

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

PRODUCT SUMMARY			
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>	$Q_g$ (Typ.)
20	0.85 at $V_{GS} = 4.5$ V	0.4	0.335
	1.08 at $V_{GS} = 2.5$ V	0.35	

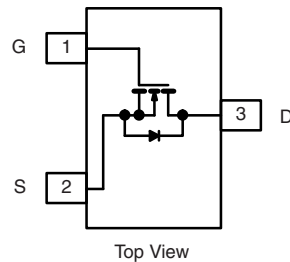
### FEATURES

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

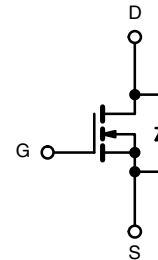
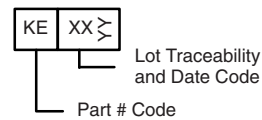


**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

### 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	$V_{GS}$	$\pm 8$		
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 <sup>b, c</sup>	
		$T_A = 70$ °C	0.30 <sup>b, c</sup>	
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 <sup>b, c</sup>	
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 <sup>b, c</sup>	
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 <sup>b, d</sup>	$R_{thJA}$	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.

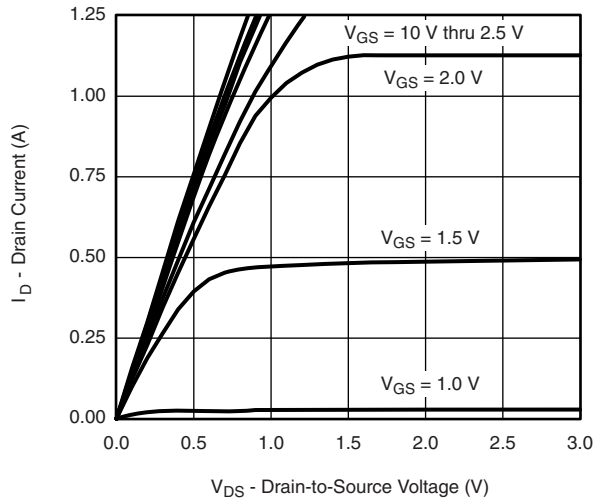
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		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	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			$\pm 100$	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	$\mu\text{A}$
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$	0.4			A
		$V_{DS} \geq 5\text{ V}, V_{GS} = 2.5\text{ V}$	0.12			
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 0.25$		0.65	0.85	$\Omega$
		$V_{GS} = 2.5\text{ V}, I_D = 0.15$		0.85	1.08	
<b>Dynamic<sup>b</sup></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	$\Omega$
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	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$			0.18	A
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				0.4	
Body Diode Voltage	$V_{SD}$	$I_S = 0.05\text{ A}$		0.7	1.2	V

## Notes:

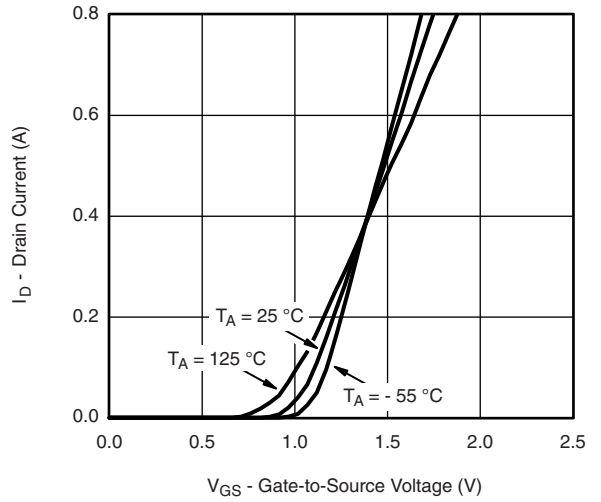
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. Guaranteed by design, not subject to production testing.

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.

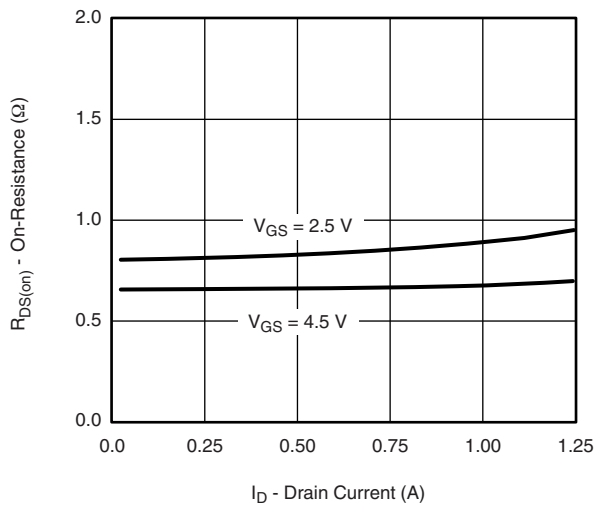
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



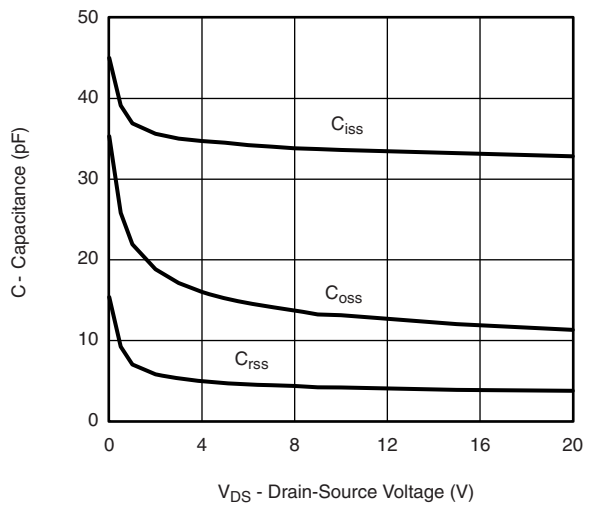
**Output Characteristics**



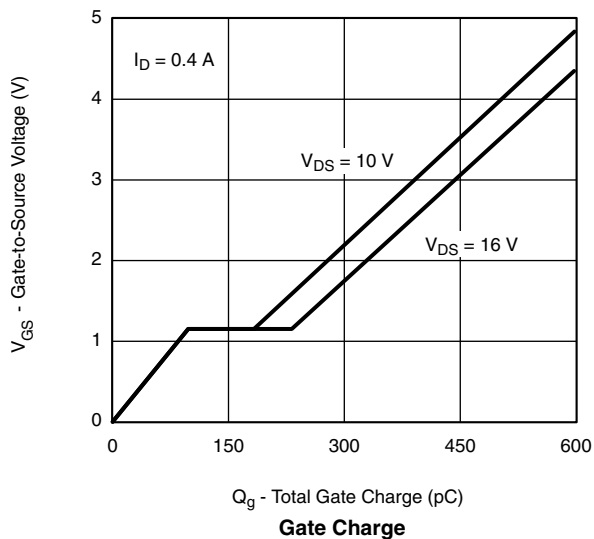
**Transfer Characteristics Curves vs. Temperature**



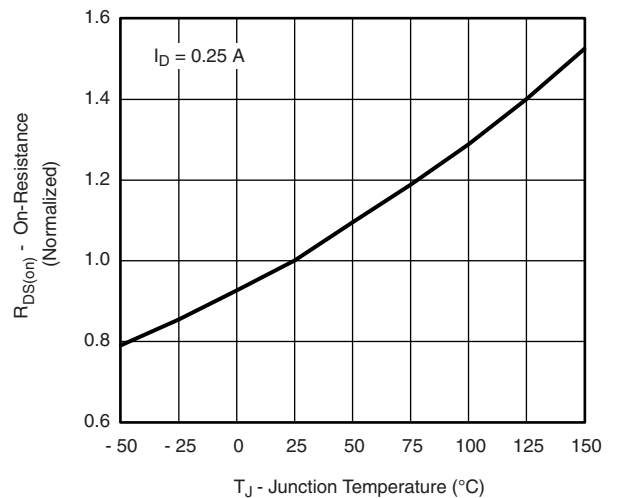
**On-Resistance vs. Drain Current**



**Capacitance**

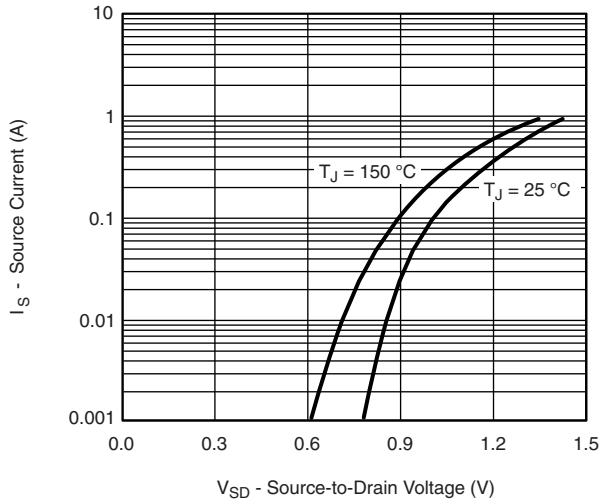


**Gate Charge**

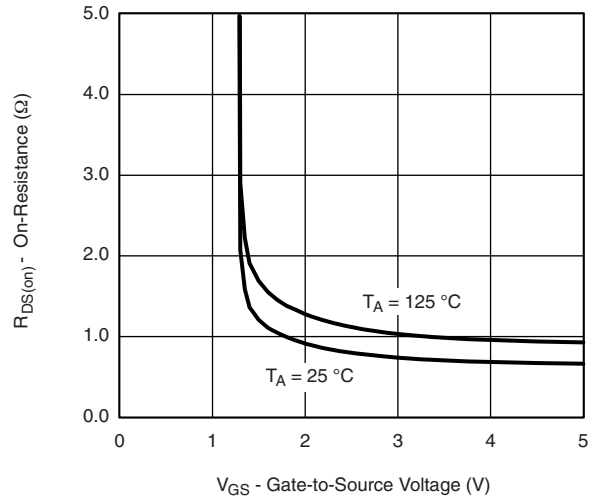


**On-Resistance vs. Junction Temperature**

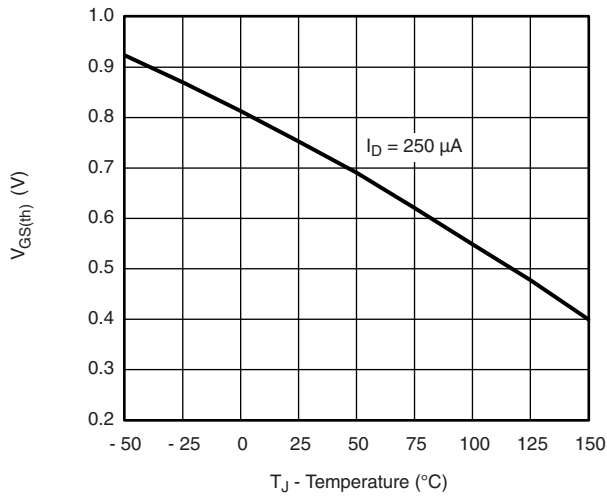
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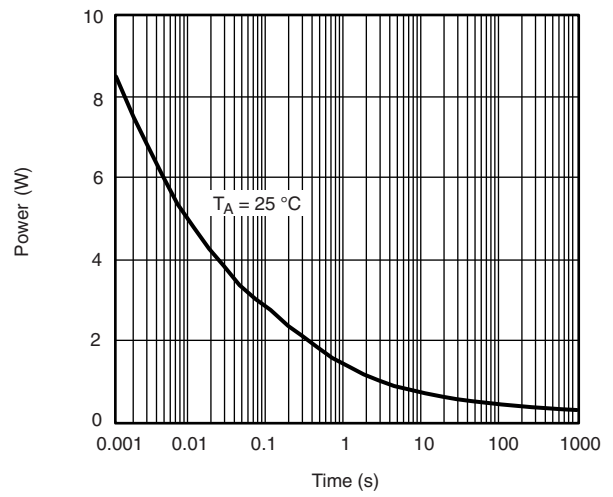
Forward Diode Voltage vs. Temperature



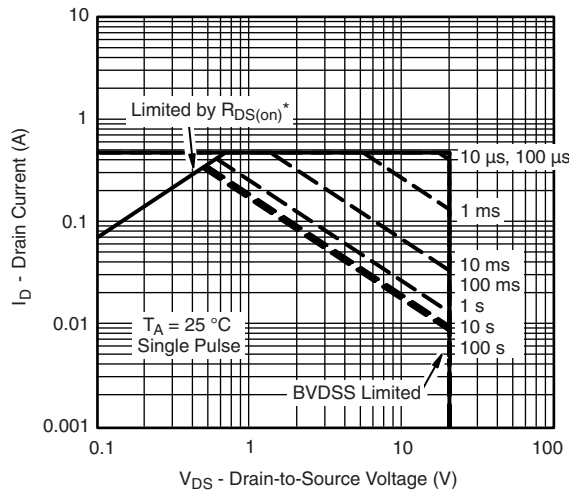
$R_{DS(on)}$  vs.  $V_{GS}$  vs. Temperature



Threshold Voltage



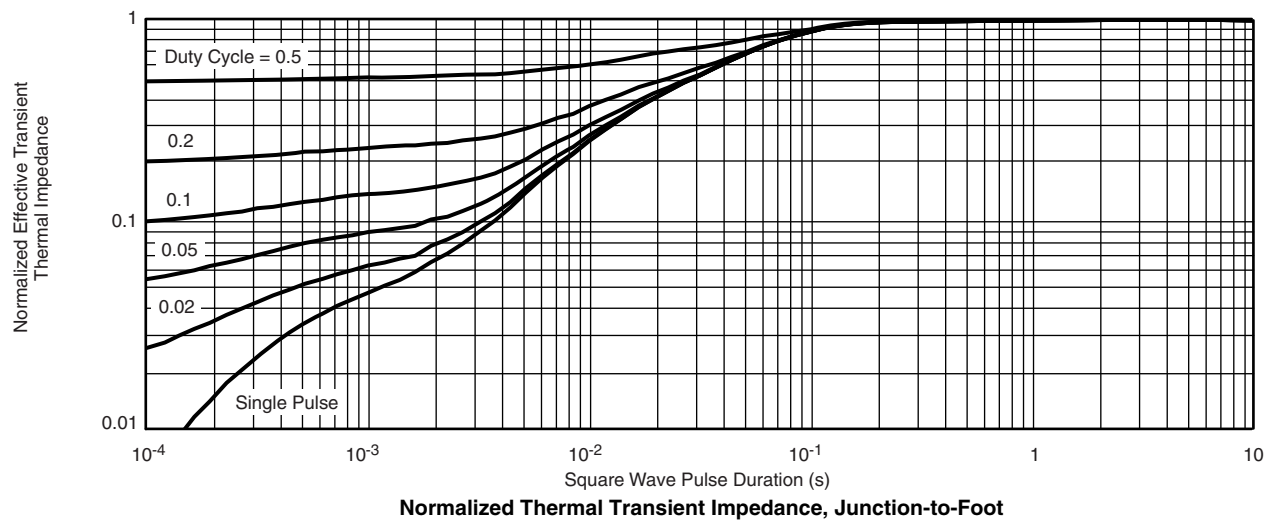
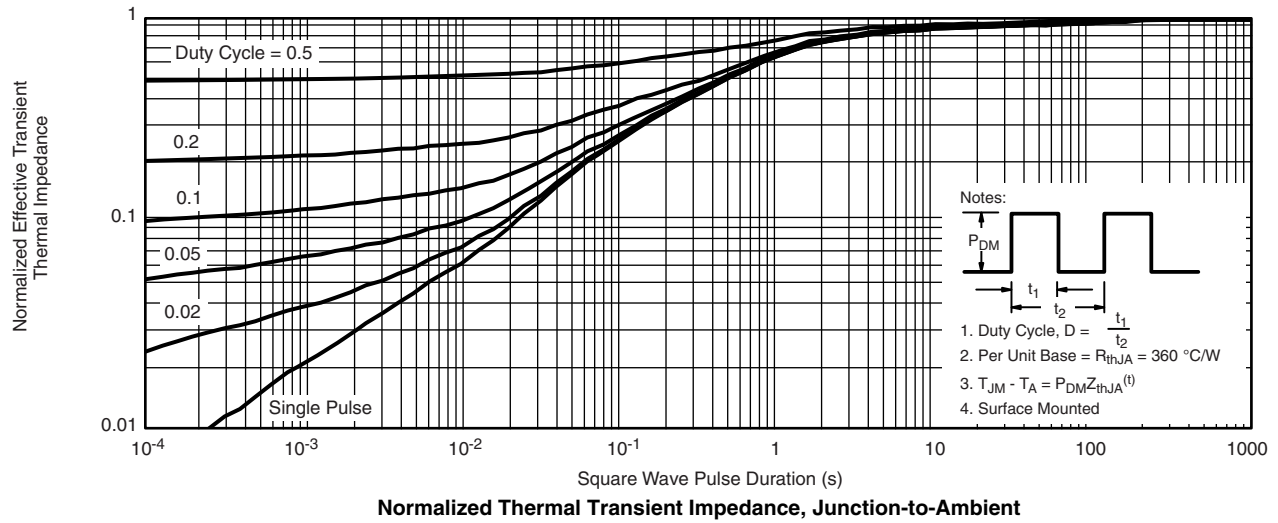
Single Pulse Power, Junction-to-Ambient



Safe Operating Area

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

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



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