

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	0.335
	1.08 at $V_{GS} = 2.5$ V	0.35	

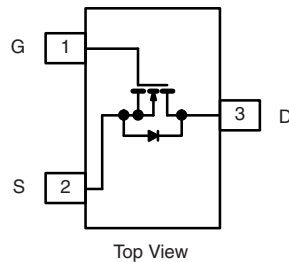
FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

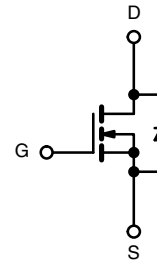
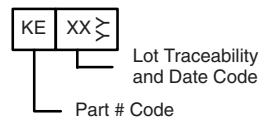


RoHS
COMPLIANT
HALOGEN
FREE
Available

SC-70 (3-LEADS)



Marking Code



N-Channel MOSFET

Ordering Information: Si1300BDL-T1-E3 (Lead (Pb)-free)
Si1300BDL-T1-GE3 (Lead (Pb)-free and Halogen-free)

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)	I_D	$T_C = 25$ °C	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	I_S	$T_C = 25$ °C	0.18	
		$T_A = 25$ °C	0.14 ^{b, c}	
Maximum Power Dissipation	P_D	$T_C = 25$ °C	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}	R_{thJA}	540	670	°C/W	
Maximum Junction-to-Foot (Drain)	R_{thJF}	450	570		

Notes:

- Based on $T_C = 25$ °C.
- Surface mounted on 1" x 1" FR4 board.
- $t = 5$ s.
- Maximum under steady state conditions is 360 °C/W.

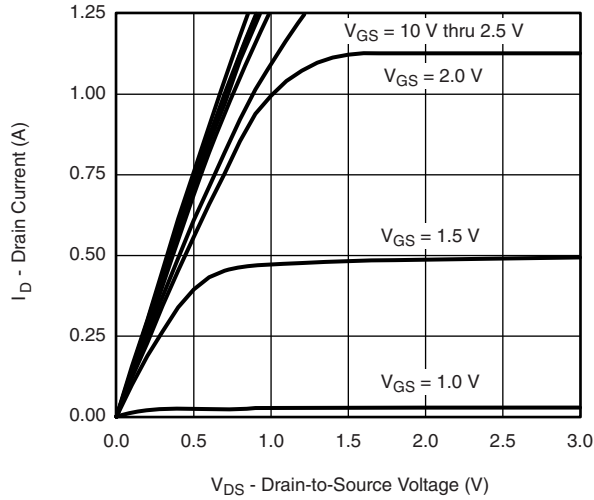
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		20		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-2.8		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.4		1.0	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			100	nA
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			5	μA
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$	0.4			A
		$V_{DS} \geq 5\text{ V}, V_{GS} = 2.5\text{ V}$	0.12			
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 0.25$		0.65	0.85	Ω
		$V_{GS} = 2.5\text{ V}, I_D = 0.15$		0.85	1.08	
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		35		pF
Output Capacitance	C_{oss}			13		
Reverse Transfer Capacitance	C_{rss}			4		
Total Gate Charge	Q_g	$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 0.4$		560	840	pC
		$V_{DS} = 10\text{ V}, V_{GS} = 2.5\text{ V}, I_D = 0.35$		335	503	
Q_{gs}			98			
Q_{gd}			85			
Gate Resistance	R_g	$f = 1\text{ MHz}$	1.5	7	12	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 25\text{ }\Omega$ $I_D \cong 0.4\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		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	$T_C = 25\text{ }^\circ\text{C}$			0.18	A
Pulse Diode Forward Current ^a	I_{SM}				0.4	
Body Diode Voltage	V_{SD}	$I_S = 0.05\text{ A}$		0.7	1.2	V

Notes:

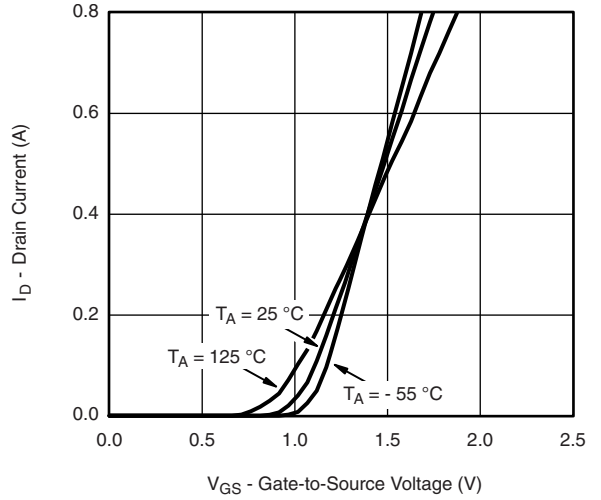
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

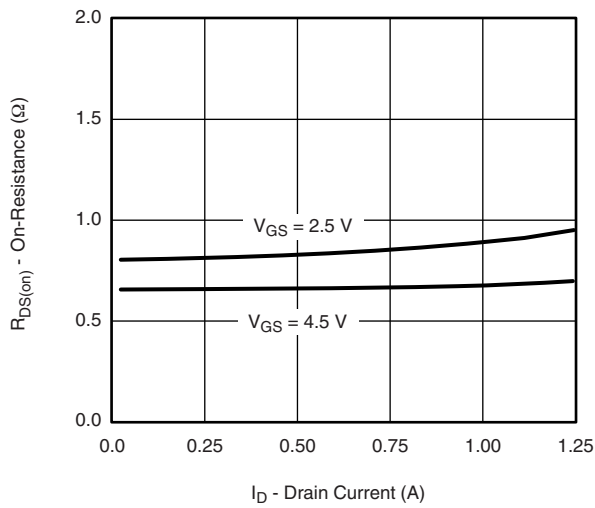
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



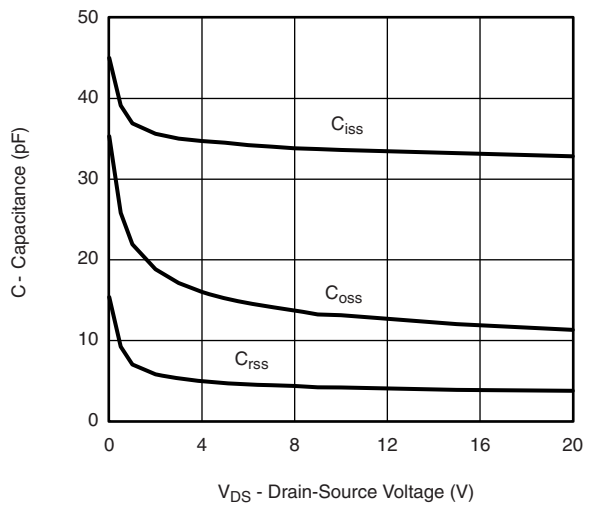
Output Characteristics



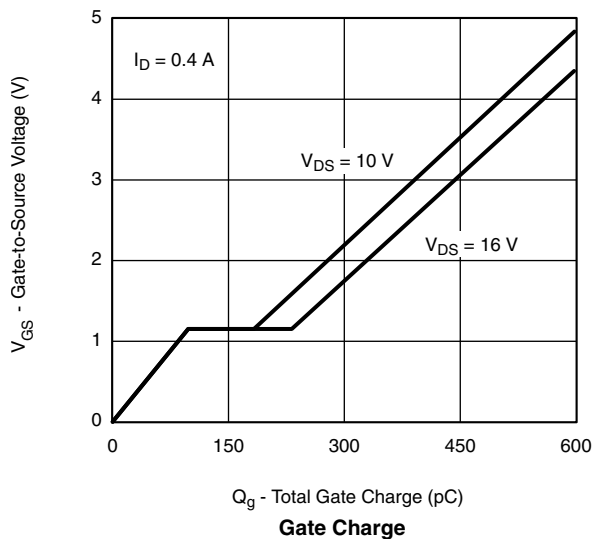
Transfer Characteristics Curves vs. Temperature



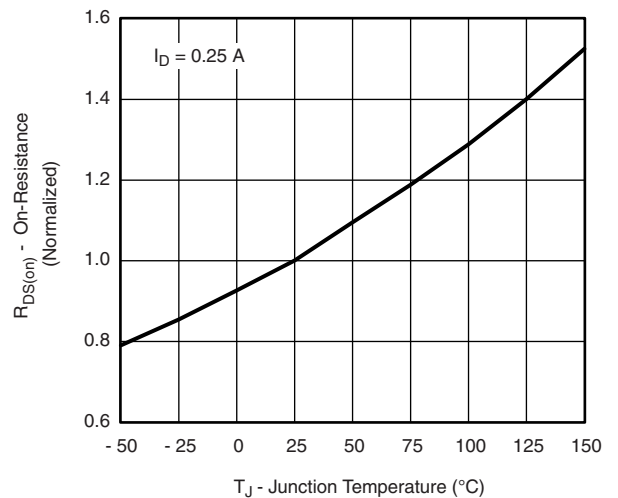
On-Resistance vs. Drain Current



Capacitance

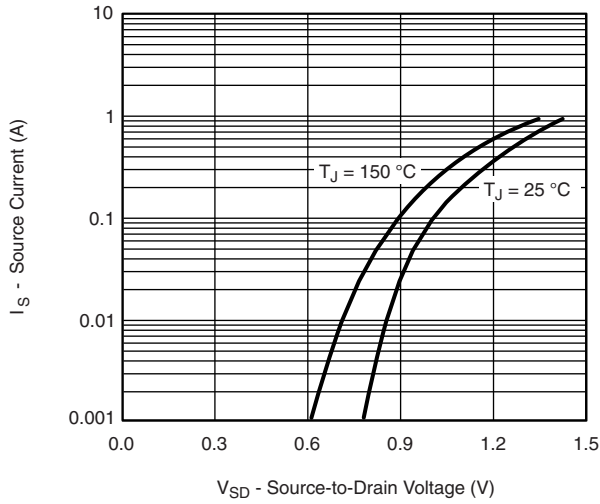


Gate Charge

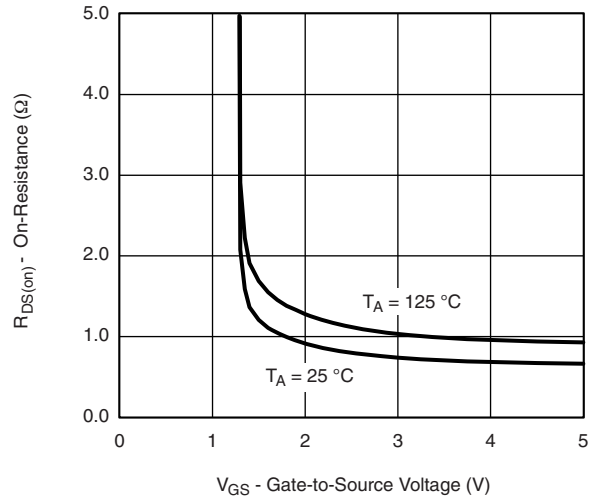


On-Resistance vs. Junction Temperature

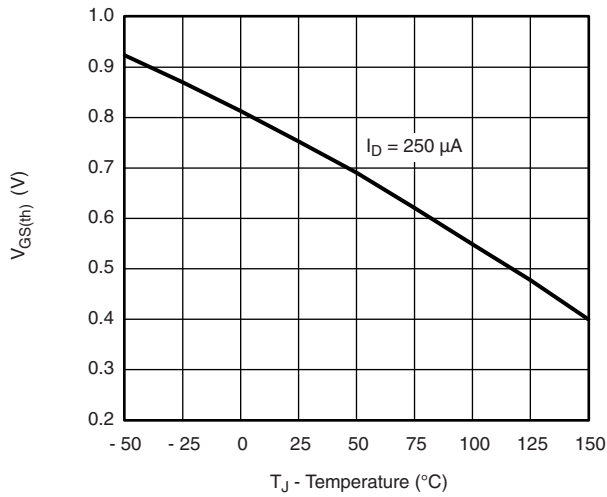
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



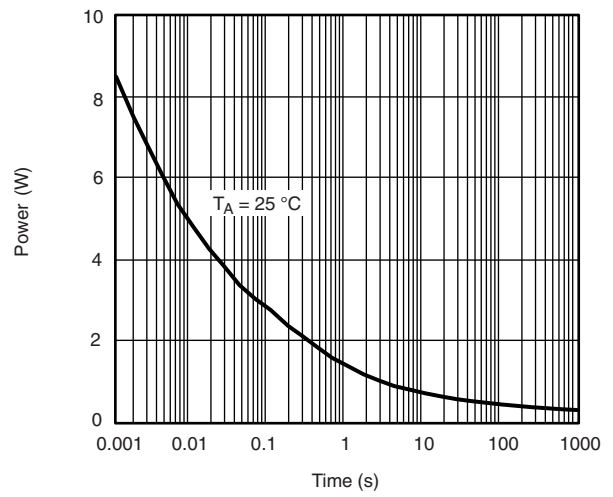
Forward Diode Voltage vs. Temperature



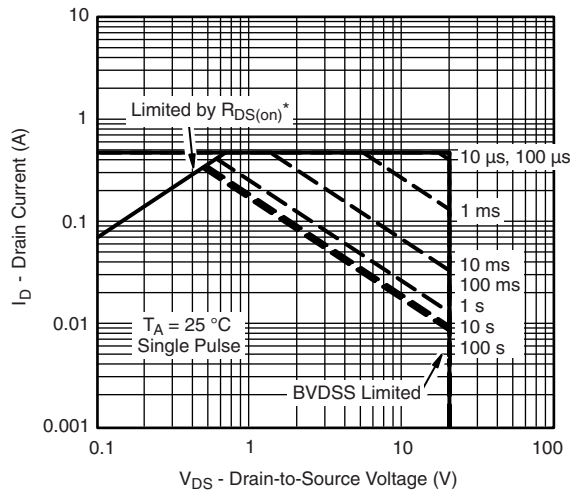
$R_{DS(on)}$ vs. V_{GS} vs. Temperature



Threshold Voltage



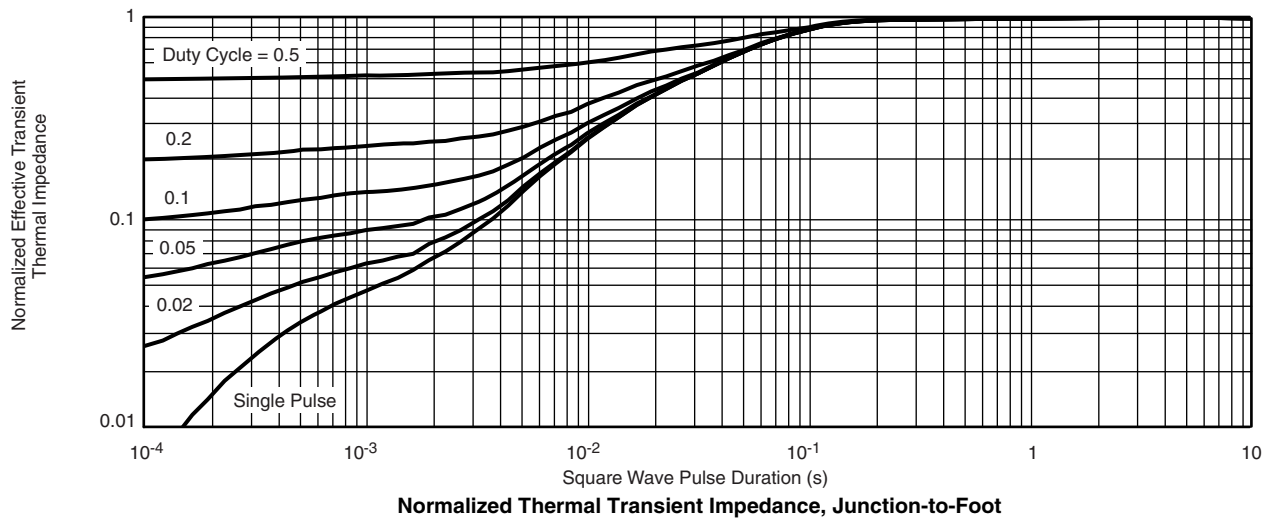
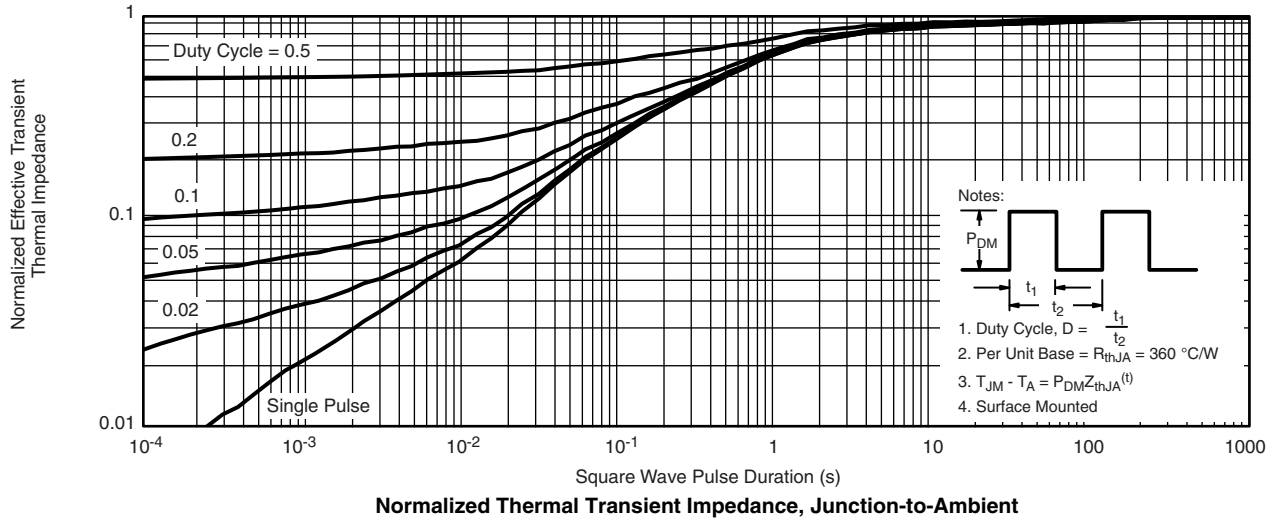
Single Pulse Power, Junction-to-Ambient



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

Safe Operating Area

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



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