

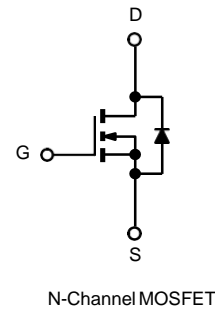
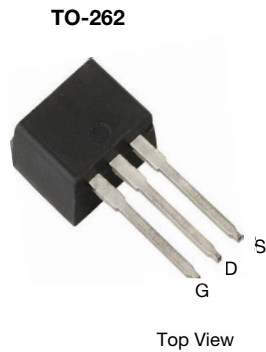
VBN1405 Datasheet

N-Channel 40-V (D-S) 175 °C MOSFET

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

FEATURES

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



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:

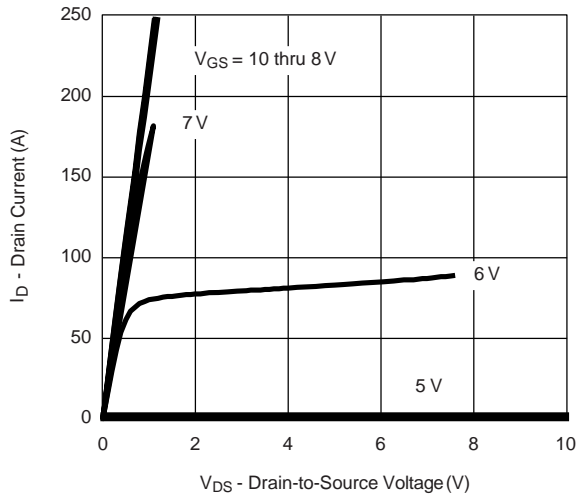
- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When Mounted on 1" square PCB (FR-4 material).

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

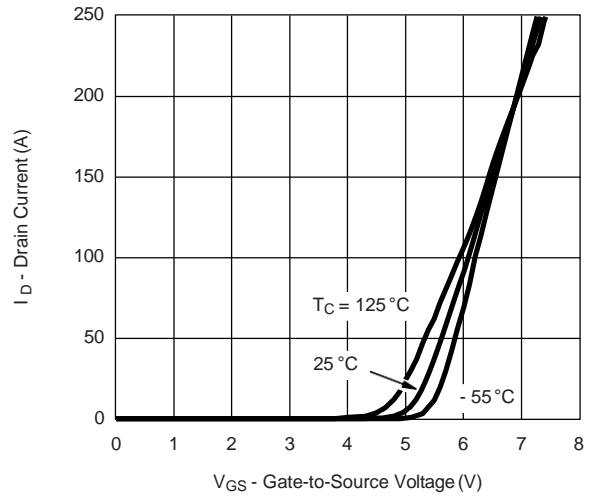
Notes:

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

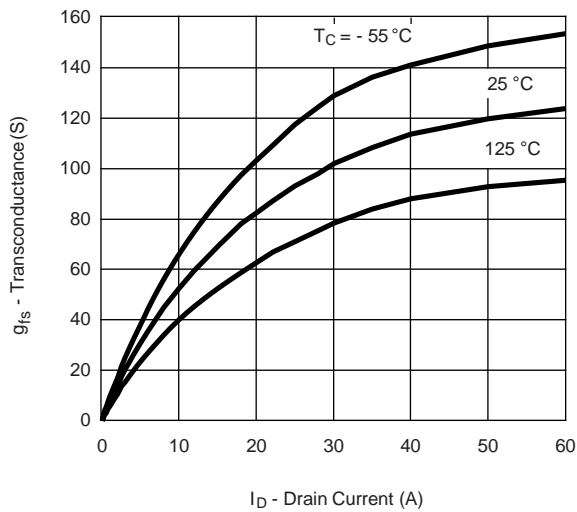
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



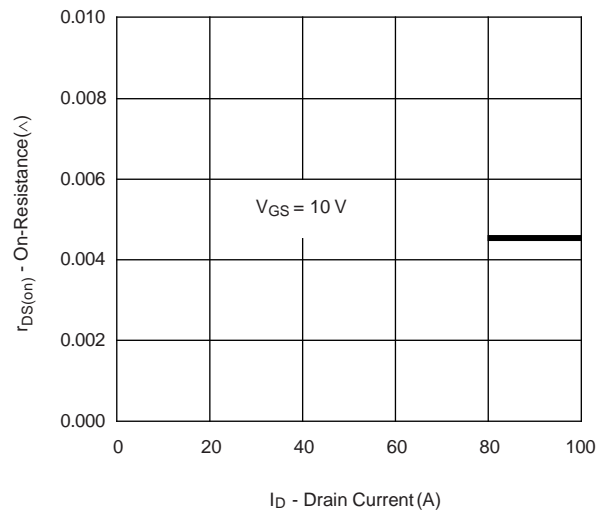
Output Characteristics



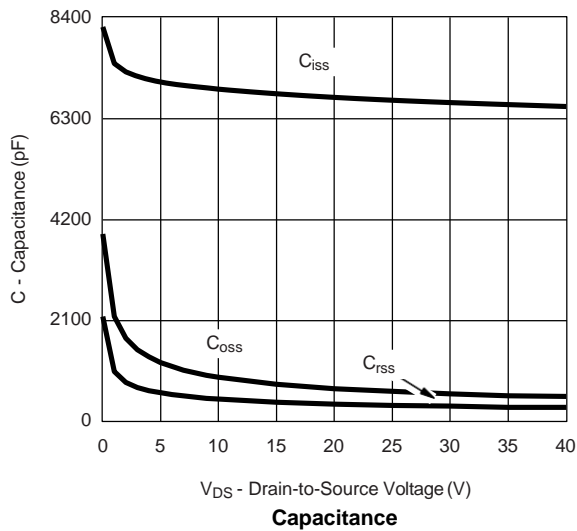
Transfer Characteristics



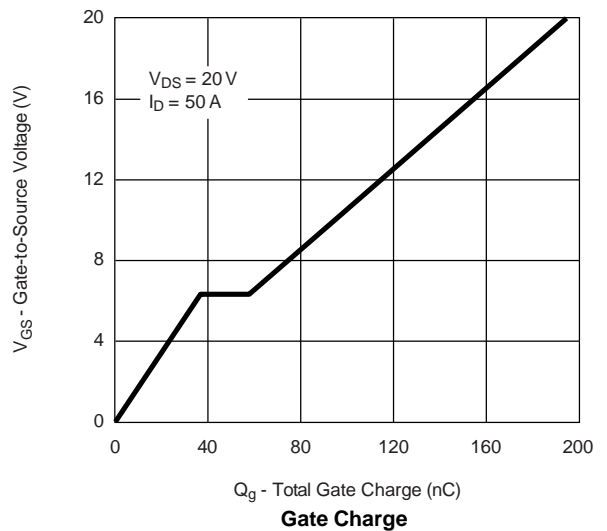
Transconductance



On-Resistance vs. Drain Current

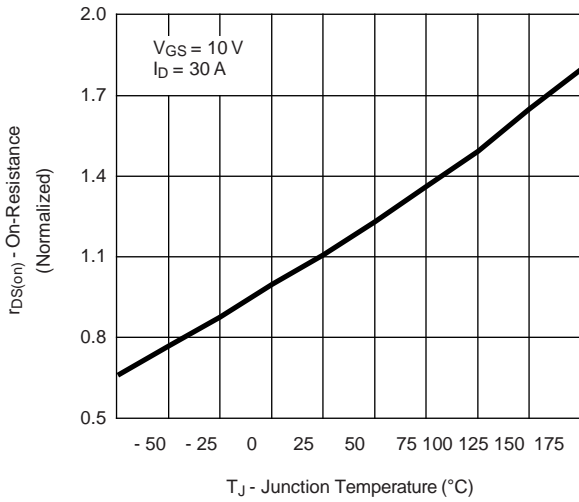


Capacitance

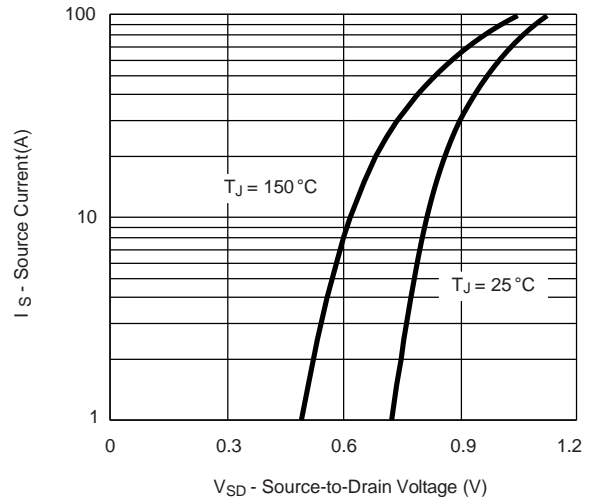


Gate Charge

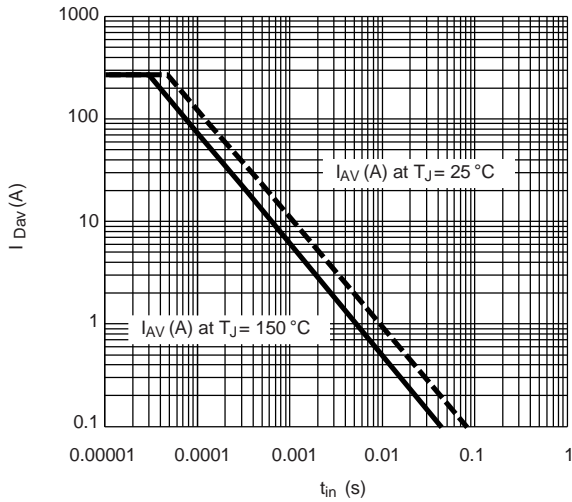
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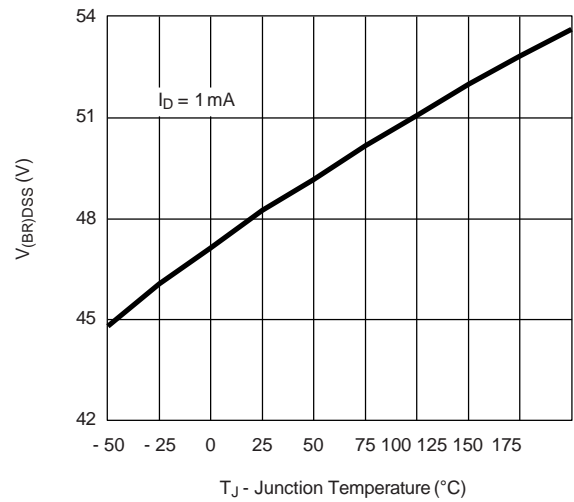
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

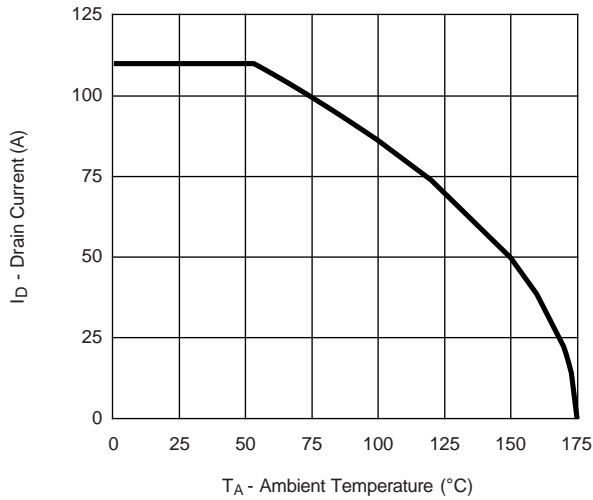


Avalanche Current vs. Time

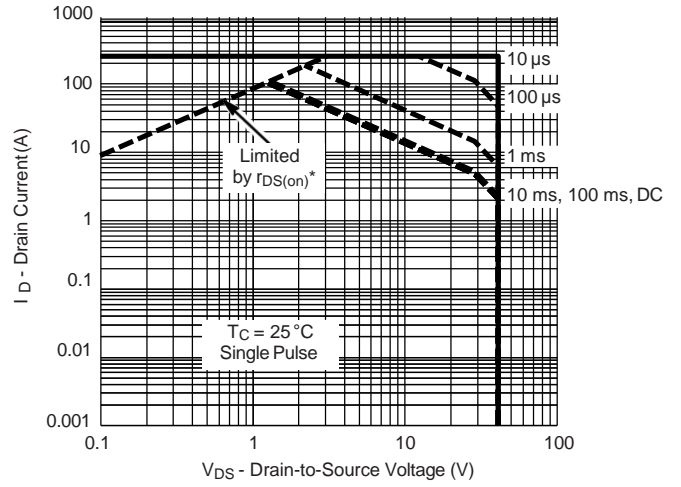


Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS

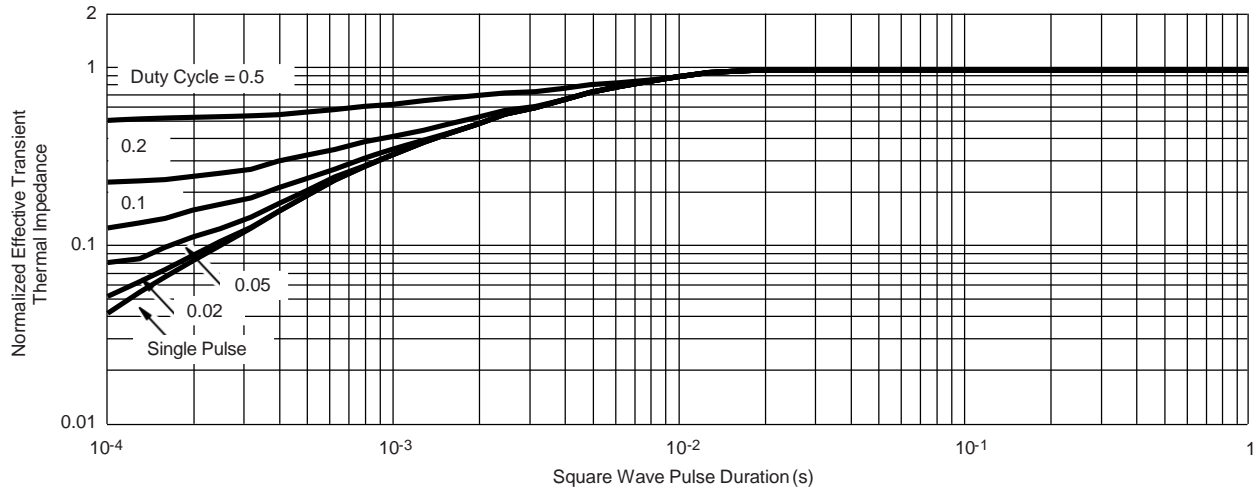


Maximum Avalanche and Drain Current vs. Case Temperature



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

Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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