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

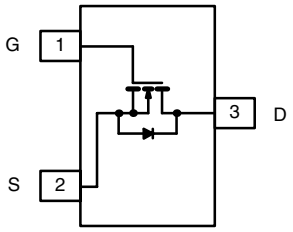
PRODUCT SUMMARY			
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ)
20	0.85 at V_{GS} = 4.5 V	0.4	335
	1.08 at V_{GS} = 2.5 V	0.35	

FEATURES

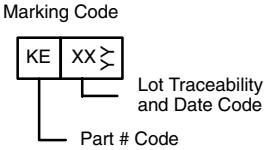
- TrenchFET® Power MOSFET
- 100 % R_g Tested

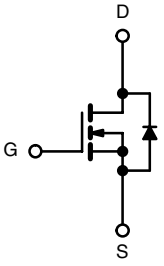
Pb-free
RoHS COMPLIANT

SC-70 (3-LEADS)



Top View





Ordering Information: Si1300BDL–T1–E3

N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C UNLESS OTHERWISE NOTED)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	± 8	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	0.4	A
	T_C = 70 °C		0.32	
	T_A = 25 °C		0.37[b, c]	
	T_A = 70 °C		0.30[b, c]	
Pulsed Drain Current		I_{DM}	0.5	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	0.18	
	T_A = 25 °C		0.14[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	0.2	W
	T_C = 70 °C		0.14	
	T_A = 25 °C		0.19	
	T_A = 70 °C		0.12[b, c]	
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[b, d]	t ≤ 5 sec	R_{thJA}	540	670	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	450	570	

Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 sec
d. Maximum under steady state conditions is 360 °C/W.

SPECIFICATIONS (T_J = 25 °C UNLESS OTHERWISE NOTED)

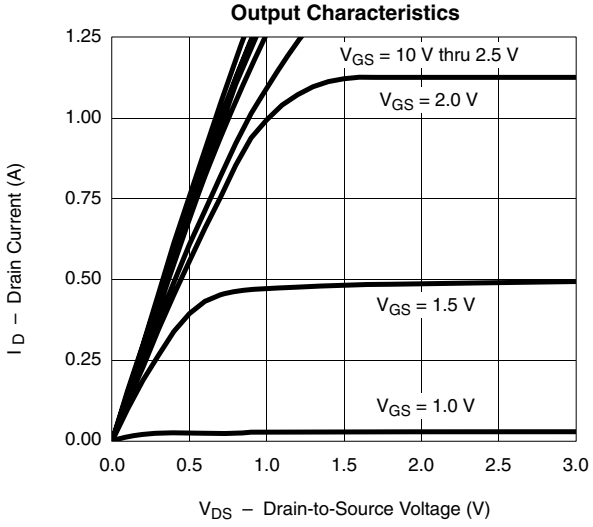
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 μA	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 μA		20		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			–2.8		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	0.4		1.0	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			100	nA
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 55 °C			5	μA
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} ≥ 5 V, V_{GS} = 4.5 V	0.4			A
		V_{DS} ≥ 5 V, V_{GS} = 2.5 V	0.12			
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 4.5 V, I_D = 0.25		0.65	0.85	Ω
		V_{GS} =2.5 V, I_D = 0.15		0.85	1.08	
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz		35		pF
Output Capacitance	C_{oss}			13		
Reverse Transfer Capacitance	C_{rss}			4		
Total Gate Charge	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 0.4		560	840	pC
		V_{DS} = 10 V, V_{GS} = 2.5 V, I_D= 0.35		335	503	
Gate-Source Charge	Q_{gs}			98		
Gate-Drain Charge	Q_{gd}			85		
Gate Resistance	R_g	f = 1 MHz		7	12	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 10 V, R_L = 25 Ω I_D ≅ 0.4 A, V_{GEN} = 4.5 V, R_g = 1 Ω		7	12	ns
Rise Time	t_r			10	15	
Turn-Off Delay Time	$t_{d(off)}$			8	13	
Fall Time	t_f			7	12	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			0.18	A
Pulse Diode Forward Current[a]	I_{SM}				0.4	
Body Diode Voltage	V_{SD}	I_S = 0.05 A		0.7	1.2	V

Notes
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

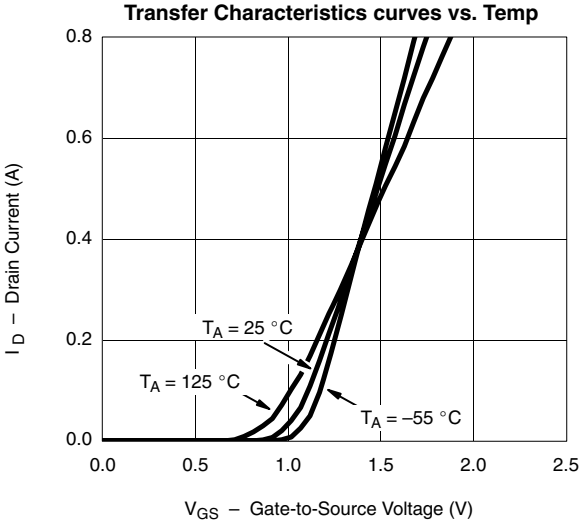
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

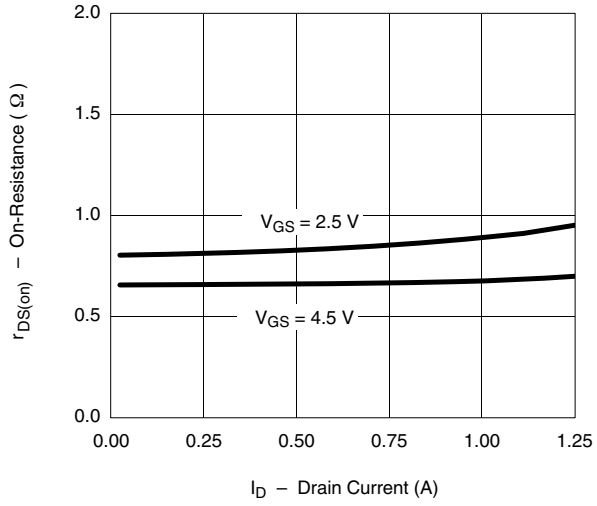
Output Characteristics



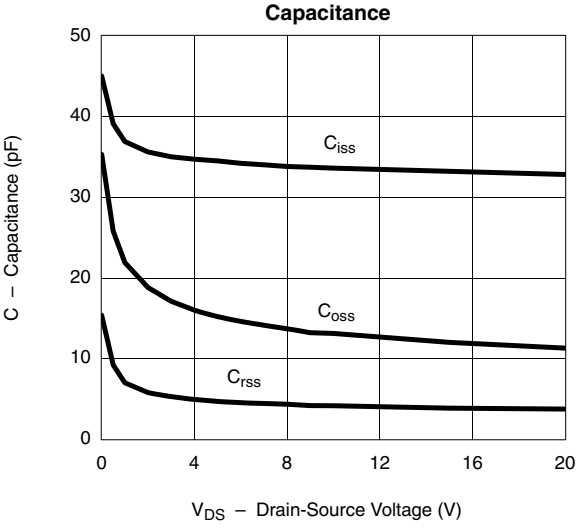
Transfer Characteristics curves vs. Temp



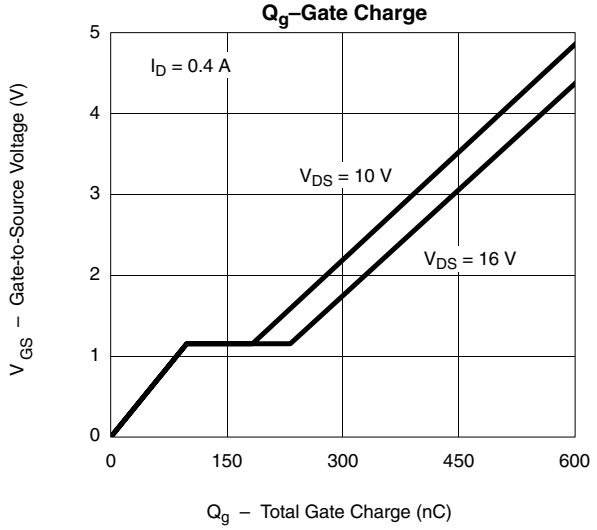
On-Resistance vs. Drain Current



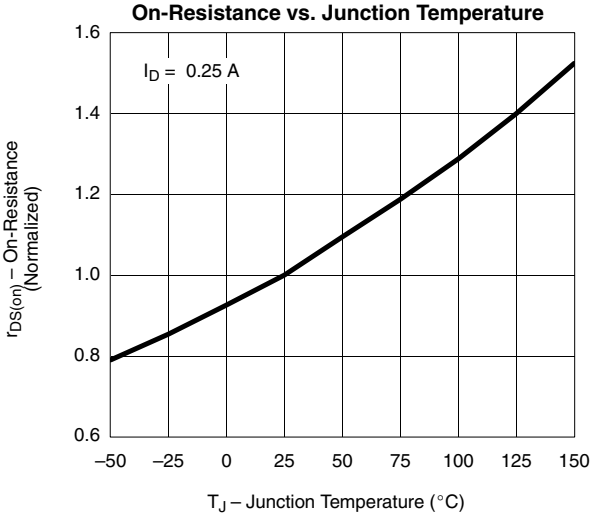
Capacitance



Q_g–Gate Charge

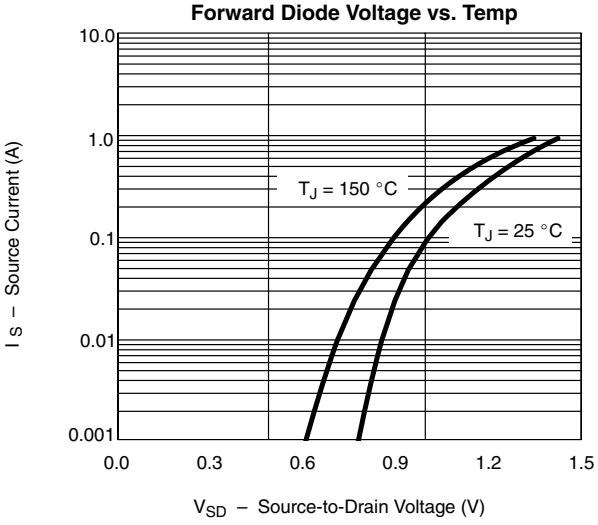


On-Resistance vs. Junction Temperature

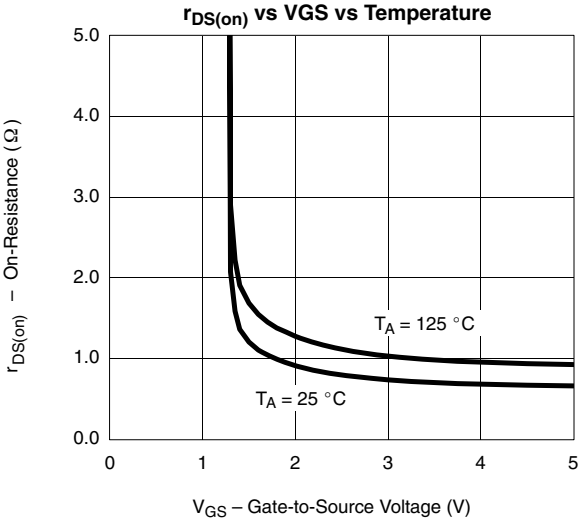


TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

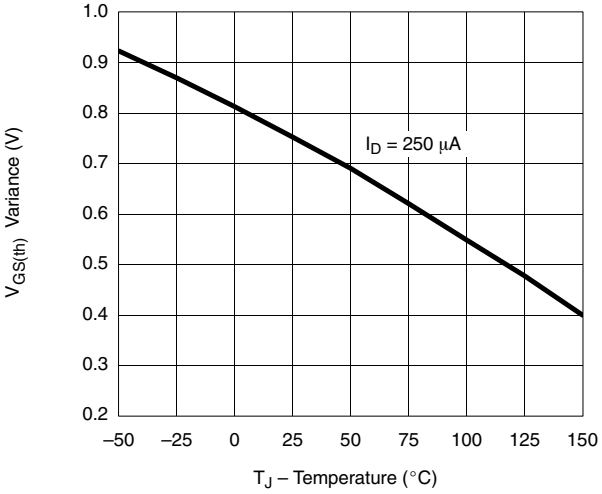
Forward Diode Voltage vs. Temp



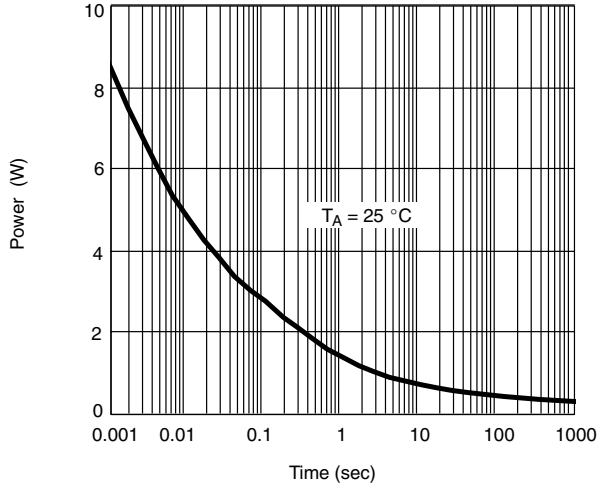
$r_{DS(on)}$ vs VGS vs Temperature



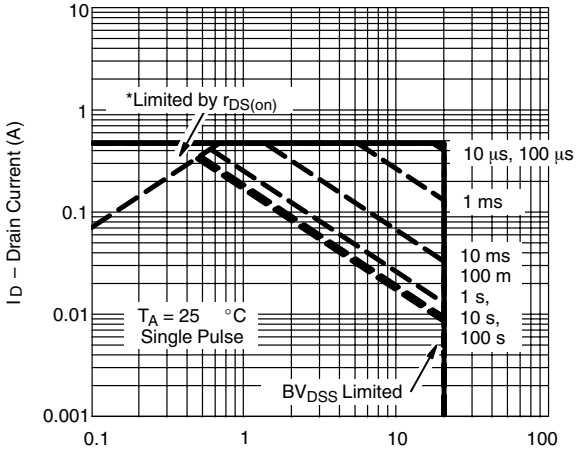
Threshold Voltage



Single Pulse Power, Junction-to-Ambient

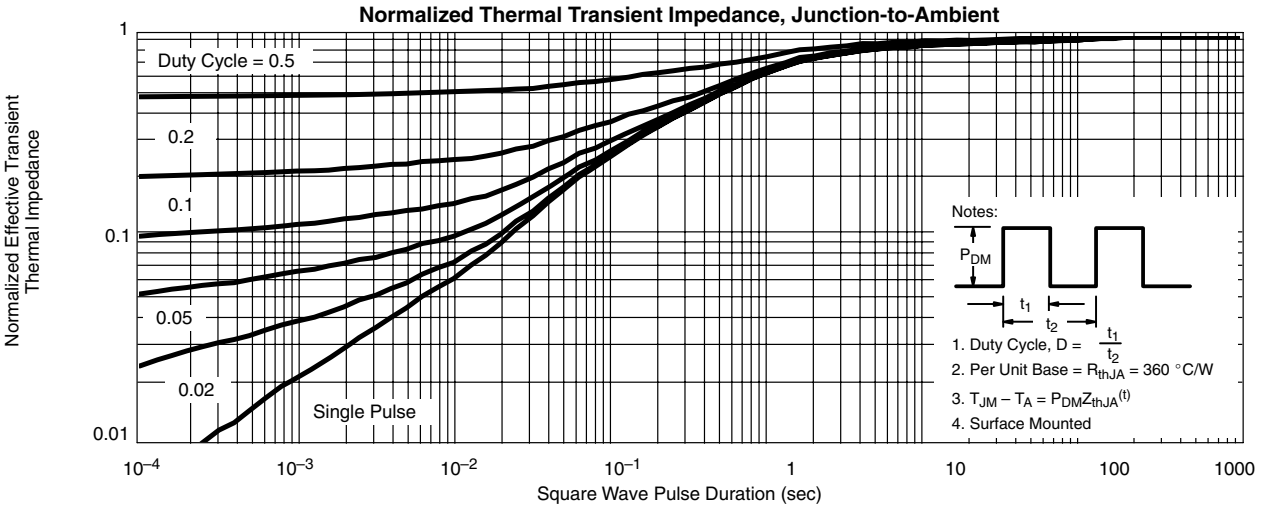


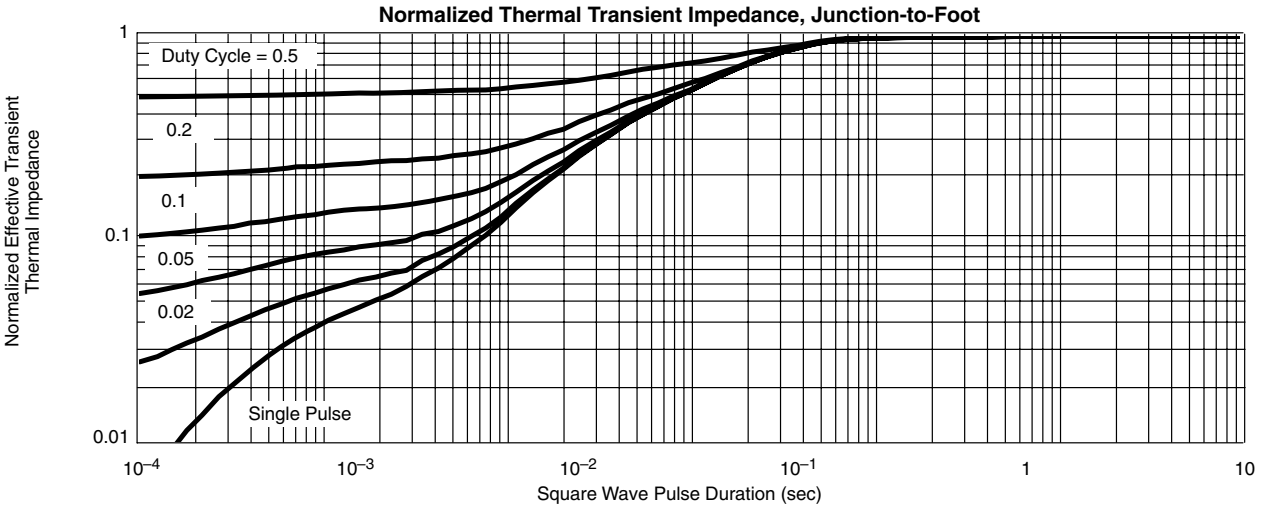
Safe Operating Area



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

TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)





*The power dissipation P_D is based on $T_{J(max)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

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