

IRFB3004GPBF-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

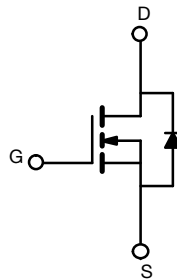
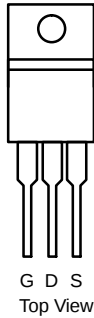
APPLICATIONS

- 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	I_D	$T_C = 25^\circ\text{C}$	A
		$T_C = 125^\circ\text{C}$	
Continuous source current (diode conduction) ^a	I_S	409	
Pulsed drain current ^b	I_{DM}	600	
Single pulse avalanche current	I_{AS}	100	
Single pulse avalanche energy		E_{AS}	mJ
Maximum power dissipation ^b	P_D	$T_C = 25^\circ\text{C}$	W
		$T_C = 125^\circ\text{C}$	
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	R_{thJA}	40	$^\circ\text{C/W}$
Junction-to-case (drain)	R_{thJC}	0.4	

Notes

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

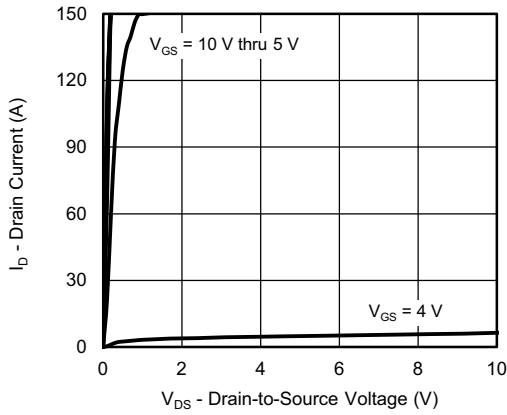
SPECIFICATIONS (T _C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		40	-	-	V
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		2.5	3.0	3.5	
Gate-source 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

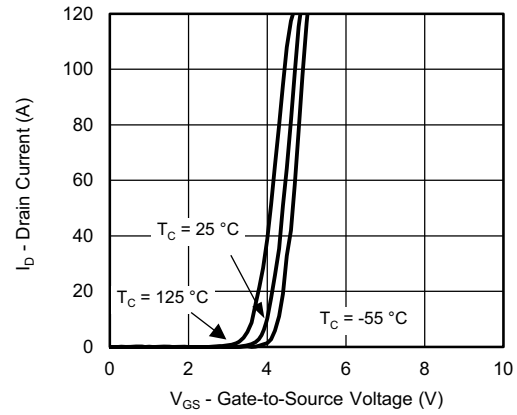
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
- b. Guaranteed by design, not subject to production testing
- c. Independent of operating temperature

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.

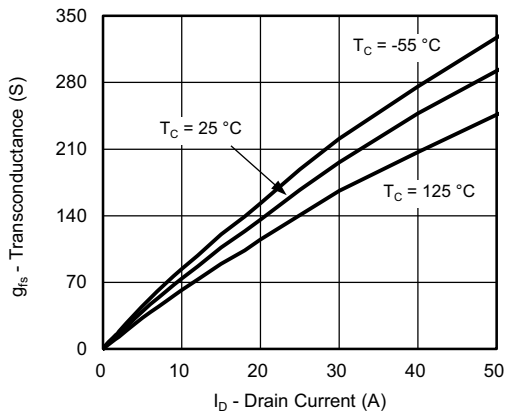
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)



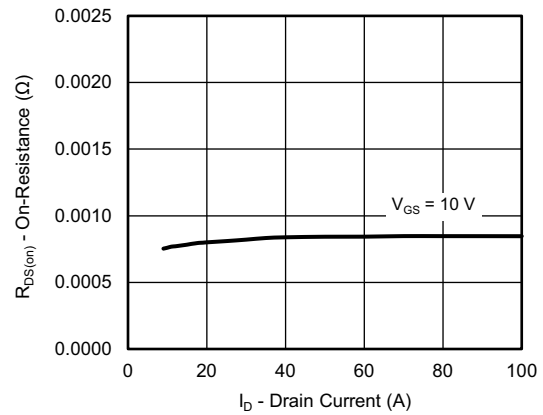
Output Characteristics



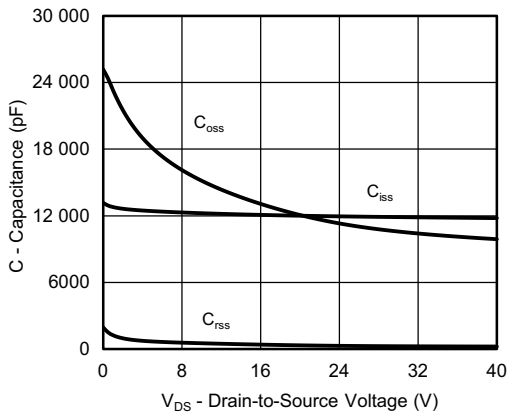
Transfer Characteristics



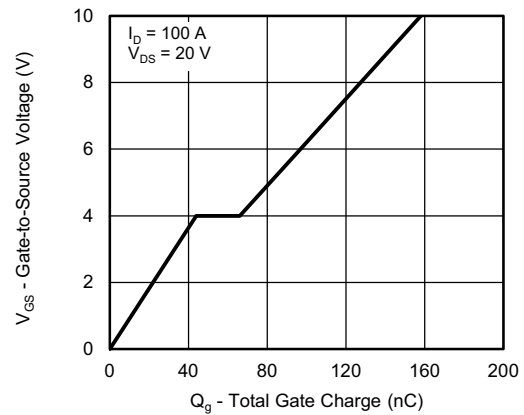
Transconductance



On-Resistance vs. Drain Current

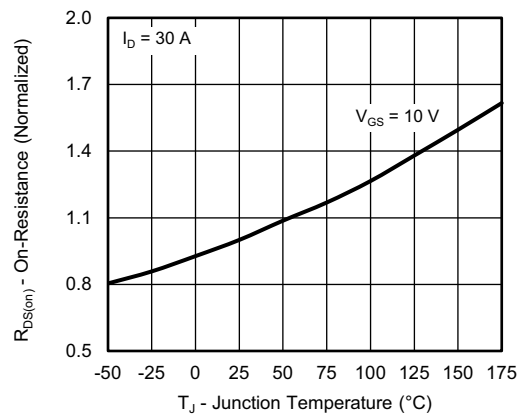


Capacitance

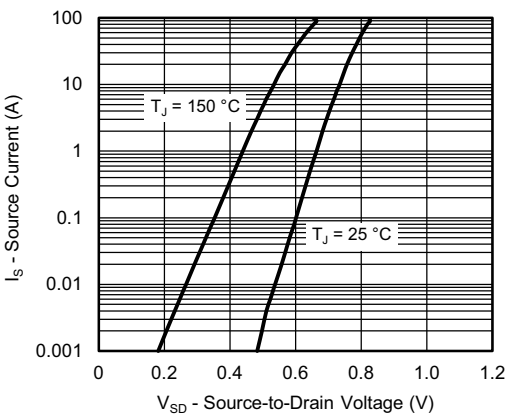


Gate Charge

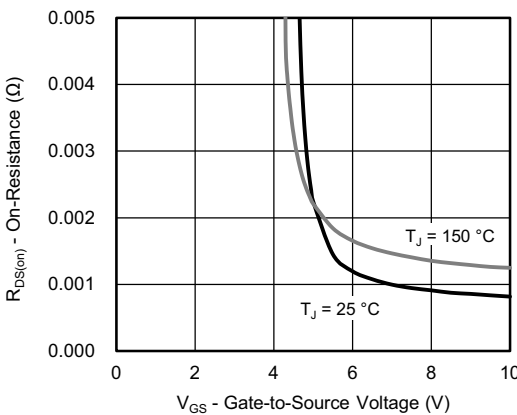
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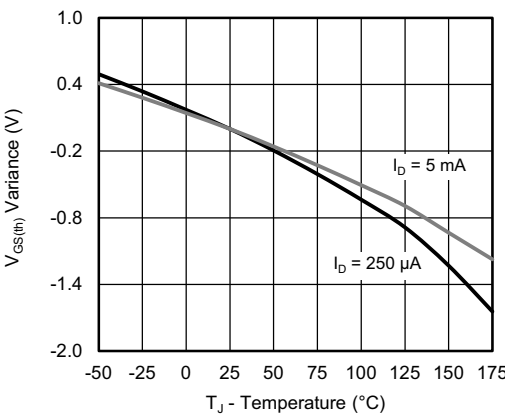
On-Resistance vs. Junction Temperature



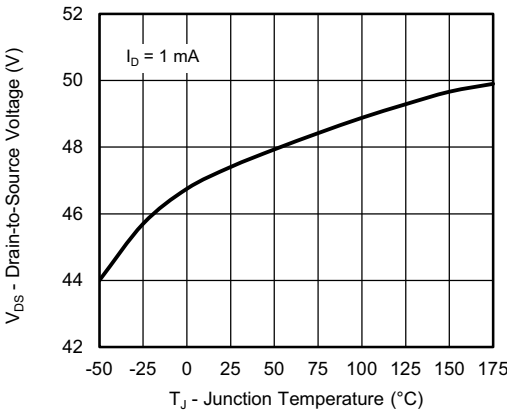
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

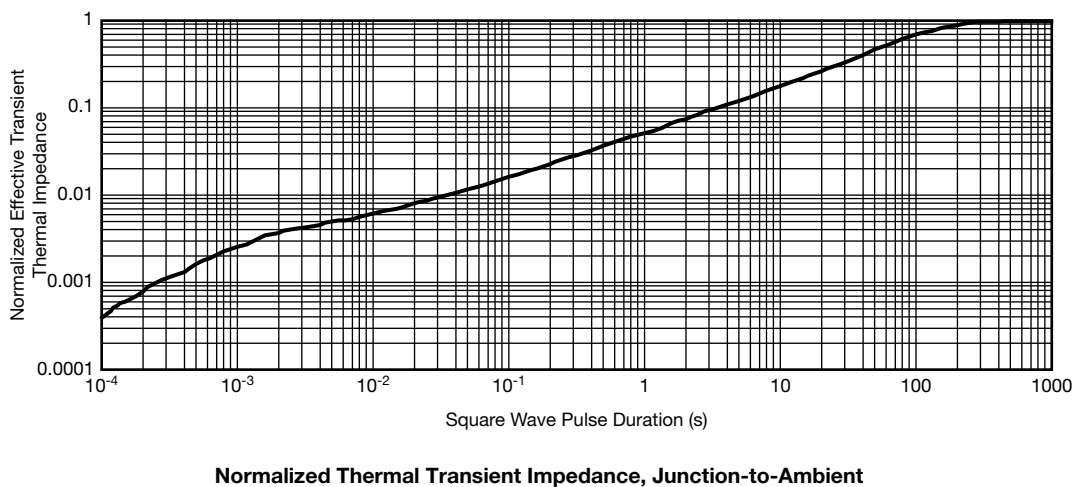
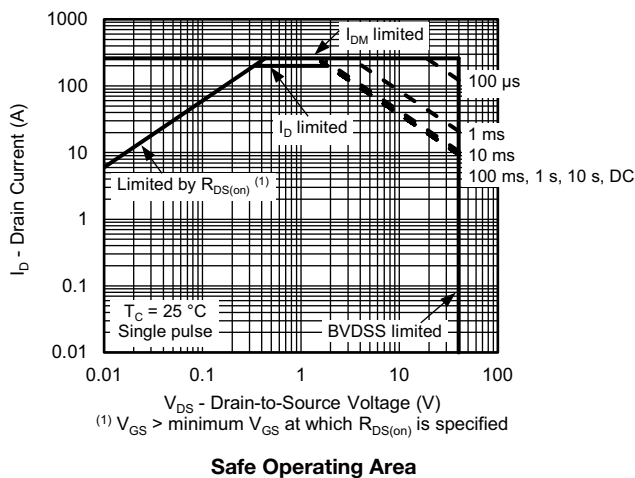


Threshold Voltage

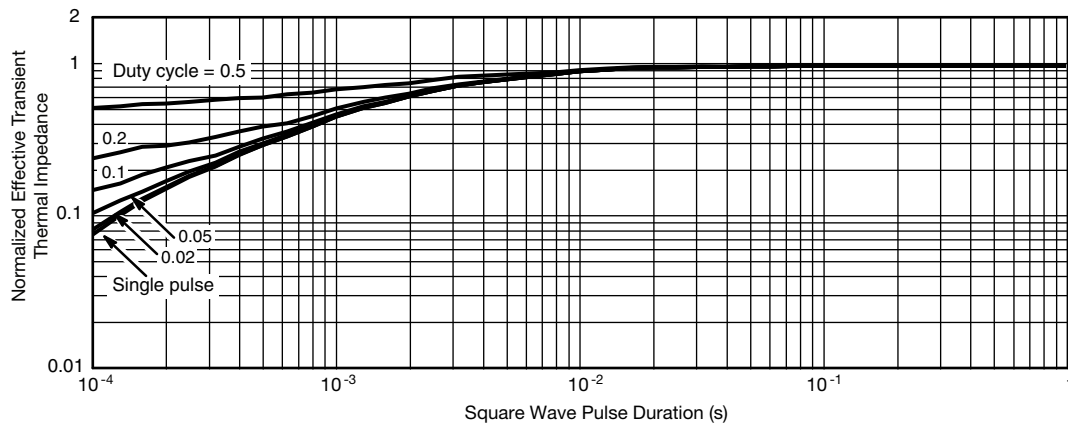


Drain Source Breakdown vs. Junction Temperature

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



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

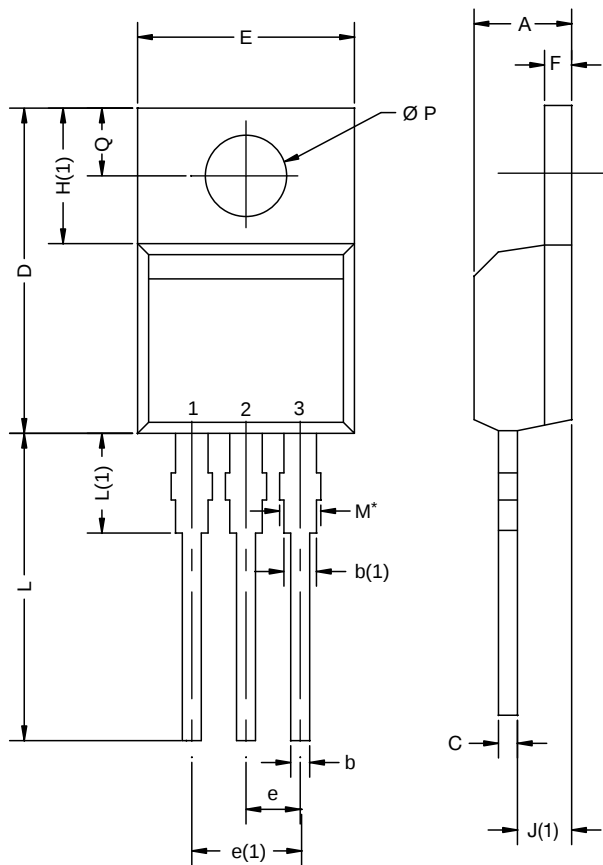


Normalized Thermal Transient Impedance, Junction-to-Case

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
$\varnothing P$	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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