

FB3004-VB Datasheet

N-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	40
$R_{DS(on)}$ (Ω) at $V_{GS} = 10$ V	0.00084
I_D (A)	409
Configuration	Single
Qg (nC)	250

FEATURES

- Trench Power MOSFET
- 100 % R_g and UIS Tested

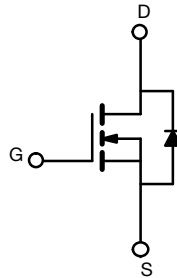
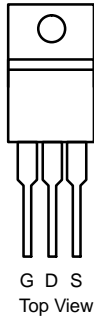
APPLICATIONS

- Synchronous Rectification
- Power Supplies



RoHS
COMPLIANT
HALOGEN
FREE

TO-220AB



ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	40	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current ^a	$T_C = 25^\circ\text{C}$	I_D	409	A
	$T_C = 125^\circ\text{C}$		320	
Continuous source current (diode conduction) ^a		I_S	409	
Pulsed drain current ^b		I_{DM}	600	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	100	
Single pulse avalanche energy		E_{AS}	500	mJ
Maximum power dissipation ^b	$T_C = 25^\circ\text{C}$	P_D	375	W
	$T_C = 125^\circ\text{C}$		125	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount ^c	R_{thJA}	40	$^\circ\text{C/W}$
Junction-to-case (drain)		R_{thJC}	0.4	

Notes

- a. Based on $T_J = 25^\circ\text{C}$.
 b. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$
 c. When mounted on 1" square PCB (FR4 material)

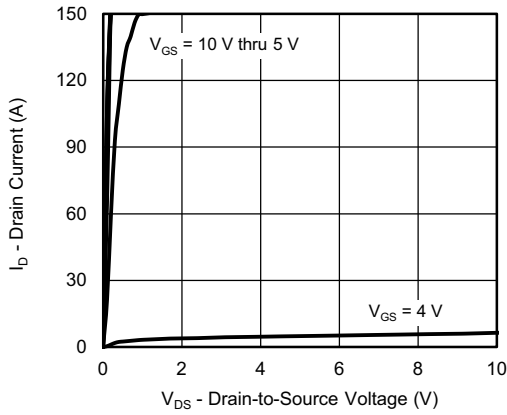
SPECIFICATIONS (T _C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		40	-	-	V
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		2.5	3.0	3.5	
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V		-	-	± 100	nA
Zero gate voltage drain current	I _{DSS}	V _{GS} = 0 V	V _{DS} = 40 V	-	-	1	μA
		V _{GS} = 0 V	V _{DS} = 40 V, T _J = 125 °C	-	-	50	
		V _{GS} = 0 V	V _{DS} = 40 V, T _J = 175 °C	-	-	300	μA
On-state drain current ^a	I _{D(on)}	V _{GS} = 10 V	V _{DS} ≥ 5 V	100	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = 10 V	I _D = 35 A	-	0.00084	-	Ω
		V _{GS} = 10 V	I _D = 35 A, T _J = 125 °C	-	0.00140	-	
		V _{GS} = 10 V	I _D = 35 A, T _J = 175 °C	-	0.00164	-	
Forward transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 30 A		-	196	-	S
Dynamic ^b							
Input capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = 25 V, f = 1 MHz	-	11 938	15 525	pF
Output capacitance	C _{oss}			-	11 163	14 520	
Reverse transfer capacitance	C _{rss}			-	282	370	
Total gate charge ^c	Q _g	V _{GS} = 10 V	V _{DS} = 20 V, I _D = 100 A	-	158	250	nC
Gate-source charge ^c	Q _{gs}			-	44	-	
Gate-drain charge ^c	Q _{gd}			-	22	-	
Gate resistance	R _g	f = 1 MHz		2.70	5.44	8.20	Ω
Turn-on delay time ^c	t _{d(on)}	V _{DD} = 20 V, R _L = 0.2 Ω I _D ≅ 100 A, V _{GEN} = 10 V, R _g = 1 Ω		-	16	25	ns
Rise time ^c	t _r			-	10	17	
Turn-off delay time ^c	t _{d(off)}			-	103	160	
Fall time ^c	t _f			-	61	95	
Source-Drain Diode Ratings and Characteristics ^b							
Pulsed current ^a	I _{SM}			-	-	260	A
Forward voltage	V _{SD}	I _F = 60 A, V _{GS} = 0 V		-	0.81	1.5	V
Body diode reverse recovery time	t _{rr}	I _F = 30 A, di/dt = 100 A/μs		-	165	350	ns
Body diode reverse recovery charge	Q _{rr}			-	530	1100	nC
Reverse recovery fall time	t _a			-	66	-	ns
Reverse recovery rise time	t _b			-	99	-	
Body diode peak reverse recovery current	I _{RM(REC)}			-	-6.2	-	A

Notes

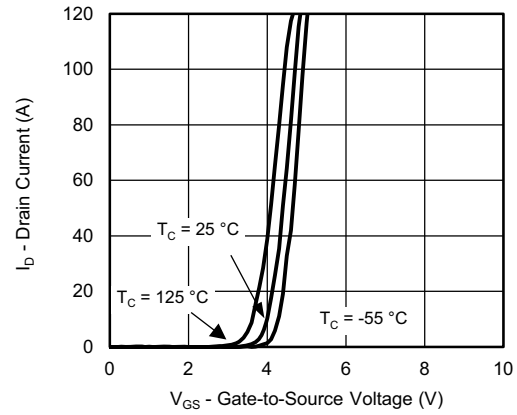
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
 b. Guaranteed by design, not subject to production testing
 c. Independent of operating temperature

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.

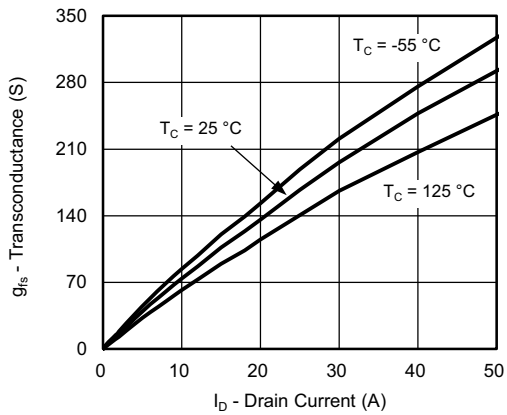
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



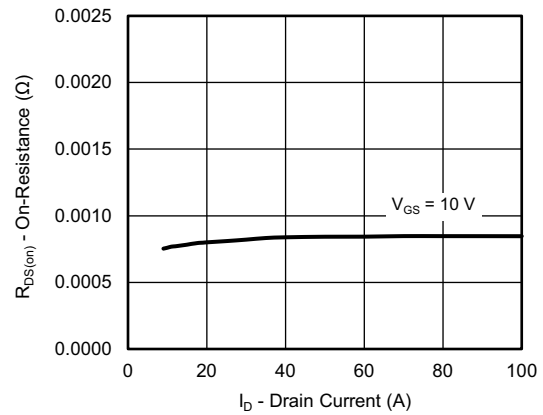
Output Characteristics



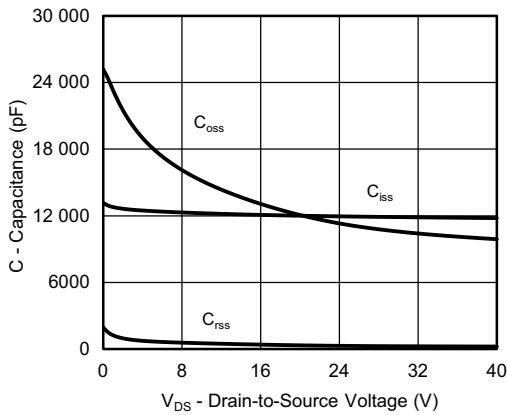
Transfer Characteristics



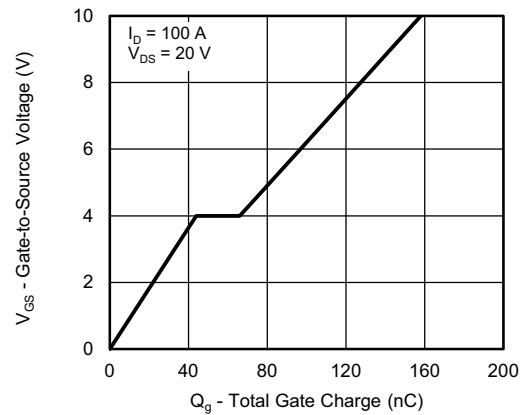
Transconductance



On-Resistance vs. Drain Current

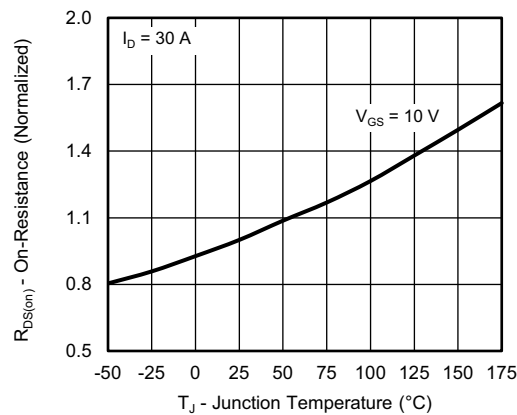


Capacitance

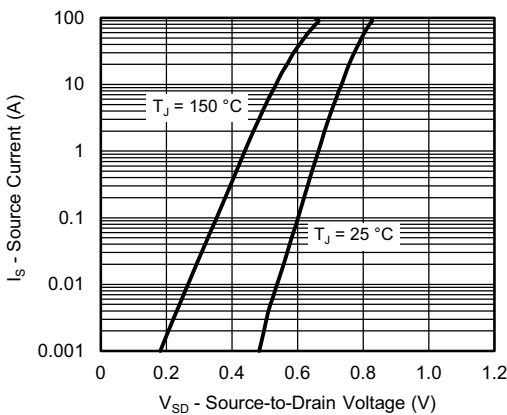


Gate Charge

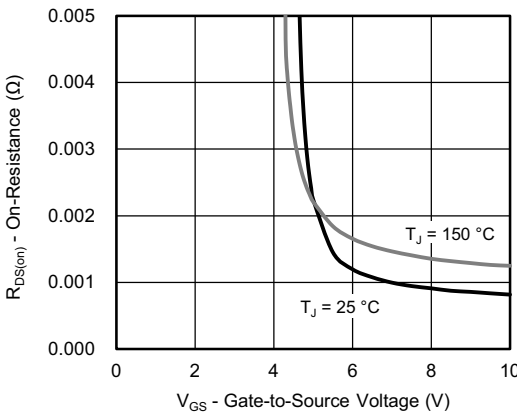
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



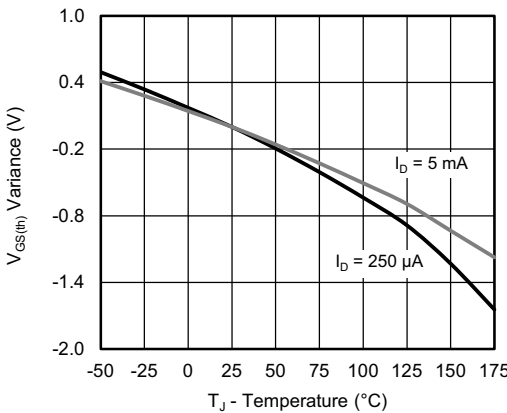
On-Resistance vs. Junction Temperature



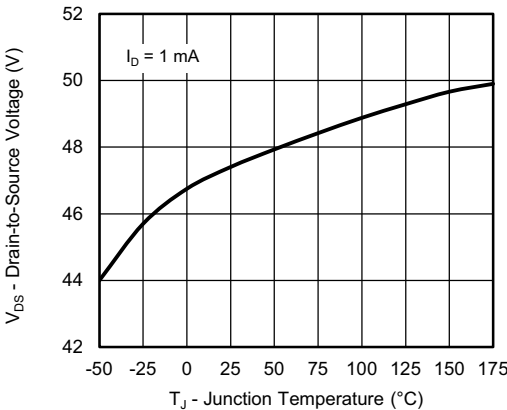
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

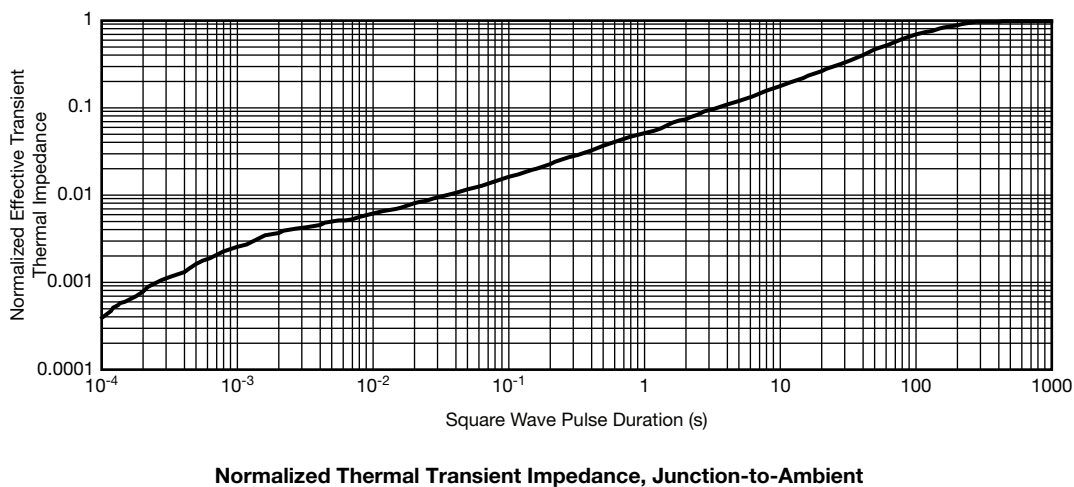
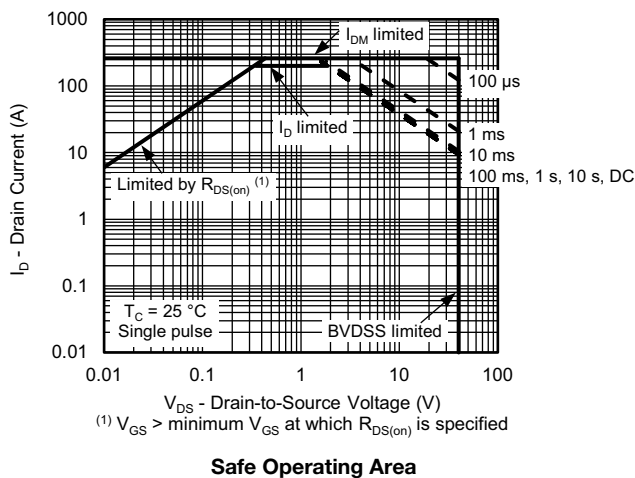


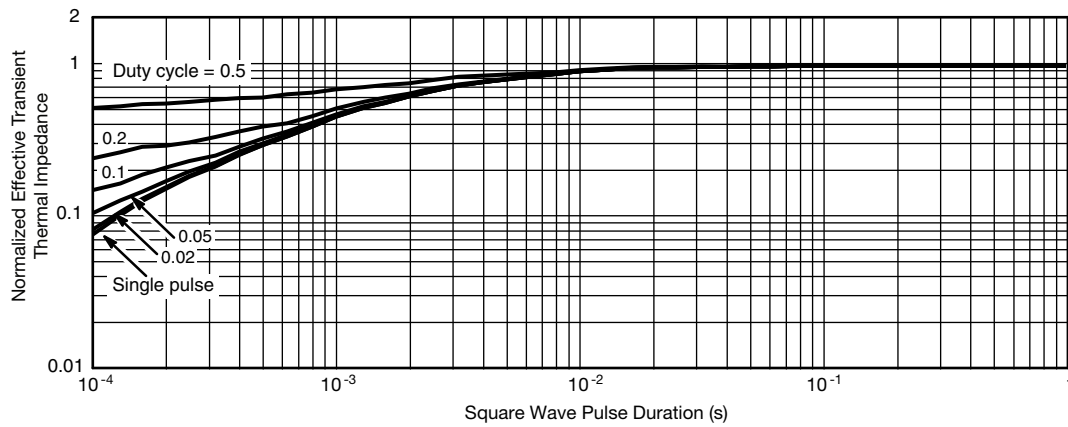
Threshold Voltage



Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



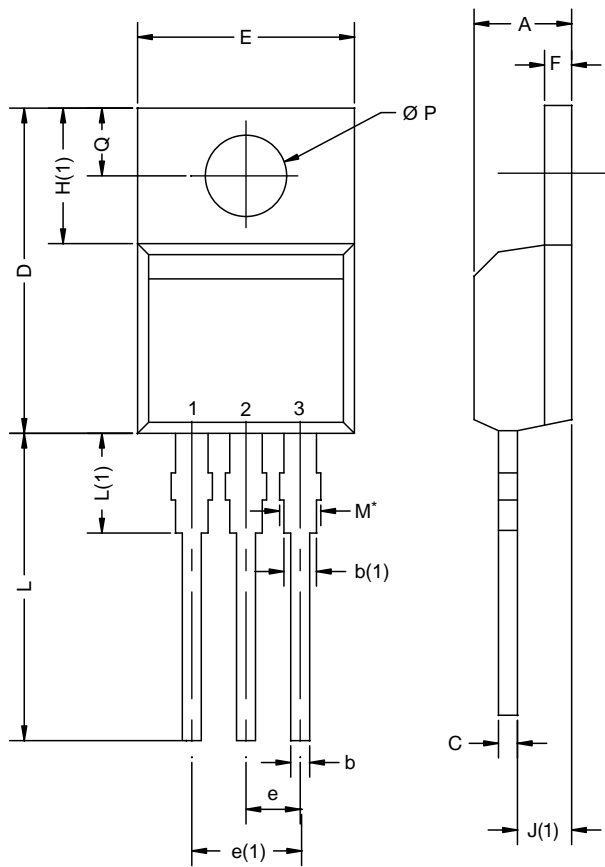
THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)


Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction-to-Ambient ($25\text{ }^{\circ}\text{C}$)
 - Normalized Transient Thermal Impedance Junction-to-Case ($25\text{ }^{\circ}\text{C}$)
 are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions

TO-220AB



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
Ø P	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118
ECN: X12-0208-Rev. N, 08-Oct-12				
DWG: 5471				

Notes
* M = 1.32 mm to 1.62 mm (dimension including protrusion)
Heatsink hole for HVM

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