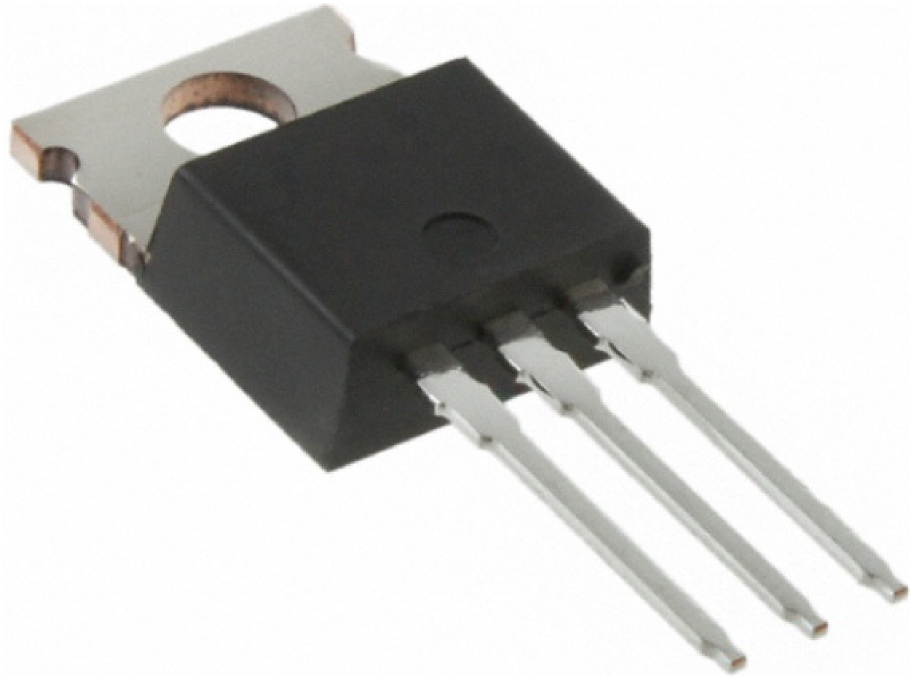
Manuals+ — User Manuals Simplified.

VISHAY IRFBG20 Discrete Semiconductor User Manual

Contents

VISHAY IRFBG20 Discrete Semiconductor



Specifications

Parameter	Value
VDS (V)	1000
RDS(on) ()	11
Qg max. (nC)	38
Qgs (nC)	4.9
Qgd (nC)	22
Configuration	Single

Description

Third generation power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance, and cost-effectiveness. The TO-220AB package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 W. The low thermal resistance and low package cost of the TO-220AB contribute to its wide acceptance throughout the industry.

Ordering Information

Package Lead (Pb)-free: IRFBG20PbF
Package Lead (Pb)-free and halogen-free: IRFBG20PbF-BE3

Thermal Resistance Ratings

Parameter	Value
Maximum junction-to-ambient	62 °C/W
Case-to-sink, flat, greased surface	0.50 °C/W
Maximum junction-to-case (drain)	2.3 °C/W

Usage Instructions

Mounting Instructions

Mount the IRFBG20 Power MOSFET using a 6-32 or M3 screw with the recommended mounting torque. Ensure proper heat dissipation for optimal performance.

Electrical Connections

Connect the drain, gate, and source terminals as indicated in the product datasheet or markings on the component. Pay attention to polarity and voltage ratings during connection.

Operating Conditions

Operate the MOSFET within the specified voltage, current, and temperature ranges provided in the datasheet. Avoid exceeding the maximum ratings to prevent damage.

FAQ

Q: What is the maximum drain-source voltage supported by IRFBG20?

A: The IRFBG20 supports a maximum drain-source voltage of 1000V.

Q: Is IRFBG20 RoHS-compliant?

A: This datasheet provides information about parts that are RoHS-compliant and/or non RoHS-compliant. Please refer to the datasheet for specific details on compliance.

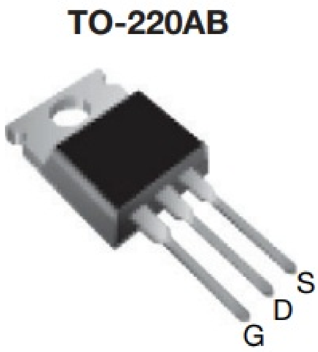
Q: What is the maximum power dissipation of IRFBG20?

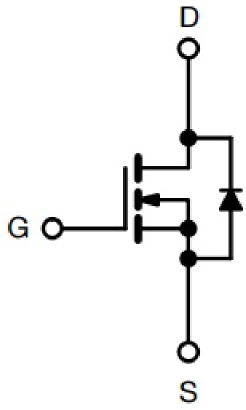
A: The IRFBG20 can handle a maximum power dissipation of approximately 50W in commercial-industrial applications.

Q: How should I handle soldering of IRFBG20?

A: Follow the soldering recommendations provided in the datasheet, including peak temperature and duration for proper soldering of IRFBG20.

Power MOSFET





PRODUCT SUMMARY

PRODUCT SUMMARY		
V_{DS} (V)	1000	
RDS(on) (W)	V_{GS} = 10 V	11
Q_g max. (nC)	38	
Q_{gs} (nC)	4.9	
Q_{gd} (nC)	22	
Configuration	Single	

FEATURES

- Dynamic dV/dt rating
- Repetitive avalanche rated
- Fast switching
- Ease of paralleling
- Simple drive requirements
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Note
* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

DESCRIPTION

Third generation power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.
The TO-220AB package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 W. The low thermal resistance and low package cost of the TO-220AB contribute to its wide acceptance throughout the industry.

ORDERING INFORMATION

ORDERING INFORMATION	
Package	TO-220AB
Lead (Pb)-free	IRFBG20PbF
Lead (Pb)-free and halogen-free	IRFBG20PbF-BE3

<table>
<tr><td colspan="6">ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)</td></tr>
<tr><td colspan="3">PARAMETER</td><td>SYMBOL</td><td>LIMIT</td><td>UNIT</td></tr>
<tr><td colspan="3">Drain-source voltage</td><td>VDS</td><td>1000</td><td rowspan="2">V</td></tr>
<tr><td colspan="3">Gate-source voltage</td><td>VGS</td><td>± 20</td></tr>
<tr><td rowspan="2">Continuous drain current</td><td rowspan="2">V_{GS} at 10 V</td><td>T_C = 25 °C</td><td rowspan="2">I_D</td><td>1.4</td><td rowspan="3">A</td></tr>
<tr><td>T_C = 100 °C</td><td>0.86</td></tr>
<tr><td colspan="3">Pulsed drain current a</td><td>IDM</td><td>5.6</td></tr>
<tr><td colspan="3">Linear derating factor</td><td></td><td>0.43</td><td>W/°C</td></tr>
<tr><td colspan="3">Single pulse avalanche energy b</td><td>EAS</td><td>200</td><td>mJ</td></tr>
<tr><td colspan="3">Repetitive avalanche current a</td><td>IAR</td><td>1.4</td><td>A</td></tr>
<tr><td colspan="3">Repetitive avalanche energy a</td><td>EAR</td><td>5.4</td><td>mJ</td></tr>
<tr><td>Maximum power dissipation</td><td colspan="2">T_C = 25 °C</td><td>P_D</td><td>54</td><td>W</td></tr>
<tr><td colspan="3">Peak diode recovery dV/dt c</td><td>dV/dt</td><td>1.0</td><td>V/ns</td></tr>
<tr><td colspan="3">Operating junction and storage temperature range</td><td>TJ, Tstg</td><td>-55 to +150</td><td rowspan="2">°C</td></tr>
<tr><td>Soldering recommendations (peak temperature) d</td><td colspan="2">For 10 s</td><td></td><td>300</td></tr>
<tr><td rowspan="2">Mounting torque</td><td colspan="2" rowspan="2">6-32 or M3 screw</td><td rowspan="2"></td><td>10</td><td>lbf · in</td></tr>
<tr><td>1.1</td><td>N · m</td></tr>
</table>

Notes

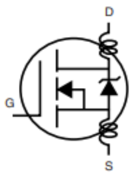
- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- b. VDD = 50 V, starting TJ = 25 °C, L = 193 μH, Rg = 25 Ω, IAS = 1.4 A (see fig. 12)
- c. ISD ≤ 1.4 A, dI/dt ≤ 60 A/μs, VDD ≤ 600, TJ ≤ 150 °C
- d. 1.6 mm from case

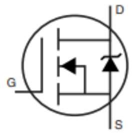
THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	RthJA	–	62	°C/W
Case-to-sink, flat, greased surfac e	RthCS	0.50	–	
Maximum junction-to-case (drain)	RthJC	–	2.3	

SPECIFICATIONS

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)								
PARAMETER	SYMBO L	TEST CONDITIONS		MI N.	TY P.	MA X.	UN IT	
Static								
Drain-source breakdown voltage	VDS	V_{GS} = 0 V, I_D = 250 μA		100 0	–	–	V	
V_{DS} temperature coefficie nt	DV_{DS}/T_J	Reference to 25 °C, I_D = 1 mA		–	1.2	–	V/° C	
Gate-source threshold vol tage	VGS(th)	V_{DS} = V_{GS}, I_D = 250 μA		2.0	–	4.0	V	
Gate-source leakage	IGSS	V_{GS} = ± 20 V		–	–	± 1 00	nA	
Zero gate voltage drain c urrent	IDSS	V_{DS} = 1000 V, V_{GS} = 0 V		–	–	100	μA	
		V_{DS} = 800 V, V_{GS} = 0 V , T_J = 125 °C		–	–	500		
Drain-source on-state res istance	RDS(on)	V_{GS} = 1 0 V	I_D = 0.84 A b	–	–	11	W	
Forward transconductanc e	gfs	V_{DS} = 50 V, I_D = 0.84 A b		1.0	–	–	S	
Dynamic								
Input capacitance	Ciss	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz, see fig. 5		–	500	–	pF	
Output capacitance	Coss			–	52	–		
Reverse transfer capacita nce	Crss			–	17	–		
Total gate charge	Q_g	V_{GS} = 1 0 V	I_D = 1.4 A, V_{DS} = 400 V, see fig. 6 an d 13 b	–	–	38	nC	
Gate-source charge	Qgs			–	–	4.9		
Gate-drain charge	Qgd			–	–	22		

Turn-on delay time	td(on)	V_{DD} = 500 V, I_D = 1.4 A, R_g = 18 W, R_D = 370 W, see fig. 10 b	–	9.4	–	ns	
Rise time	t_r		–	17	–		
Turn-off delay time	td(off)		–	58	–		
Fall time	t_f		–	31	–		
Internal drain inductance	L_D	Between lead, D	–	4.5	–		
Internal source inductance	L_S	6 mm (0.25″) from package and center of die contact  G S	–	7.5	–	nH	
Gate input resistance	R_g	f = 1 MHz, open drain	0.6	–	3.4	W	
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	MOSFET symbol showing the integral reverse D G	–	–	1.4		
Pulsed diode forward current a	ISM		–	–	5.6	A	

		p – n juncti on diode  S					
Body diode voltage	VSD	T_J = 25 °C, I_S = 1.4 A, V_{GS} = 0 V b	–	–	1.5	V	
Body diode reverse recov ery time	trr	T_J = 25 °C, I_F = 1.4 A, dI/dt = 100 A/μs b	–	130	190	ns	
Body diode reverse recov ery charge	Qrr		–	0.4 6	0.6 9	μC	
Forward turn-on time	ton	Intrinsic turn-on time is negligible (turn-on is d ominated by L_S and L_D)					

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- b. Pulse width ≤ 300 μs; duty cycle ≤ 2 %

TYPICAL CHARACTERISTICS

(25 °C, unless otherwise noted)

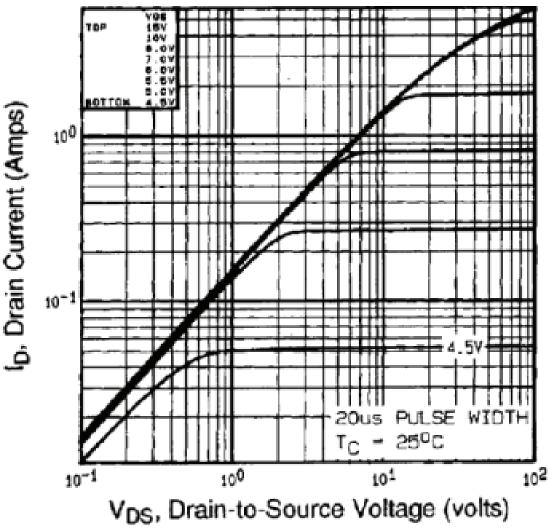


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

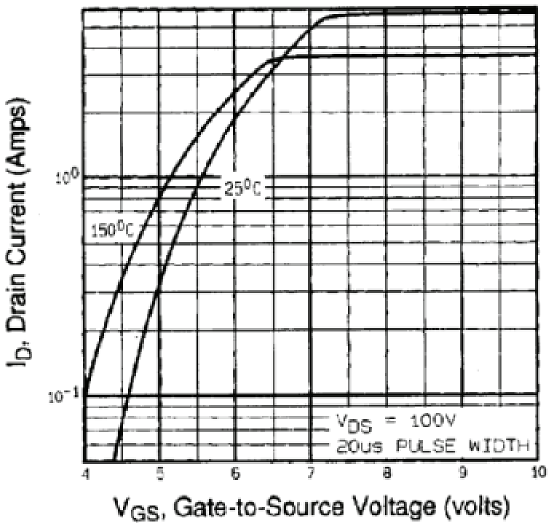


Fig. 3 - Typical Transfer Characteristics

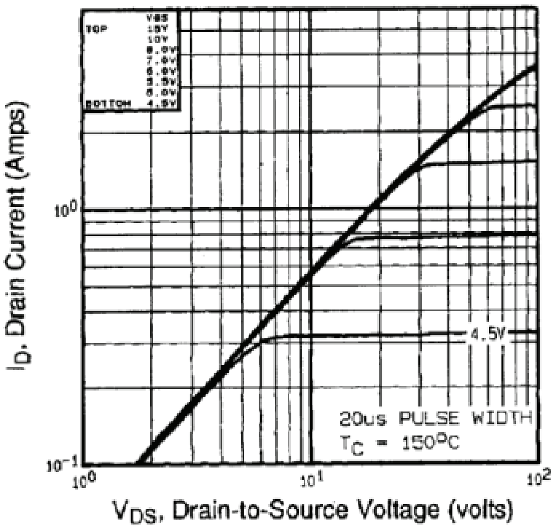


Fig. 2 - Typical Output Characteristics, T_C = 150 °C

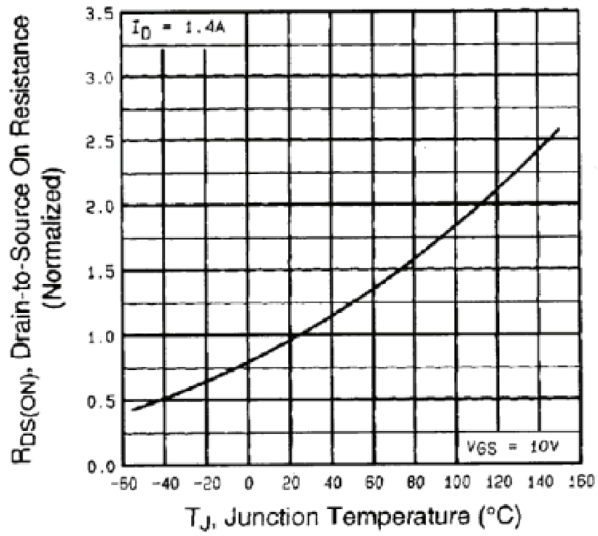


Fig. 4 - Normalized On-Resistance vs. Temperature

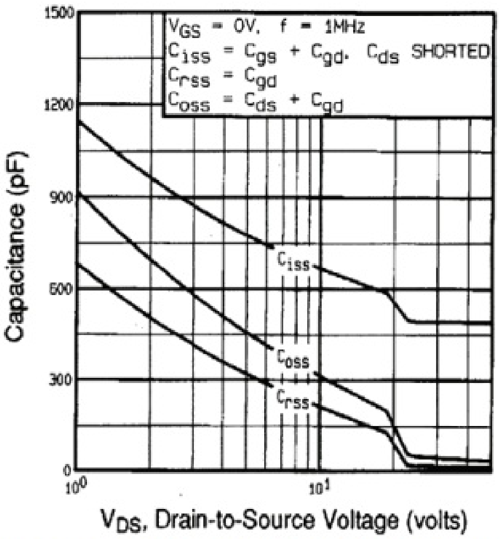


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

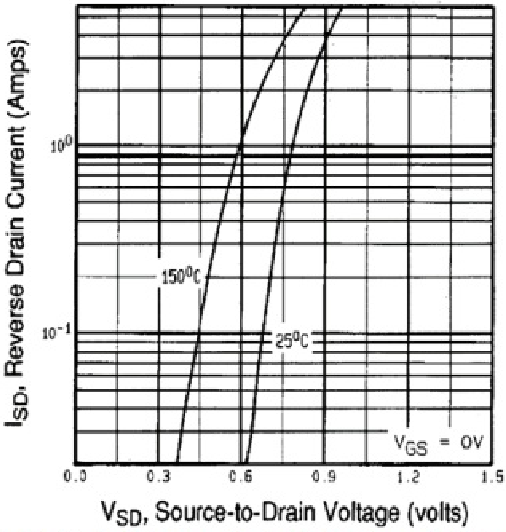


Fig. 7 - Typical Source-Drain Diode Forward Voltage

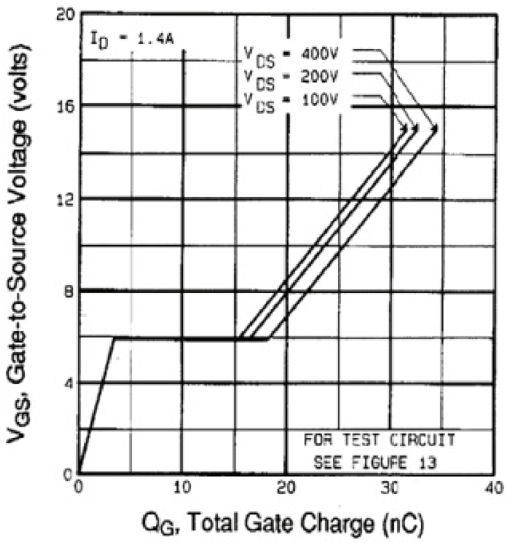


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

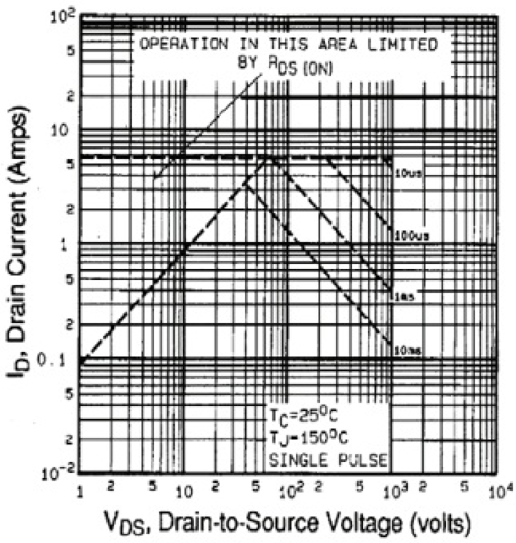


Fig. 8 - Maximum Safe Operating Area

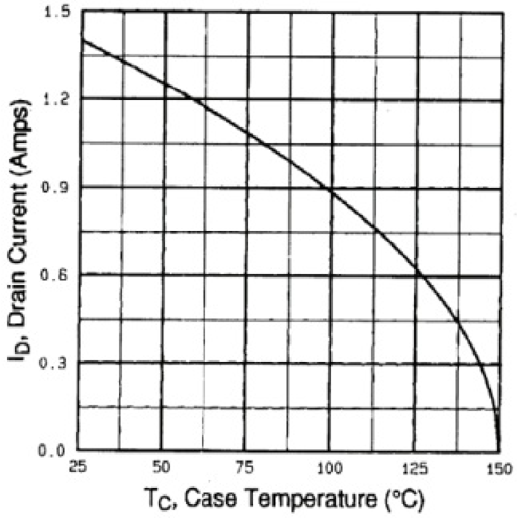


Fig. 9 - Maximum Drain Current vs. Case Temperature

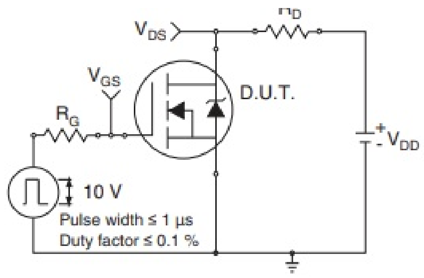


Fig. 10a - Switching Time Test Circuit

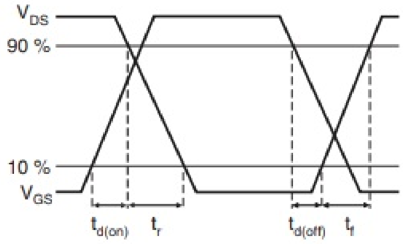


Fig. 10b - Switching Time Waveforms

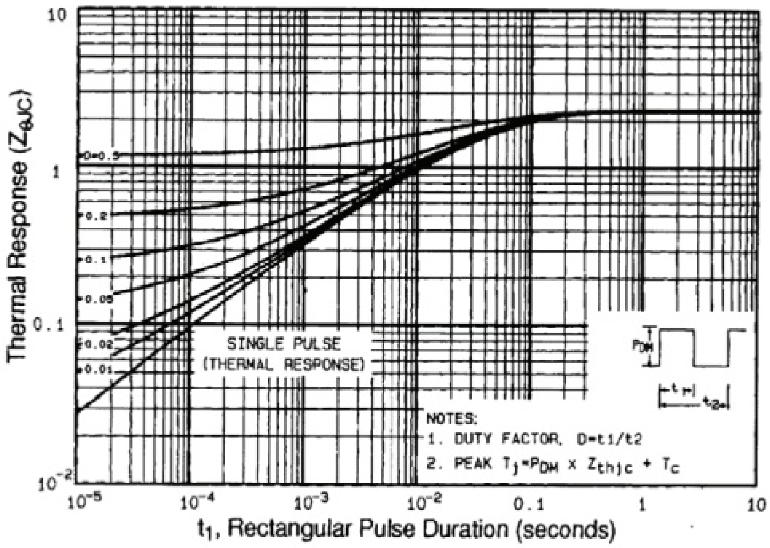


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

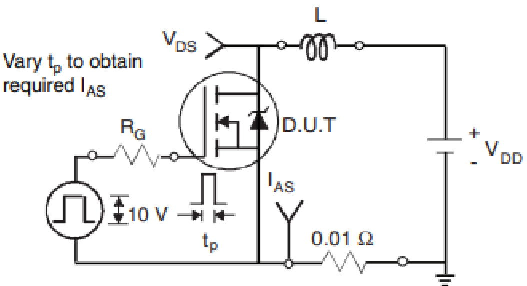


Fig. 12a - Unclamped Inductive Test Circuit

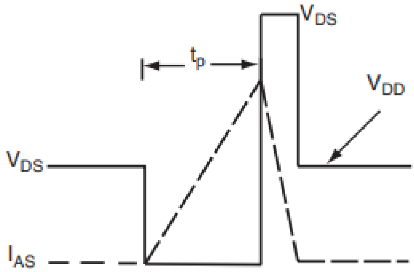


Fig. 12b - Unclamped Inductive Waveforms

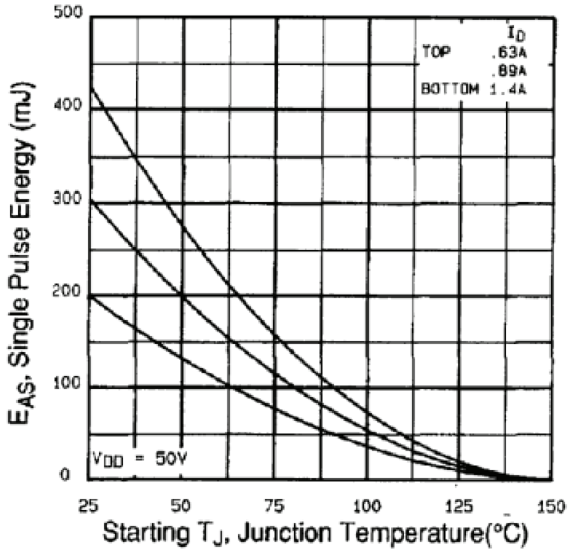


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

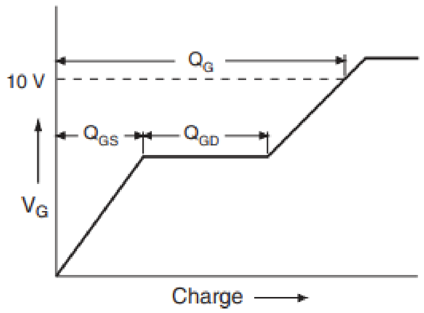


Fig. 13a - Basic Gate Charge Waveform

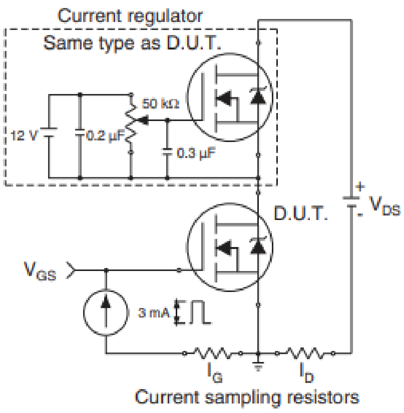
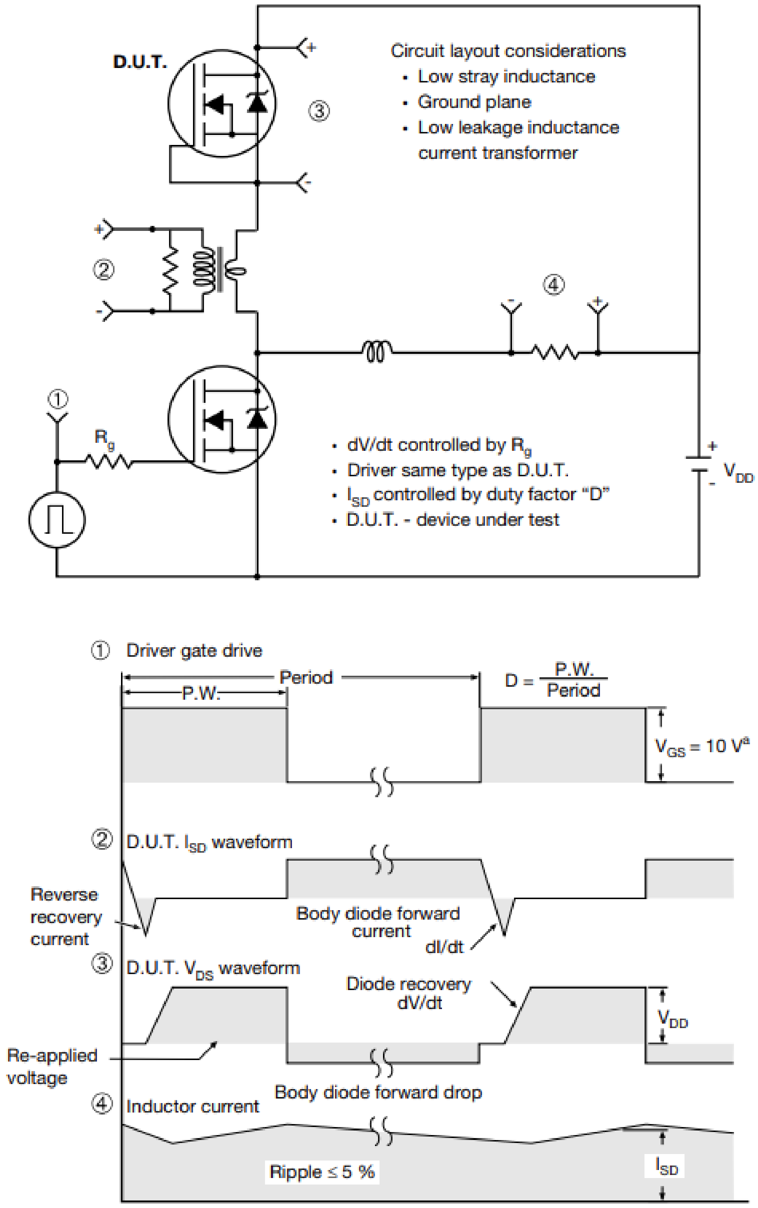


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



Note

a. $V_{GS} = 5$ V for logic level devices

Fig. 14 - For N-Channel

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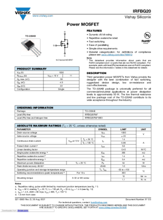	**VISHAY IRFBG20 Discrete Semiconductor** [pdf] User Manual IRFBG20 Discrete Semiconductor, IRFBG20, Discrete Semiconductor, Semiconductor

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