VBN1405 Datasheet

N-Channel 40-V (D-S) 175 °C MOSFET

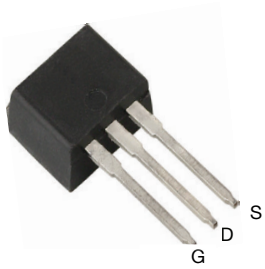
PRODUCT SUMMARY			
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
40	0.005 at V_{GS} = 10 V	100	95

FEATURES

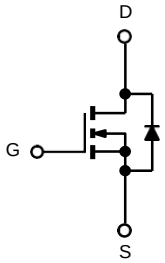
- Trench Power MOSFET
- 175 °C Junction Temperature
- High Threshold Voltage at High Temperature

RoHS
COMPLIANT

TO-262



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_C = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	20	
Continuous Drain Current (T_J = 175 °C)	T_C = 25 °C	I_D	110	A
	T_C = 125 °C		70	
Pulsed Drain Current		I_{DM}	300	
Avalanche Current		I_{AR}	50	
Repetitive Avalanche Energy[a]	L = 0.1 mH	E_{AR}	125	mJ
Maximum Power Dissipation[a]	T_C = 25 °C	P_D	150[b]	W
	T_A = 25 °C[c]		3.75	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	°C

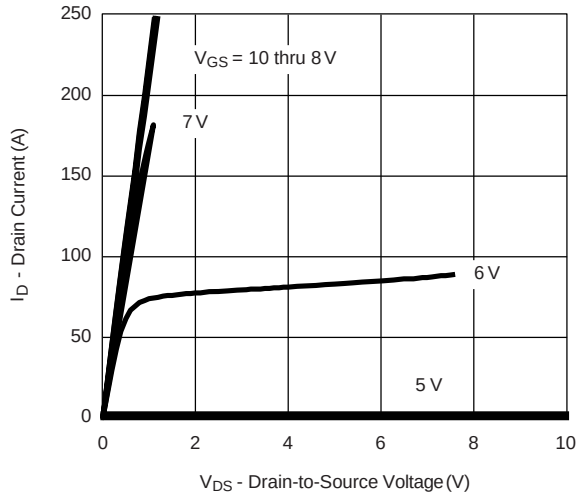
THERMAL RESISTANCE RATINGS				
Parameter		**Symbol**	**Limit**	**Unit**
Junction-to-Ambient	PCB Mount[c]	R_{thJA}	40	°C/W
Junction-to-Case		R_{thJC}	1	

Notes:
a. Duty cycle ≤ 1 %.
b. See SOA curve for voltage derating.
c. When Mounted on 1" square PCB (FR-4 material).

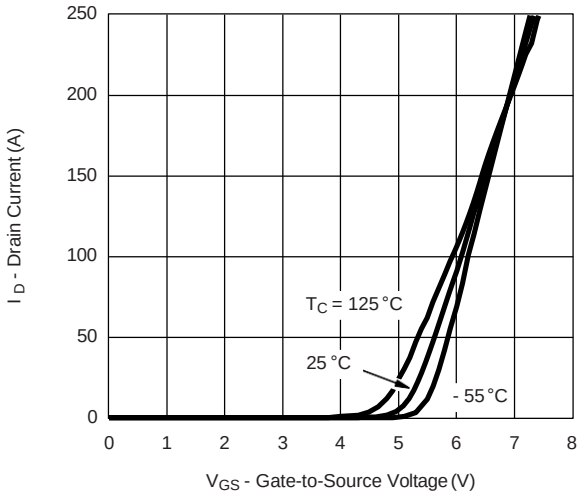
SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{DS} = 0 V, I_D = 250 µA	40			V
Gate-Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	1.0	2.0	4.0	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 40 V, V_{GS} = 0 V			1	µA
		V_{DS} = 40 V, V_{GS} = 0 V, T_J = 125 °C			50	
		V_{DS} = 40 V, V_{GS} = 0 V, T_J = 175 °C			250	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	120			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.005		^
		V_{GS} = 10 V, I_D = 15 A, T_J = 125 °C		0.008		
		V_{GS} = 10 V, I_D = 15 A, T_J = 175 °C		0.0106		
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 15 A	20	50		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		3200		pF
Output Capacitance	C_{oss}			600		
Reverse Transfer Capacitance	C_{rss}			320		
Total Gate Charge[c]	Q_g	V_{DS} = 20 V, V_{GS} = 10 V, I_D = 50 A		95		nC
Gate-Source Charge[c]	Q_{gs}			37		
Gate-Drain Charge[c]	Q_{gd}			21		
Gate Resistance	R_g	f = 1.0 MHz		1.7		^
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 20 V, R_L = 0.4 ^ I_D ≅ 50 A, V_{GEN} = 10 V, R_g = 2.5 ^		20	30	ns
Rise Time[c]	t_r			95	145	
Turn-Off Delay Time[c]	$t_{d(off)}$			50	75	
Fall Time[c]	t_f			12	20	
Source-Drain Diode Ratings and Characteristics T_C = 25 °C[b]						
Continuous Current	I_S				100	A
Pulsed Current	I_{SM}				300	
Forward Voltage[a]	V_{SD}	I_F = 30 A, V_{GS} = 0 V		0.90	1.50	V
Reverse Recovery Time	t_{rr}	I_F = 30 A, di/dt = 100 A/µs		40	60	ns

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

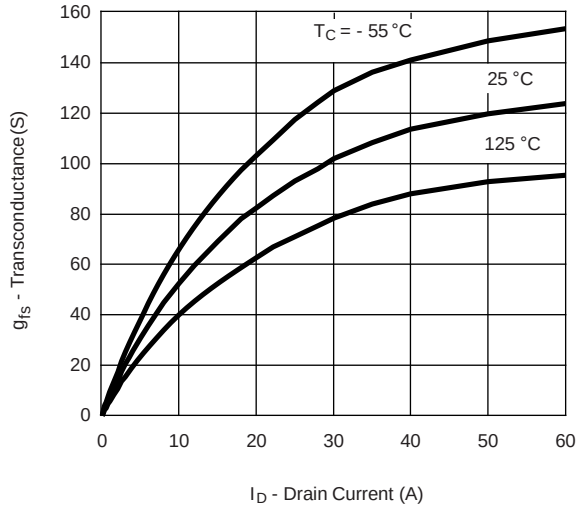
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



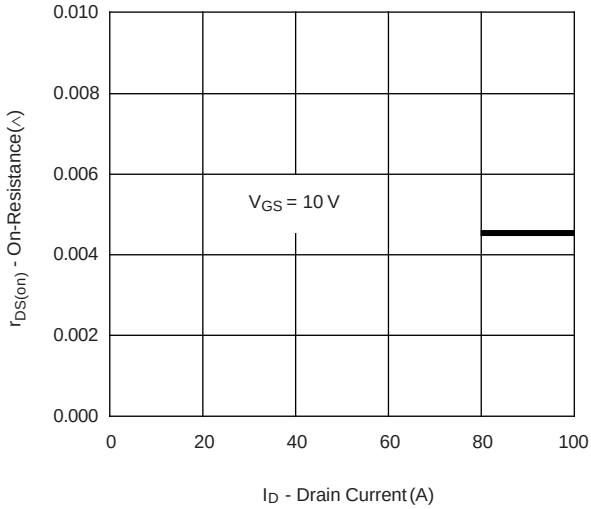
Output Characteristics



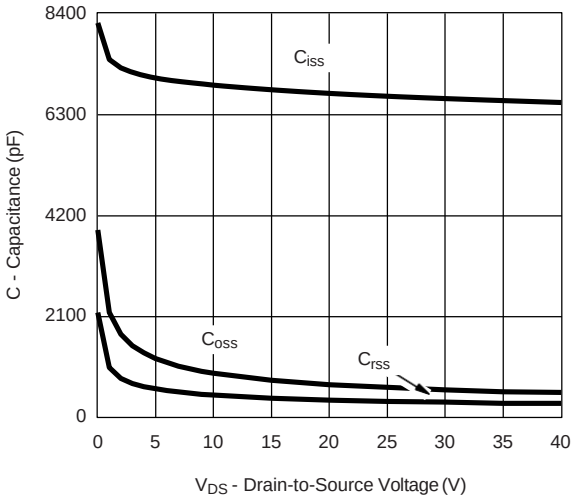
Transfer Characteristics



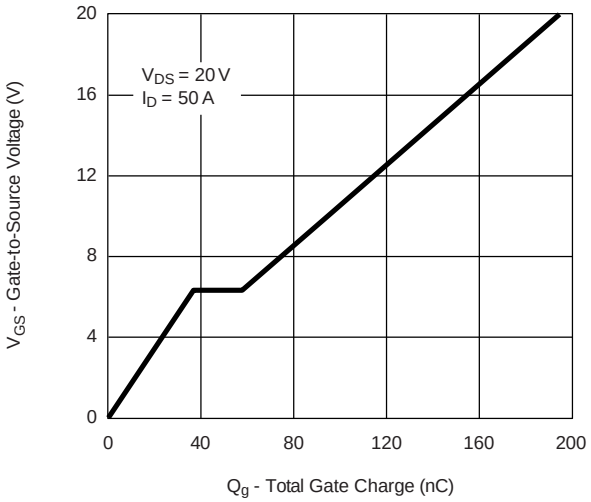
Transconductance



On-Resistance vs. Drain Current

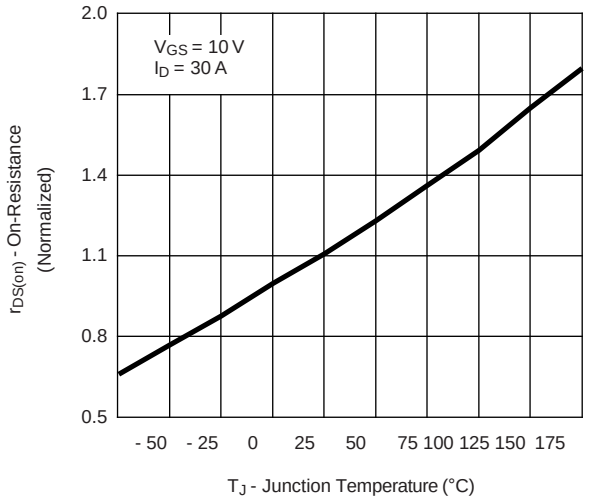


Capacitance

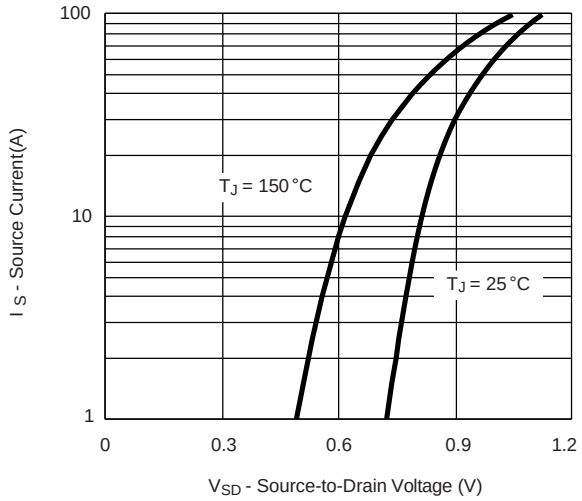


Gate Charge

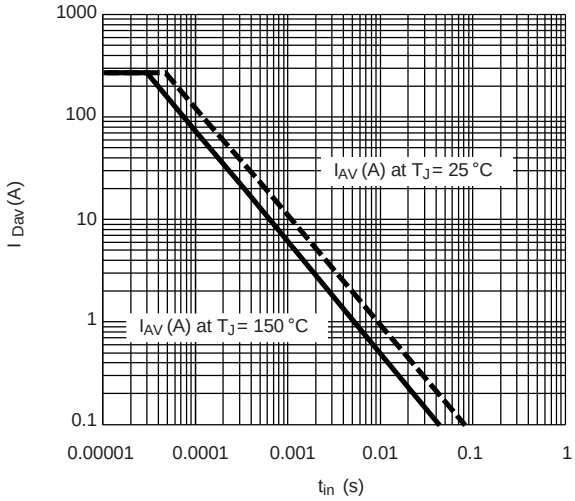
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



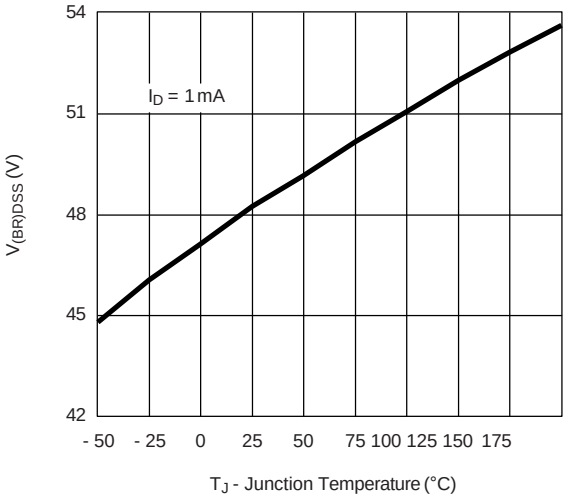
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

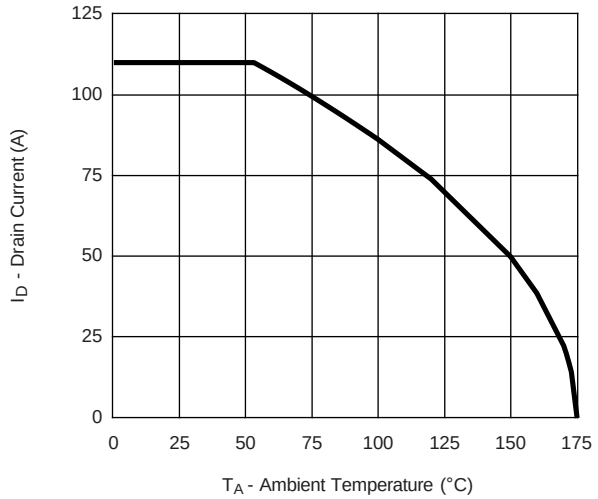


Avalanche Current vs. Time

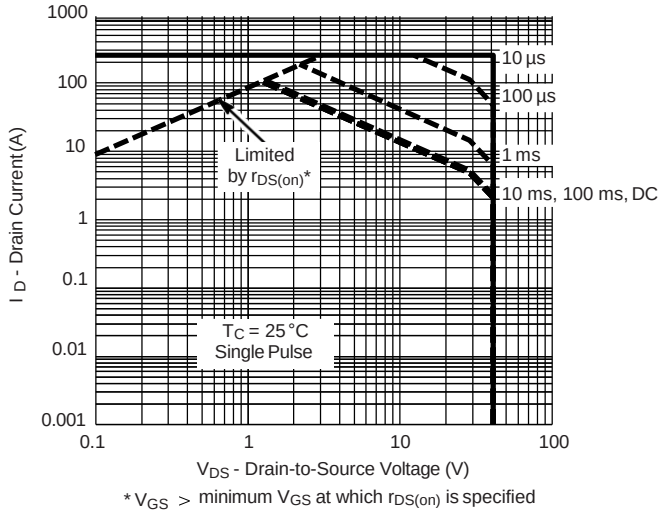


Drain Source Breakdown vs. Junction Temperature

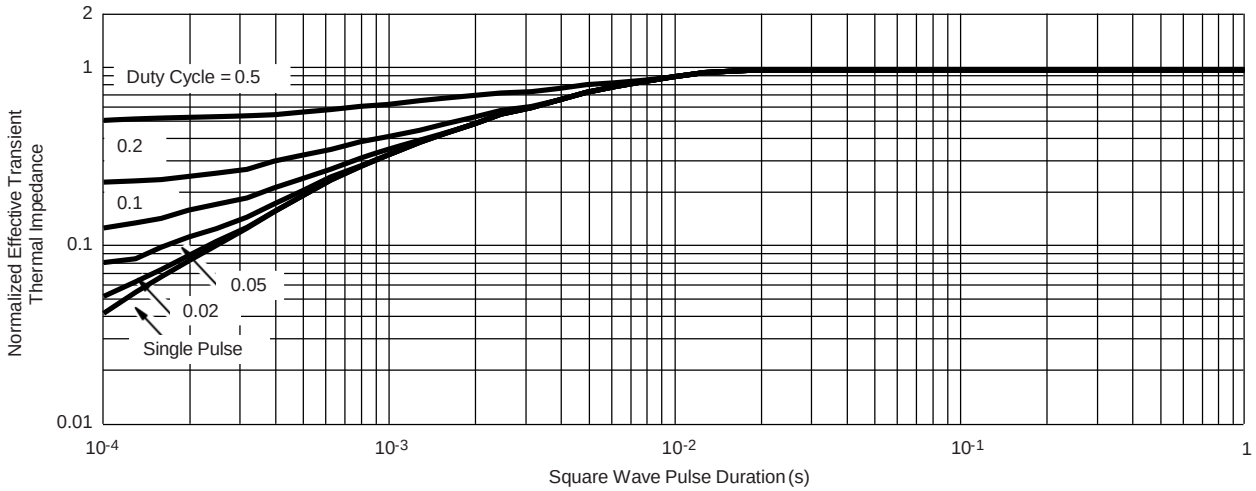
THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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