



New Product

Si1300BDL  
Vishay Siliconix

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

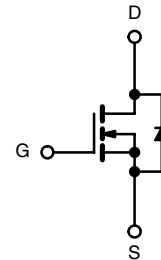
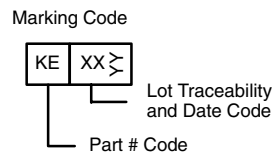
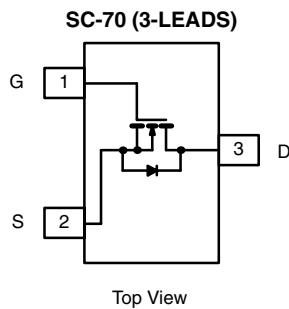


RoHS  
COMPLIANT

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	335
	1.08 at $V_{GS} = 2.5$ V	0.35	

### FEATURES

- TrenchFET<sup>®</sup> Power MOSFET
- 100 %  $R_g$  Tested



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		$V_{GS}$	$\pm 8$	
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 <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	$T_C = 25$ °C	$I_S$	0.18	
	$T_A = 25$ °C		0.14 <sup>b, c</sup>	
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 <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>	$t \leq 5$ sec	$R_{thJA}$	540	670	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	$R_{thJF}$	450	570	

Notes:

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

SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	20			V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = 250 μA		20		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>			-2.8		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	0.4		1.0	V
Gate-Source 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			100	nA
		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			5	μA
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	0.4			A
		V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 2.5 V	0.12			
Drain-Source On-State Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 0.25		0.65	0.85	Ω
		V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 0.15		0.85	1.08	
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz		35		pF
Output Capacitance	C <sub>oss</sub>			13		
Reverse Transfer Capacitance	C <sub>rss</sub>			4		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 0.4		560	840	pC
		V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 0.35		335	503	
Gate-Source Charge	Q <sub>gs</sub>			98		
Gate-Drain Charge	Q <sub>gd</sub>		85			
Gate Resistance	R <sub>g</sub>	f = 1 MHz		7	12	Ω
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 10 V, R <sub>L</sub> = 25 Ω I <sub>D</sub> = 0.4 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 1 Ω		7	12	ns
Rise Time	t <sub>r</sub>			10	15	
Turn-Off Delay Time	t <sub>d(off)</sub>			8	13	
Fall Time	t <sub>f</sub>			7	12	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			0.18	A
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				0.4	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 0.05 A		0.7	1.2	V

## Notes

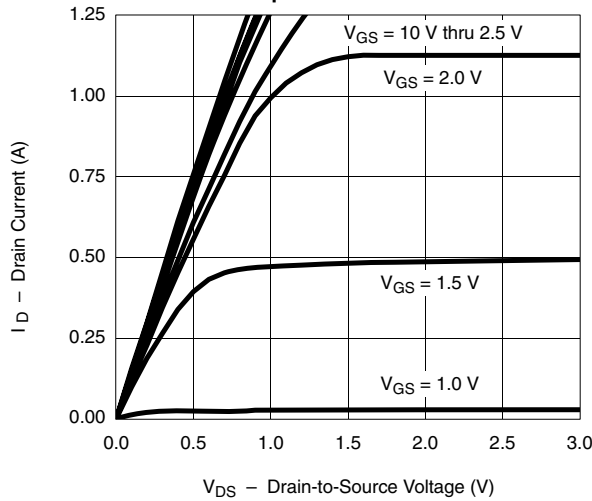
- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.  
b. Guaranteed by design, not subject to production testing.

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.

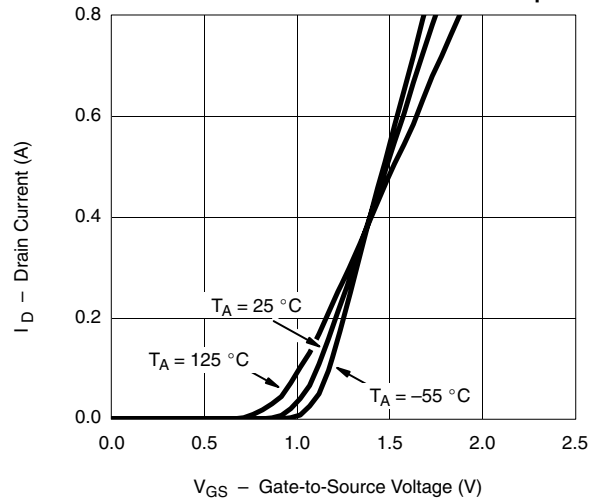


**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**

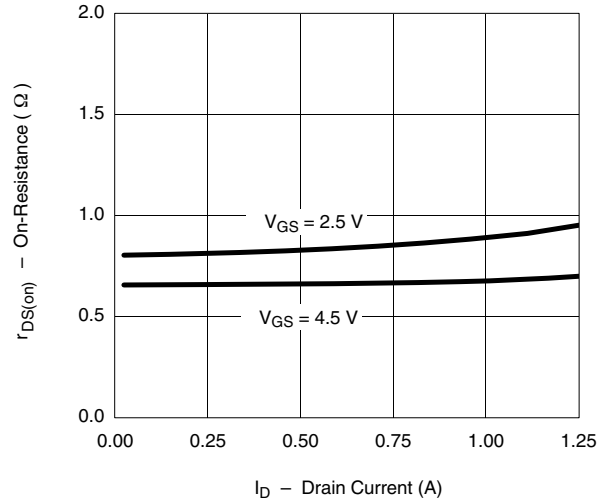
**Output Characteristics**



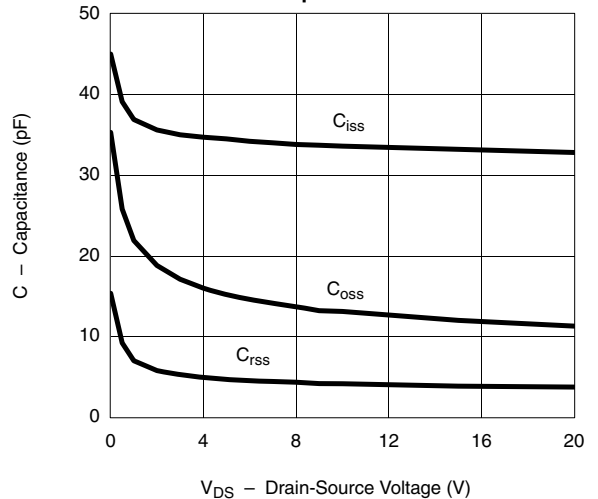
**Transfer Characteristics curves vs. Temp**



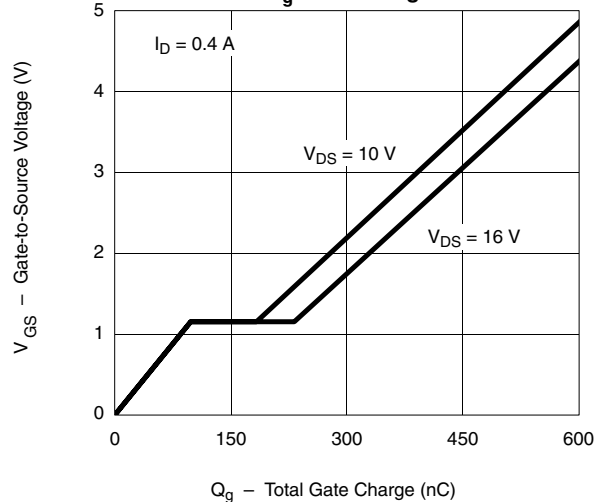
**On-Resistance vs. Drain Current**



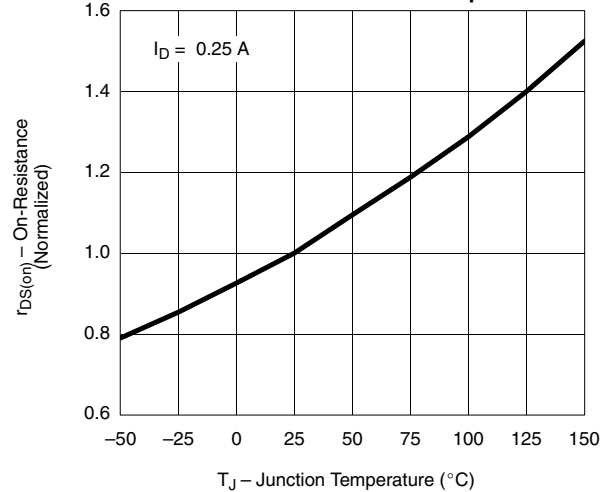
**Capacitance**



**Qg - Gate Charge**

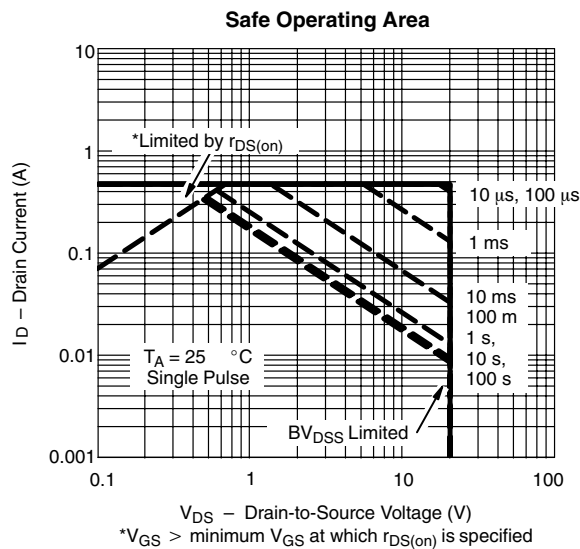
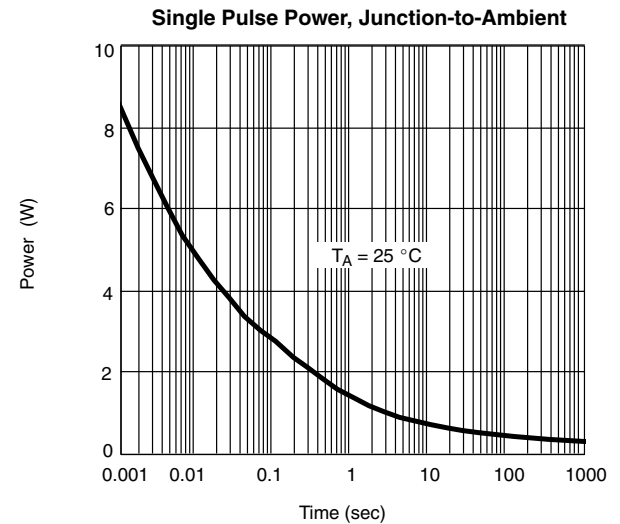
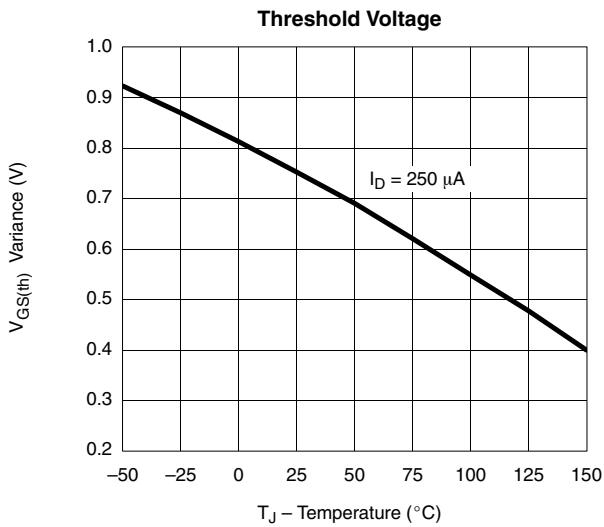
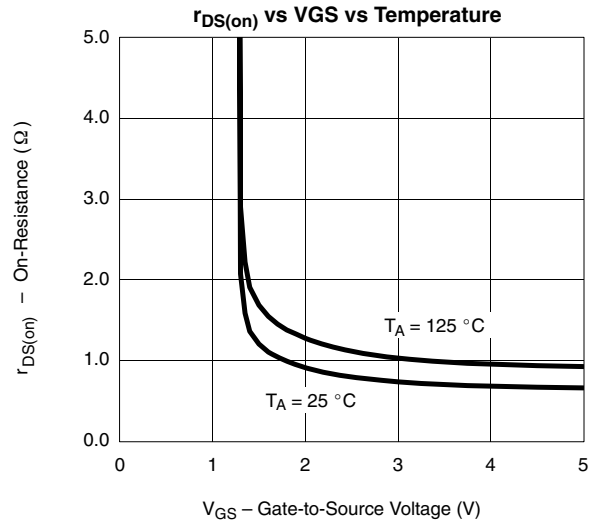
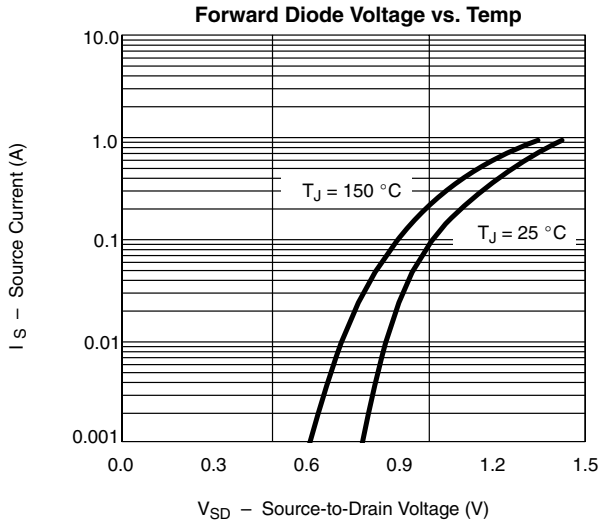


**On-Resistance vs. Junction Temperature**





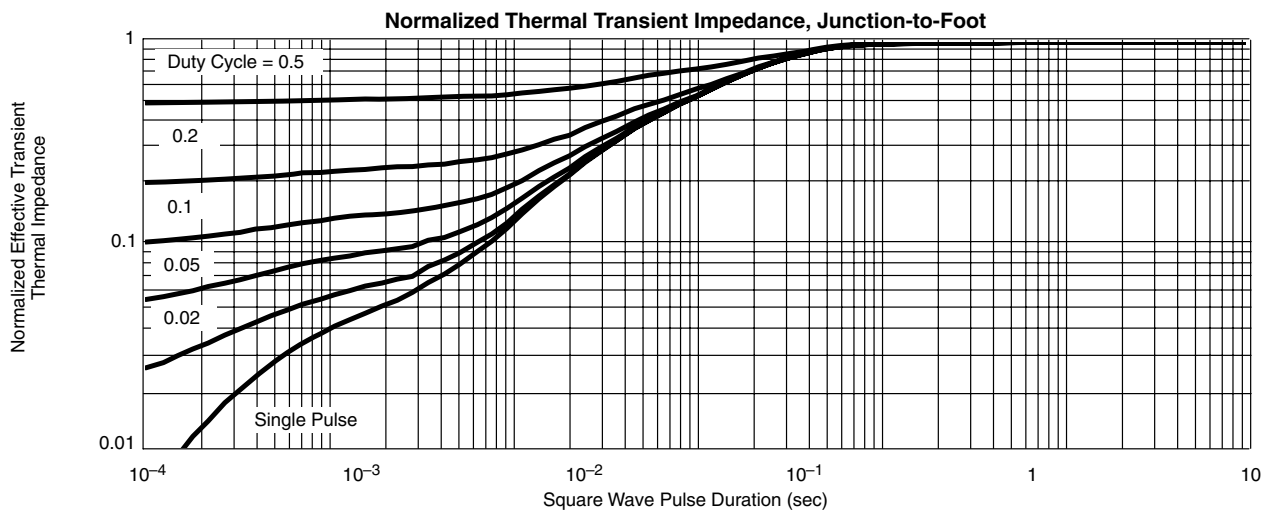
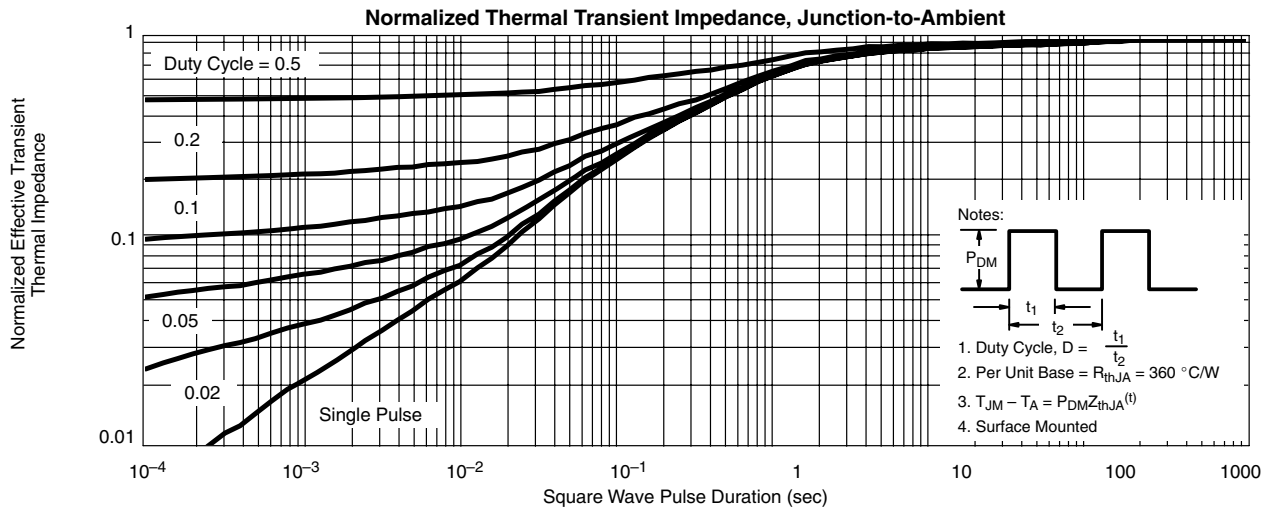
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



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



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



\*The power dissipation  $P_D$  is based on  $T_{J(max)} = 150 \text{ }^\circ\text{C}$ , using junction-to-case thermal resistance, and is more useful in setting 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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