



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

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	r <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)	Q <sub>g</sub> (Typ)
-20	0.032 @ V <sub>GS</sub> = -4.5 V	-7.1	16.5
	0.040 @ V <sub>GS</sub> = -2.5 V	-6.4	
	0.053 @ V <sub>GS</sub> = -1.8 V	-5.5	

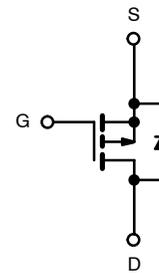
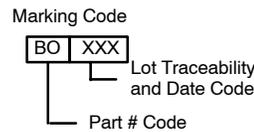
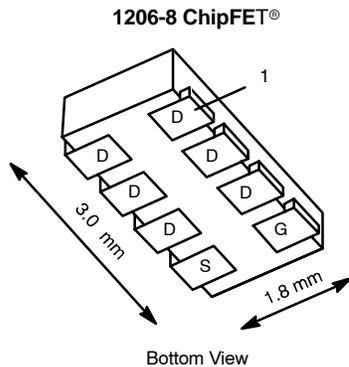
## FEATURES

- TrenchFET® Power MOSFET
- Ultra-Low On-Resistance
- Thermally Enhanced ChipFET® Package
- 40% Smaller Footprint Than TSOP-6

## APPLICATIONS

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

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Ordering Information: Si5401DC-T1—E3

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25°C UNLESS OTHERWISE NOTED)					
Parameter	Symbol	5 secs	Steady State	Unit	
Drain-Source Voltage	V <sub>DS</sub>	-20		V	
Gate-Source Voltage	V <sub>GS</sub>	±8			
Continuous Drain Current (T <sub>J</sub> = 150°C) <sup>a</sup>	I <sub>D</sub>	T <sub>A</sub> = 25°C	-7.1	-5.2	A
		T <sub>A</sub> = 85°C	-5.1	-3.7	
Pulsed Drain Current	I <sub>DM</sub>	-20			
Continuous Source Current <sup>a</sup>	I <sub>S</sub>	-2.1	-1.1		
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>A</sub> = 25°C	2.5	1.3	W
		T <sub>A</sub> = 85°C	1.3	0.7	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to 150		°C	
Soldering Recommendations (Peak Temperature) <sup>b, c</sup>		260			

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient <sup>a</sup>	R <sub>thJA</sub>	t ≤ 5 sec	40	50	°C/W
		Steady State	80	95	
Maximum Junction-to-Foot (Drain)	R <sub>thJF</sub>	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.



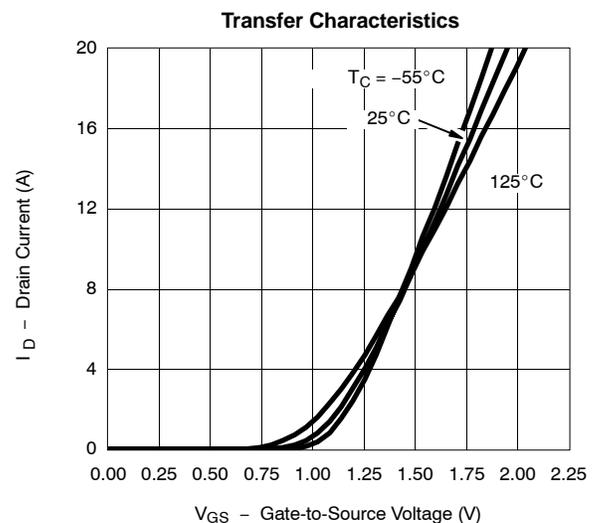
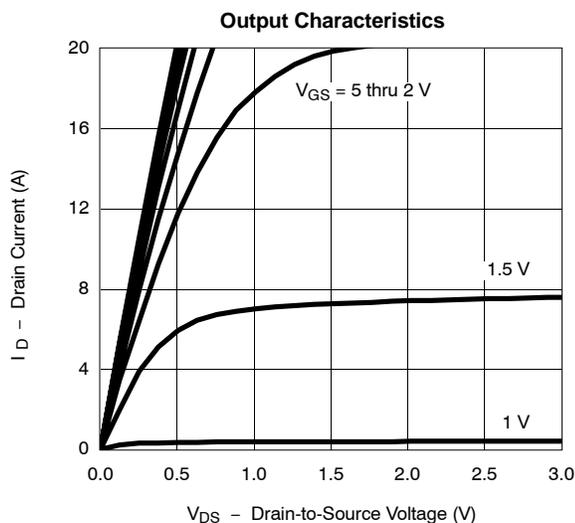
SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	-0.40		-1.0	V
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±8 V			±100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V			-1	μA
		V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 85 °C			-5	
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	-20			A
Drain-Source On-State Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -5.2 A		0.026	0.032	Ω
		V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -4.6 A		0.033	0.040	
		V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -1.9 A		0.044	0.053	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -5.2 A		20		S
Diode Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>S</sub> = -1.1 A, V <sub>GS</sub> = 0 V		-0.8	-1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -5.2 A		16.5	25	nC
Gate-Source Charge	Q <sub>gs</sub>		1.7			
Gate-Drain Charge	Q <sub>gd</sub>		3.5			
Gate Resistance	R <sub>g</sub>	f = 1 MHz		9		Ω
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = -10 V, R <sub>L</sub> = 10 Ω I <sub>D</sub> ≈ -1 A, V <sub>GEN</sub> = -4.5 V, R <sub>g</sub> = 6 Ω		10	15	ns
Rise Time	t <sub>r</sub>		25	40		
Turn-Off Delay Time	t <sub>d(off)</sub>		115	175		
Fall Time	t <sub>f</sub>		70	105		
Source-Drain Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = -1.1 A, di/dt = 100 A/μs		30	60	
Reverse Recovery Charge	Q <sub>rr</sub>			140		nC

Notes

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 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.

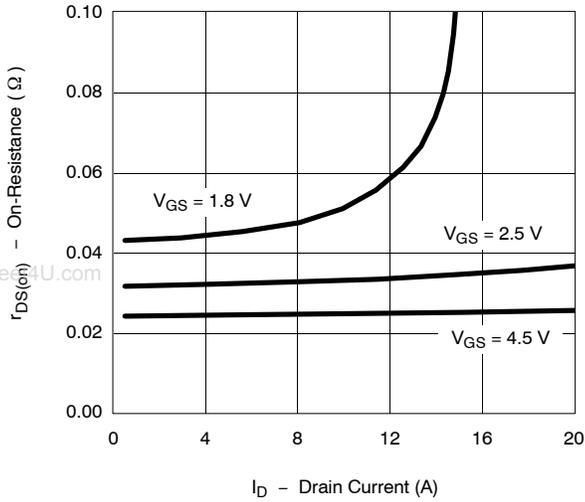
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



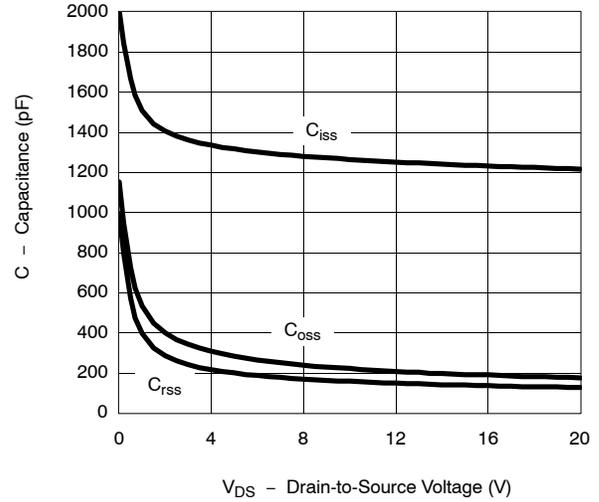


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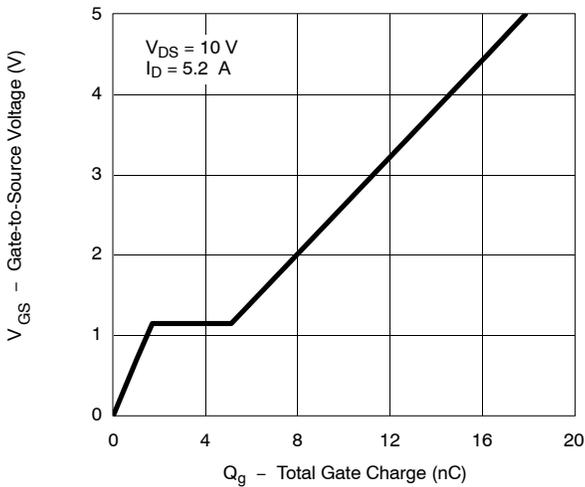
On-Resistance vs. Drain Current



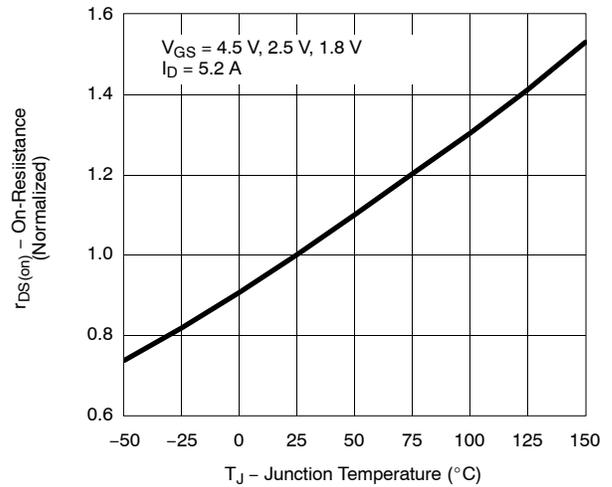
Capacitance



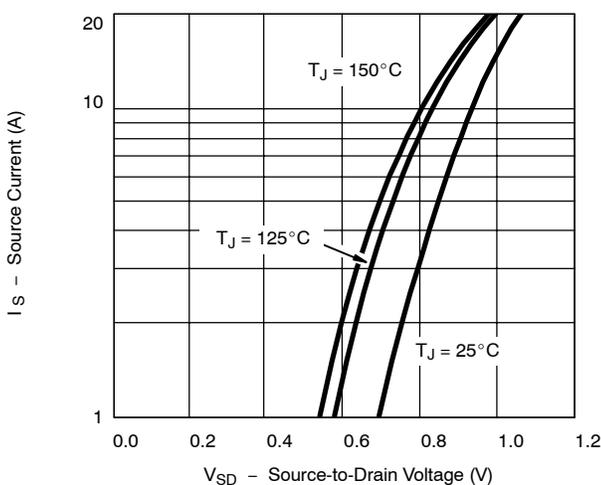
Gate Charge



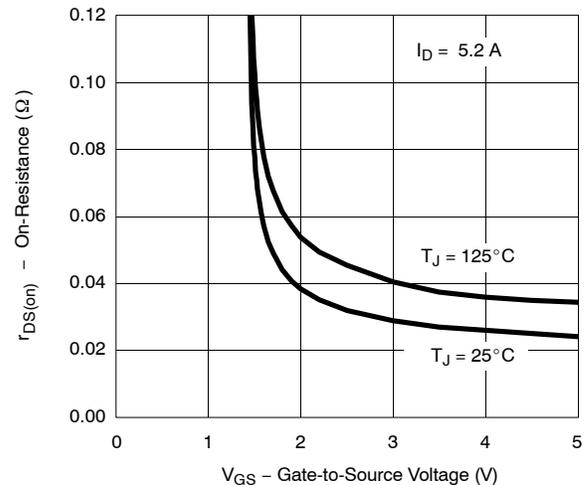
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

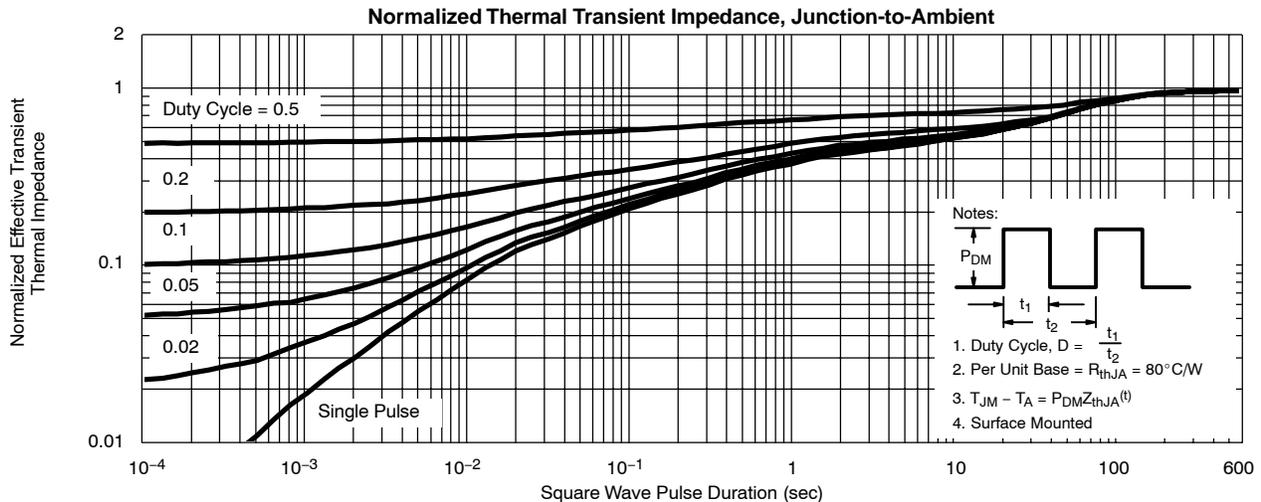
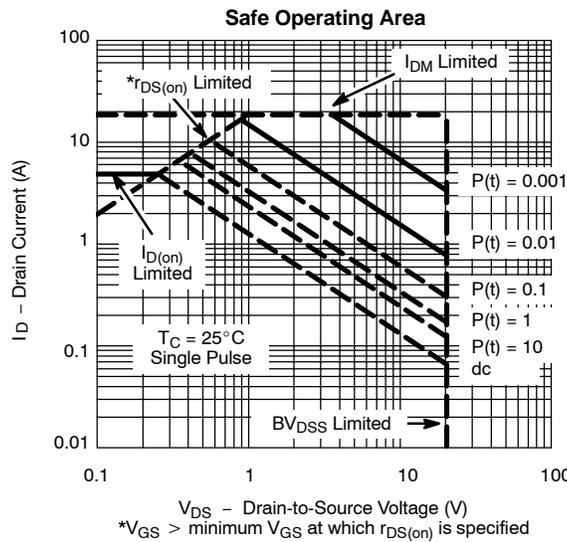
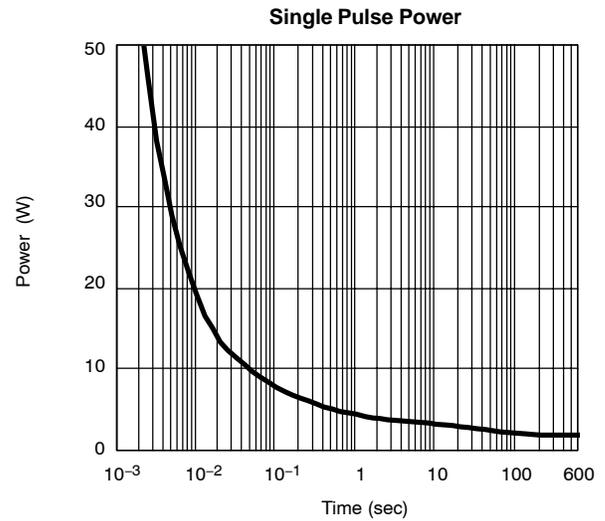
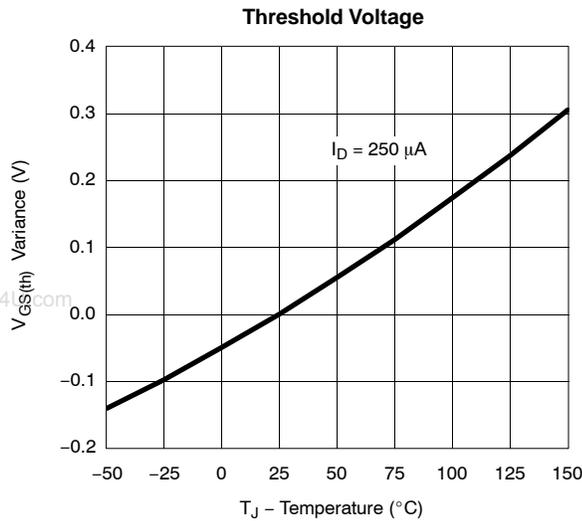


On-Resistance vs. Gate-to-Source Voltage





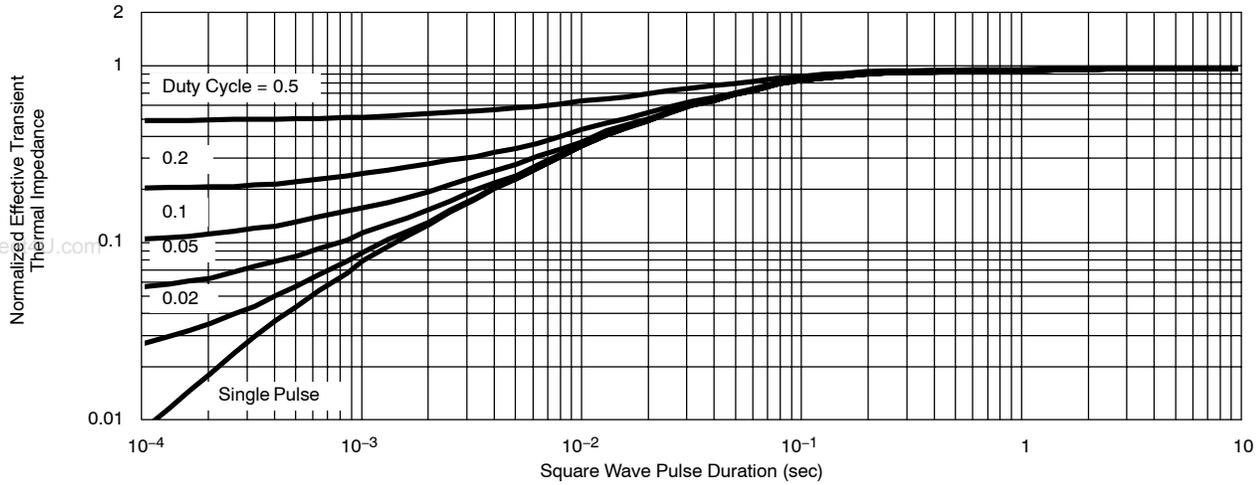
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**





**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**

Normalized Thermal Transient Impedance, Junction-to-Foot



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