



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

PRODUCT SUMMARY

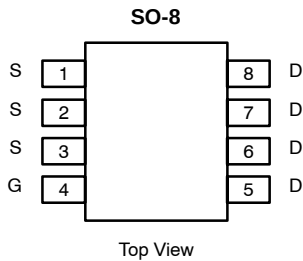
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
20	0.0027 @ $V_{GS} = 4.5$ V	25
	0.0042 @ $V_{GS} = 2.5$ V	22

FEATURES

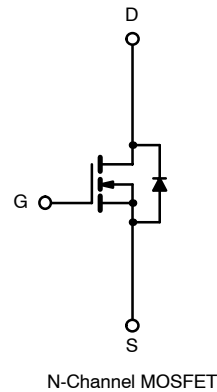
- Ultra Low On-Resistance Using High Density TrenchFET® Gen II Power MOSFET Technology
- Q_g Optimized
- 100% R_g Tested

APPLICATIONS

- Synchronous Rectification
- Point-Of-Load



Ordering Information: Si4378DY—E3
Si4378DY-T1—E3 (with Tape and Reel)

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

Parameter		Symbol	10 secs	Steady State	Unit
Drain-Source Voltage		V _{DS}	20		V
Gate-Source Voltage		V _{GS}	± 12		
Continuous Drain Current (T _J = 150°C) ^a	T _A = 25°C	I _D	25	19	A
	T _A = 70°C		20	13	
Pulsed Drain Current (10 μs Pulse Width)		I _{DM}	70		
Continuous Source Current (Diode Conduction) ^a		I _S	2.9	1.3	
Avalanche Current	L = 0.1 mH	I _{AS}	40		
Maximum Power Dissipation ^a	T _A = 25°C	P _D	3.5	1.6	W
	T _A = 70°C		2.2	1	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	-55 to 150		°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	$t \leq 10$ sec	R_{thJA}	29	35	$^\circ\text{C/W}$
	Steady State		67	80	
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	13	16	

Notes

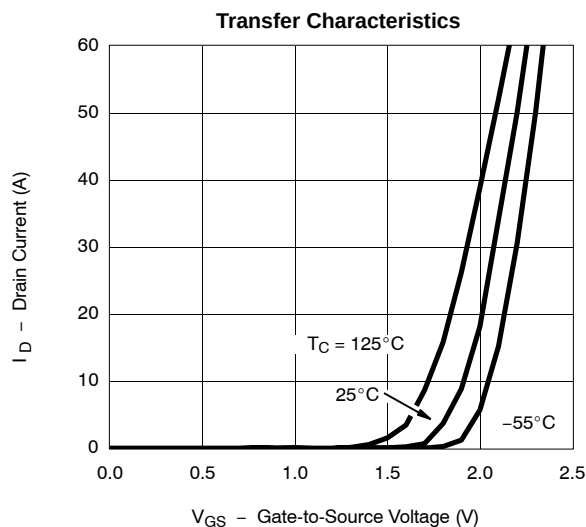
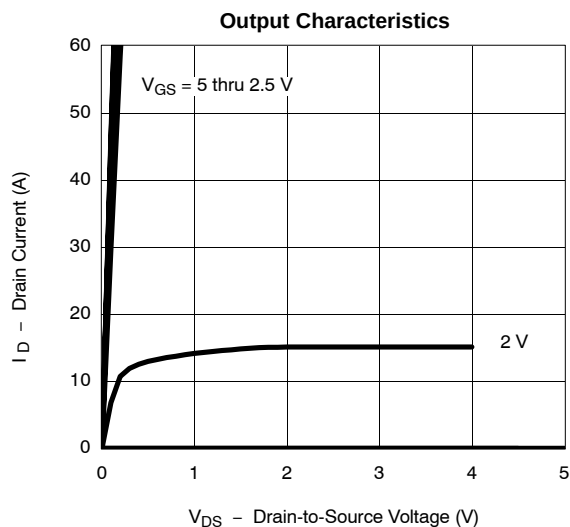
a. Surface Mounted on 1" x 1" FR4 Board.

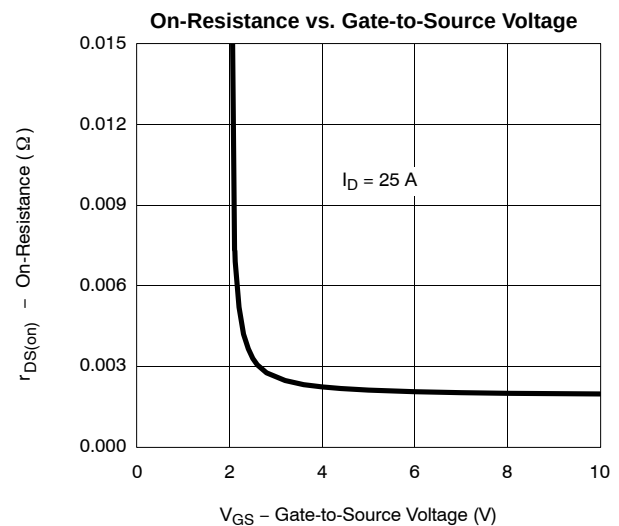
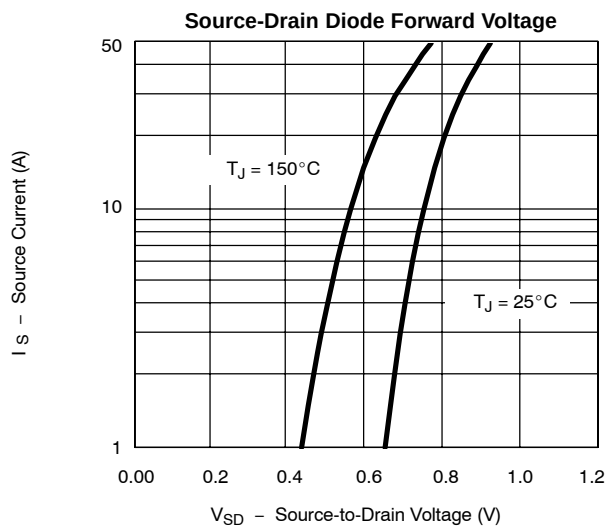
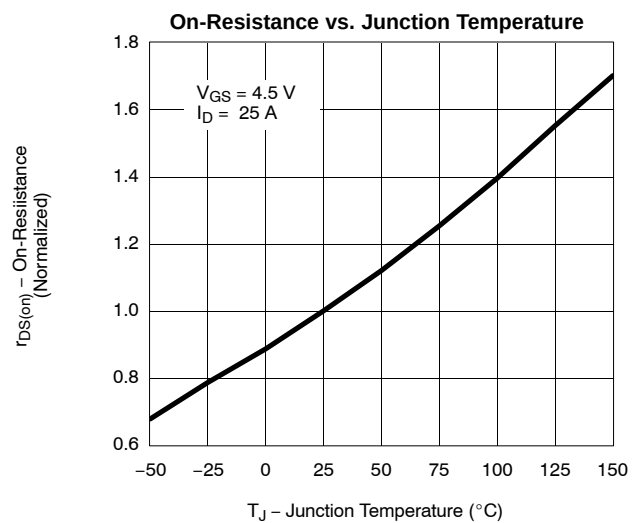
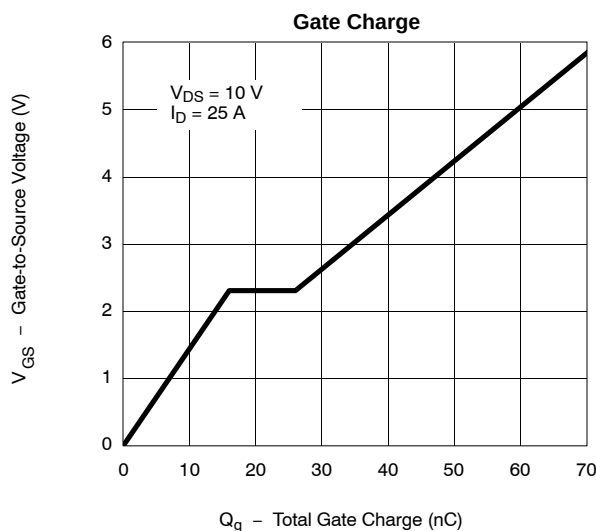
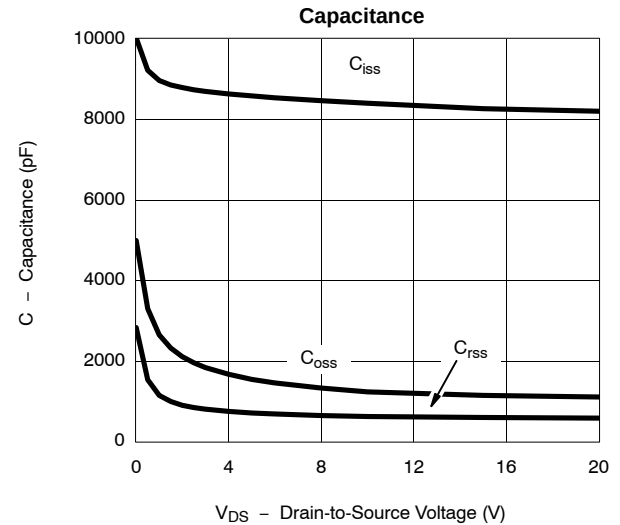
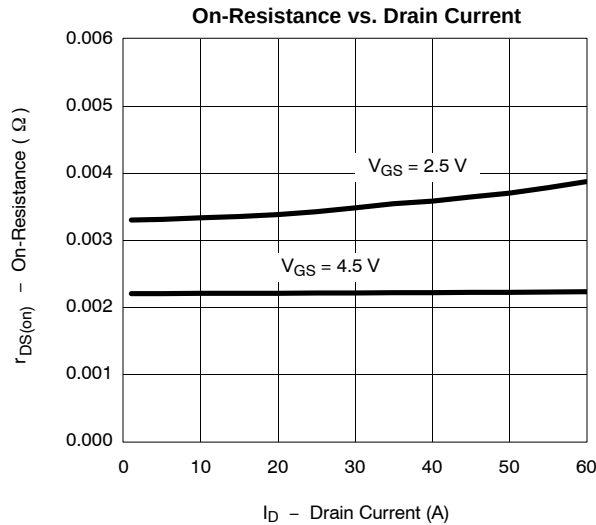
SPECIFICATIONS ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

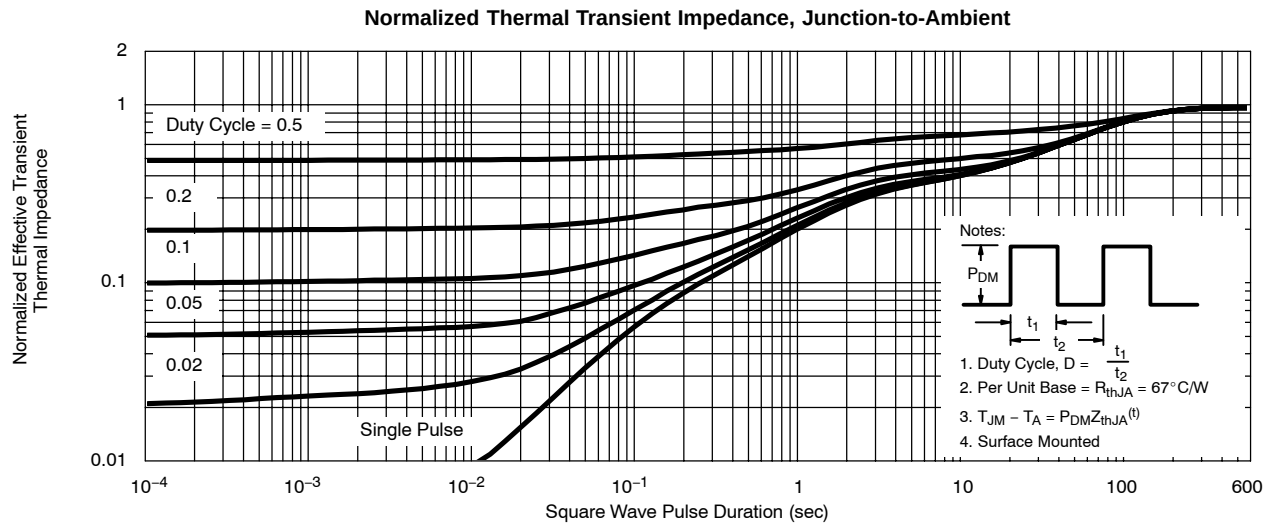
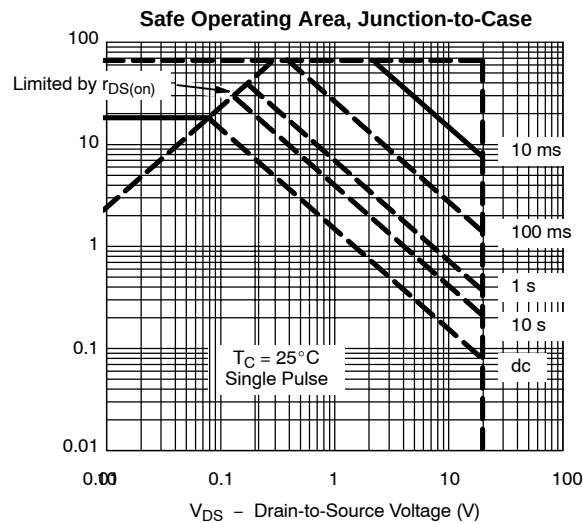
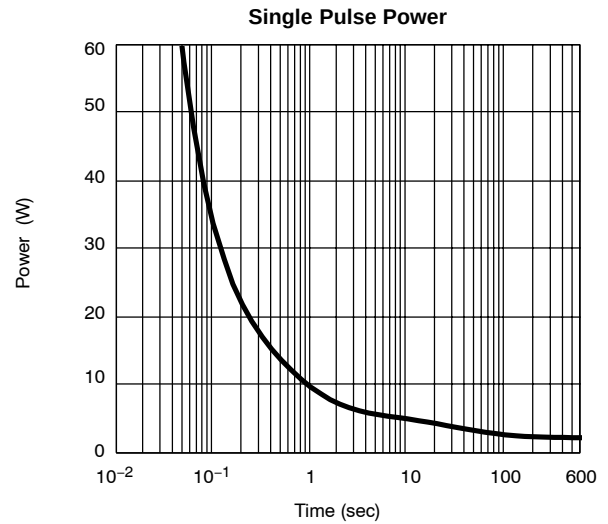
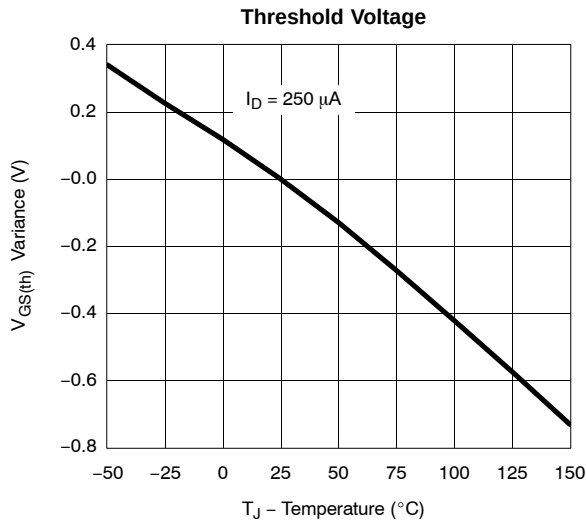
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	0.6		1.8	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\ \text{V}$, $V_{GS} = \pm 12\ \text{V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\ \text{V}$, $V_{GS} = 0\ \text{V}$			1	μA
		$V_{DS} = 20\ \text{V}$, $V_{GS} = 0\ \text{V}$, $T_J = 55^\circ\text{C}$			5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\ \text{V}$, $V_{GS} = 4.5\ \text{V}$	30			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 4.5\ \text{V}$, $I_D = 25\ \text{A}$		0.0022	0.0027	Ω
		$V_{GS} = 2.5\ \text{V}$, $I_D = 22\ \text{A}$		0.0034	0.0042	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\ \text{V}$, $I_D = 25\ \text{A}$		150		S
Diode Forward Voltage ^a	V_{SD}	$I_S = 2.9\ \text{A}$, $V_{GS} = 0\ \text{V}$		0.72	1.1	V
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 10\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$		8500		pF
Output Capacitance	C_{oss}			1250		
Reverse Transfer Capacitance	C_{rss}			650		
Total Gate Charge	Q_g	$V_{DS} = 10\ \text{V}$, $V_{GS} = 4.5\ \text{V}$, $I_D = 25\ \text{A}$		55		nC
Gate-Source Charge	Q_{gs}			16		
Gate-Drain Charge	Q_{gd}			10		
Gate Resistance	R_g		0.8	1.3	2.0	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\ \text{V}$, $R_L = 10\ \Omega$ $I_D \cong 1\ \text{A}$, $V_{GEN} = 4.5\ \text{V}$, $R_g = 6\ \Omega$		85	130	ns
Rise Time	t_r			65	100	
Turn-Off Delay Time	$t_{d(off)}$			140	210	
Fall Time	t_f			50	80	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = 2.9\ \text{A}$, $di/dt = 100\ \text{A}/\mu\text{s}$		50	80	

Notes

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

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

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