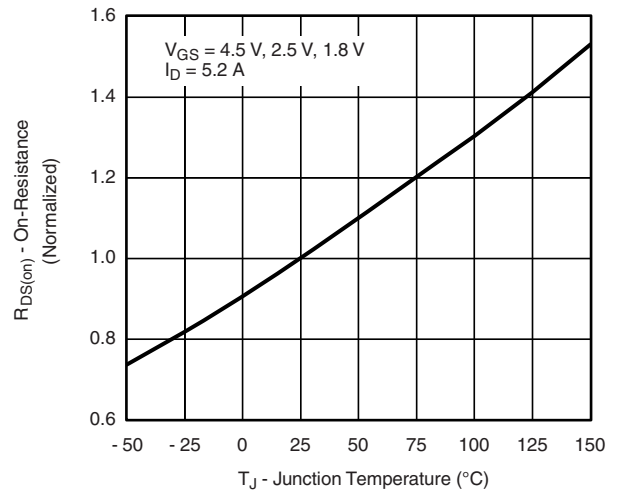
On-Resistance vs. Drain Current



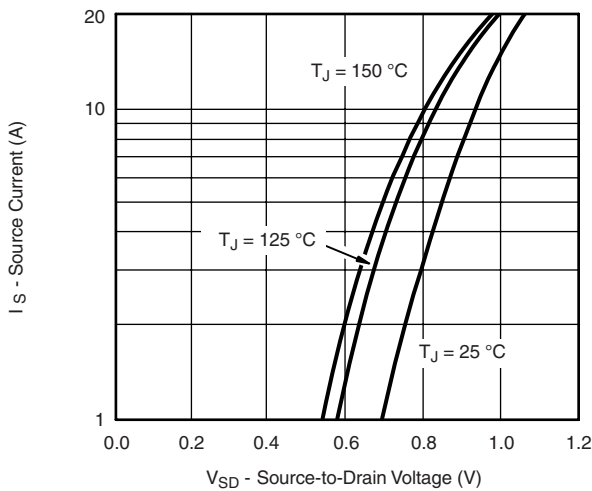
Capacitance



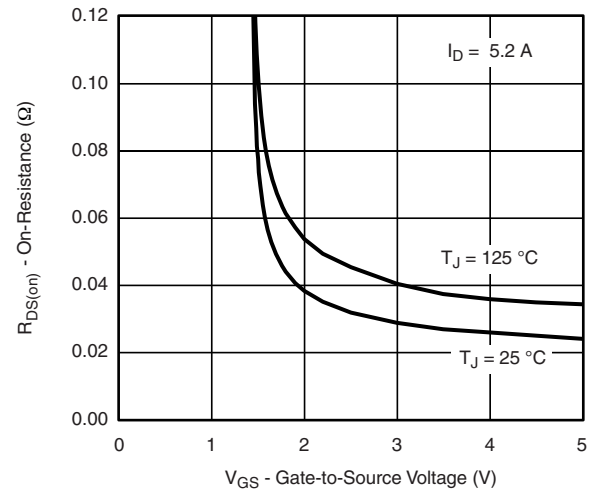
Gate Charge



On-Resistance vs. Junction Temperature

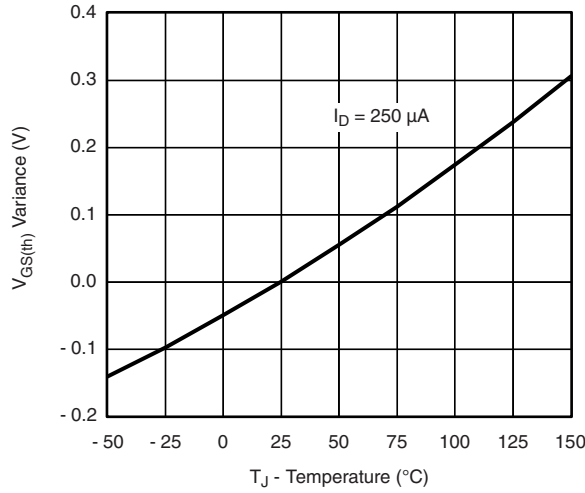


Source-Drain Diode Forward Voltage

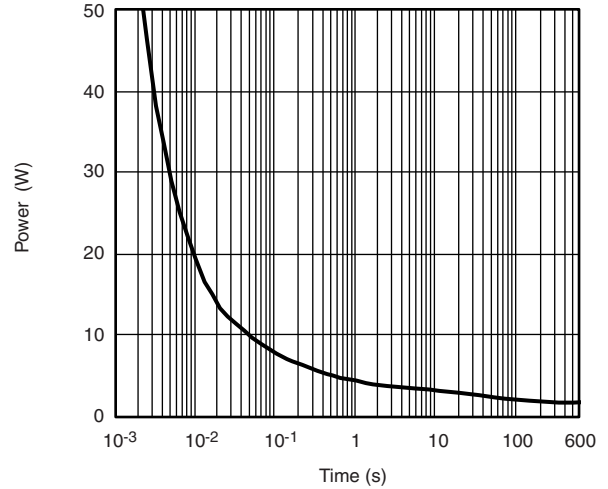


On-Resistance vs. Gate-to-Source Voltage

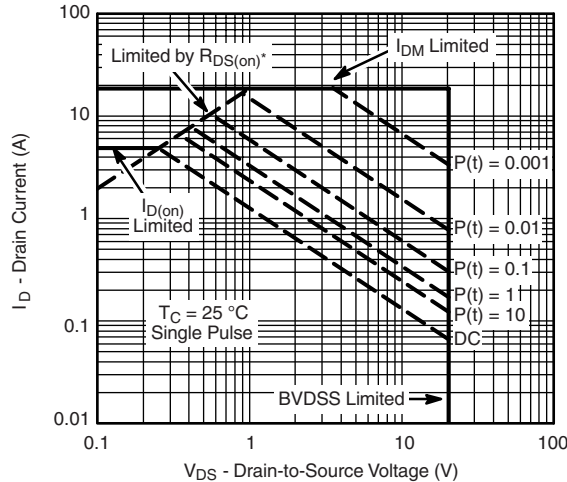
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Threshold Voltage

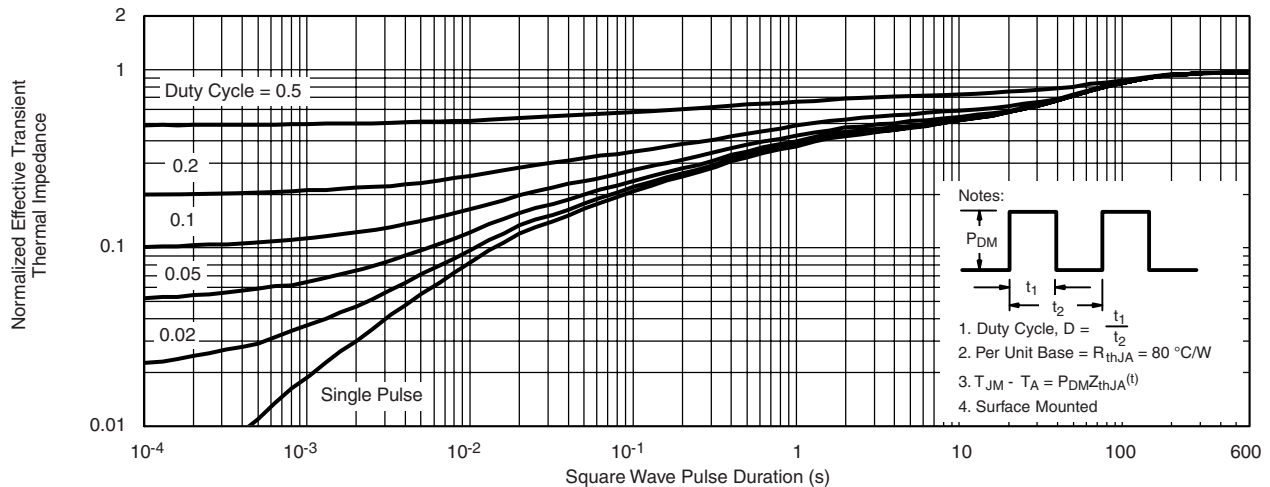


Single Pulse Power



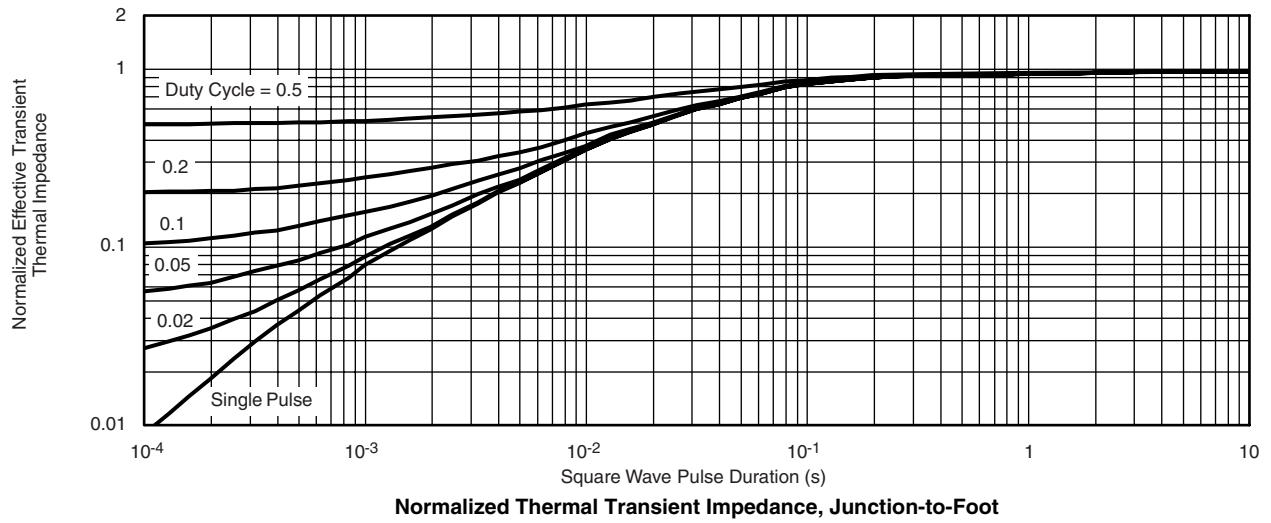
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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