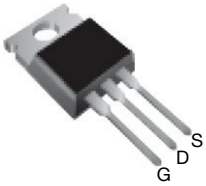
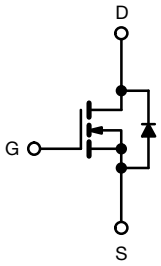
Power MOSFET

TO-220AB





N-Channel MOSFET

FEATURES

- Extremely low $R_{DS(on)}$
- Compact plastic package
- Fast switching
- Low drive current
- Ease of paralleling
- Excellent temperature stability
- Parts per million quality
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Available

RoHS* Available

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

PRODUCT SUMMARY		
V_{DS} (V)	50	
$R_{DS(on)}$ (Ω)	V_{GS} = 10 V	0.10
Q_g (Max.) (nC)	17	
Q_{gs} (nC)	9.0	
Q_{gd} (nC)	3.0	
Configuration	Single	

DESCRIPTION

The technology has expanded its product base to serve the low voltage, very low $R_{DS(on)}$ MOSFET transistor requirements. Vishay's highly efficient geometry and unique processing have been combined to create the lowest on resistance per device performance. In addition to this feature all have documented reliability and parts per million quality!

The transistor also offer all of the well established advantages of MOSFETs such as voltage control, very fast switching, ease of paralleling, and temperature stability of the electrical parameters.

They are well suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers, high energy pulse circuits, and in systems that are operated from low voltage batteries, such as automotive, portable equipment, etc.

ORDERING INFORMATION	
Package	TO-220AB
Lead (Pb)-free	IRFZ20PbF
Lead (Pb)-free and halogen-free	IRFZ20PbF-BE3

ABSOLUTE MAXIMUM RATINGS

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-source voltage [a]			V_{DS}	50	V
Gate-source voltage [a]			V_{GS}	± 20	
Continuous drain current	V_{GS} at 10 V	T_C = 25 °C	I_D	15	A
		T_C = 100 °C		10	
Pulsed drain current [b]			I_{DM}	60	
Single pulse avalanche energy [c]			E_{AS}	5	mJ
Linear derating factor (see fig. 16)				0.32	W/°C
Maximum power dissipation (see fig. 16)	T_C = 25 °C		P_D	40	W
Operating junction and storage temperature range			T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature)	For 10 s			300 (0.063" (1.6 mm) from case	

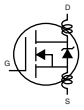
Notes

a. T_J = 25 °C to 150 °C

b. Repeditive rating: Pulse width limited by max. junction temperature. See transient temperature impedance curve (see fig. 11)

c. Starting T_J = 25 °C, L = 0.07 mH, R_g = 25 Ω, I_{AS} = 12 A

THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Typical socket mount, junction-to-ambient	R_{thJA}	-	80	°C/W
Case-to-sink, mounting surface flat, smooth, and greased	R_{thCS}	1.0	-	
Junction-to-case	R_{thJC}	-	3.12	

SPECIFICATIONS (T_J = 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		50	-	-	V
V_{DS} temperature coefficient	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		2.0	-	4.0	V
Gate-source threshold voltage	I_{GSS}	V_{GS} = ± 20 V		-	-	± 500	nA
Gate-source leakage	I_{DSS}	V_{DS} > Max. Rating, V_{GS} = 0 V		-	-	250	µA
Zero gate voltage drain current		V_{DS} = Max. Rating x 0.8, V_{GS} = 0 V, T_C = 125 °C		-	-	1000	
	$I_{D(on)}$	V_{GS} = 10 V	V_{DS} > $I_{D(on)}$ x $R_{DS(on)}$ max.	-	-	15	A
Drain-source on-state resistance [b]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 10 A	-	0.080	0.10	Ω
Forward transconductance [b]	g_{fs}	V_{DS} > $I_{D(on)}$ x $R_{DS(on)}$ max., I_D = 9.0 A		5.0	6.0	-	S
Dynamic							
Input capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz, see fig. 11		-	560	860	pF
Output capacitance	C_{oss}			-	250	350	
Reverse transfer capacitance	C_{rss}			-	60	100	
Total gate charge	Q_g	V_{GS} = 10 V	I_D = 20 A, V_{DS} = 0.8 max. rating, see fig. 18 for test circuit (Gate charge is essentially independent of operating temperature)	-	12	17	nC
Gate-source charge	Q_{gs}			-	9.0	-	
Gate-drain charge	Q_{gd}			-	3.0	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 25 V, I_D = 9.0 A, Z_0 = 50 Ω, see fig. 5[b]		-	15	30	ns
Rise time	t_r			-	45	90	
Turn-off delay time	$t_{d(off)}$			-	20	40	
Fall time	t_f			-	15	30	
Internal drain inductance	L_D	Modified MOSFET symbol showing the internal device inductances 		-	3.5	-	nH
Internal source inductance	L_S			-	4.5	-	
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	MOSFET symbol showing the integral reverse p - n junction rectifier 		-	-	15	A
Pulsed diode forward current [a]	I_{SM}			-	-	60	
Body diode voltage [b]	V_{SD}	T_C = 25 °C, I_S = 15 A, V_{GS} = 0 V		-	-	1.5	V
Body diode reverse recovery time	t_{rr}	T_J = 150 °C, I_F = 15 A, dI_F/dt = 100 A/µs		-	100	-	ns
Body diode reverse recovery charge	Q_{rr}			-	0.4	-	µC
Forward turn-on time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

Notes

a. Repeditive rating: Pulse width limited by max. junction temperature. See transient temperature impedance curve (see fig. 5)

b. Pulse test: Pulse width ≤ 300 µs; duty cycle ≤ 2 %

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

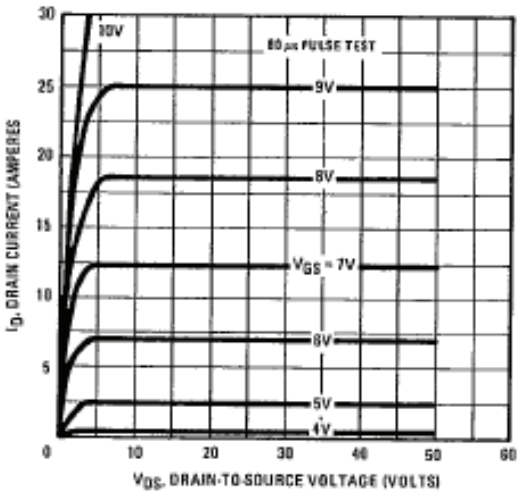


Fig. 1 - Typical Output Characteristics

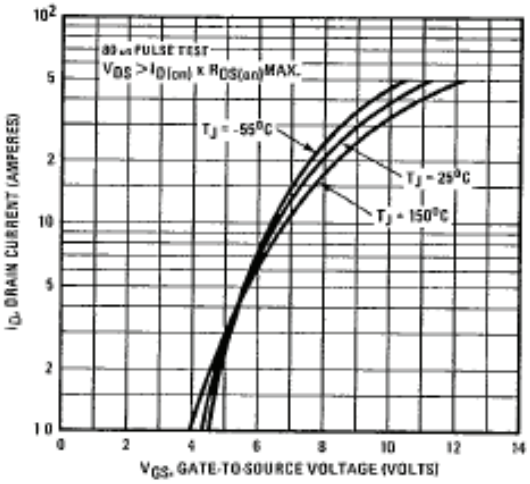


Fig. 1 - Typical Transfer Characteristics

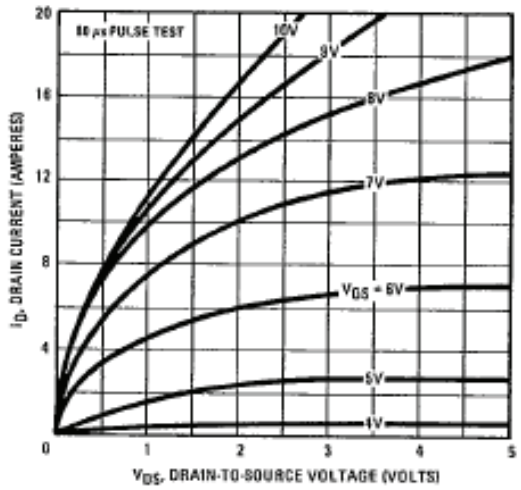


Fig. 2 - Typical Saturation Characteristics

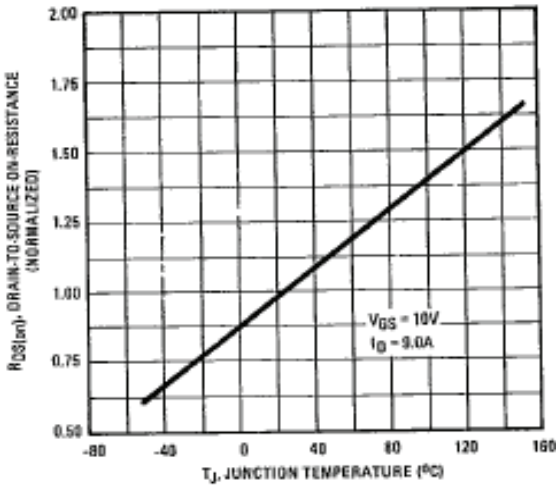


Fig. 2 - Normalized On-Resistance vs. Temperature

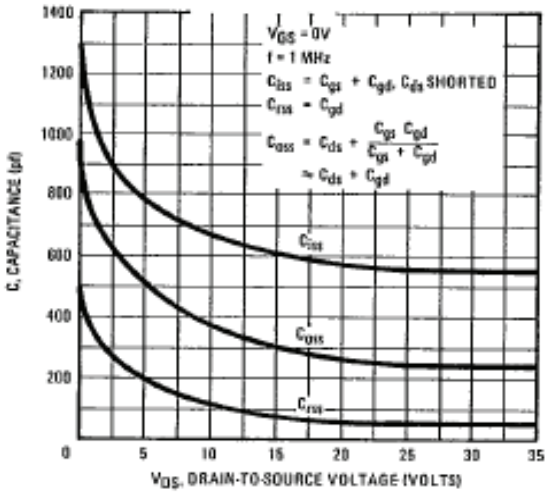


Fig. 3 - Typical Capacitance vs. Drain-to-Source Voltage

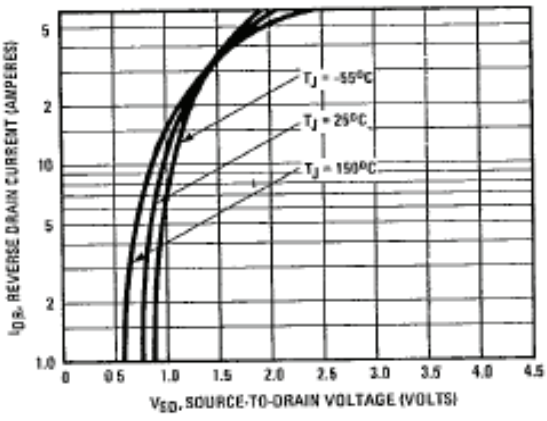


Fig. 5 - Typical Source-Drain Diode Forward Voltage

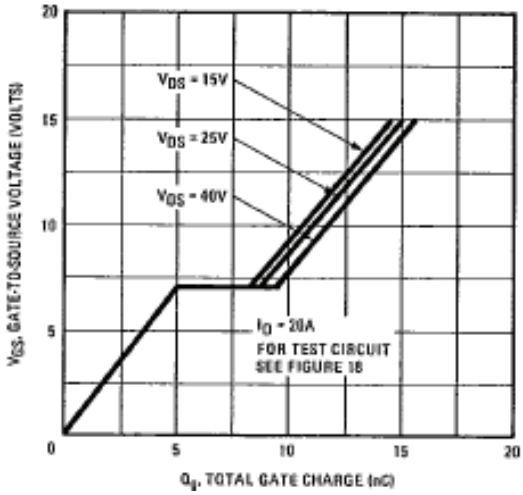


Fig. 4 - Typical Gate Charge vs. Gate-to-Source Voltage

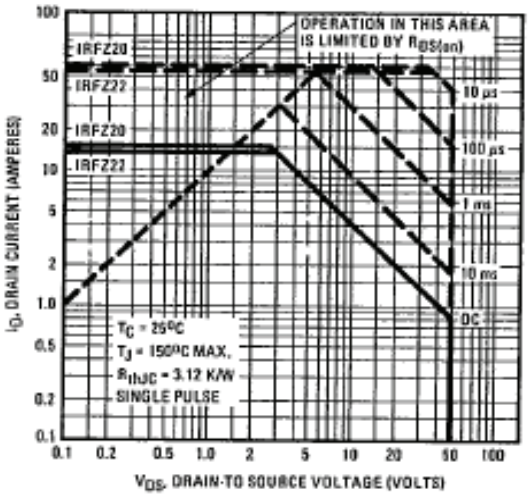


Fig. 6 - Maximum Safe Operating Area

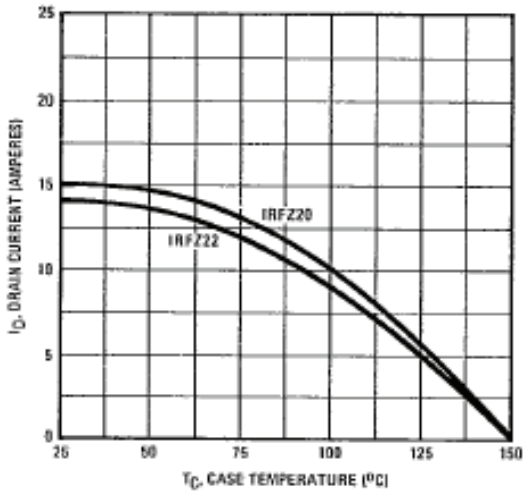


Fig. 7 - Maximum Drain Current vs. Case Temperature

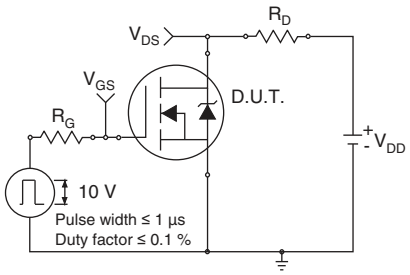


Fig. 10a - Switching Time Test Circuit

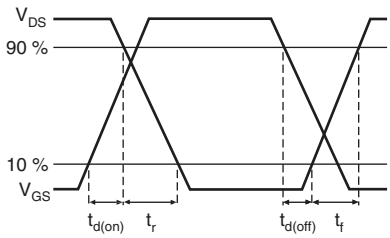


Fig. 10b - Switching Time Waveforms

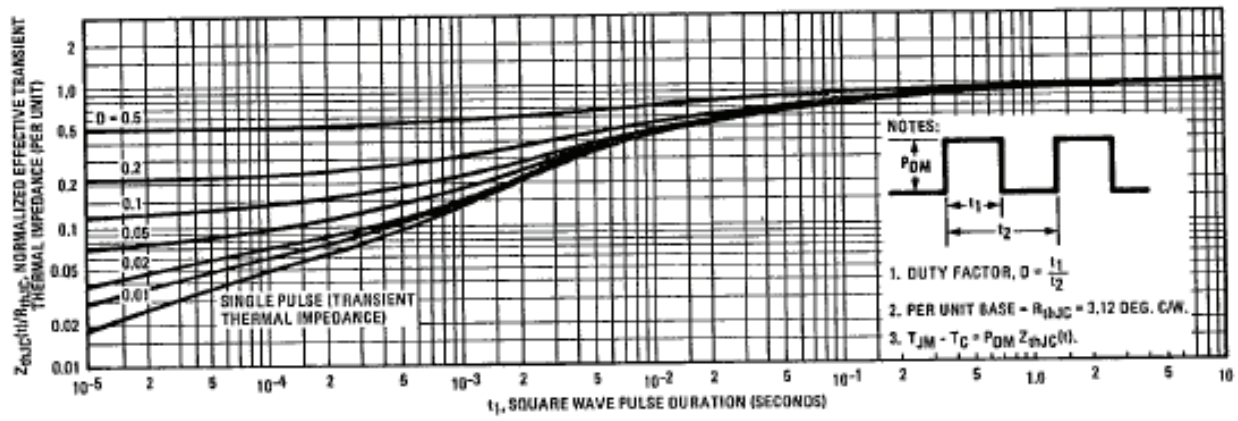


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case vs. Pulse Duration

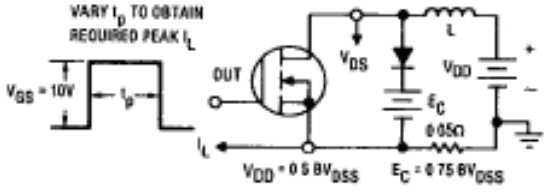


Fig. 12a - Clamped Inductive Test Circuit

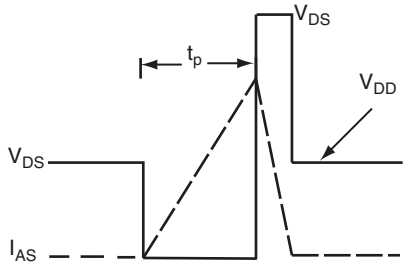


Fig. 12b - Unclamped Inductive Waveforms

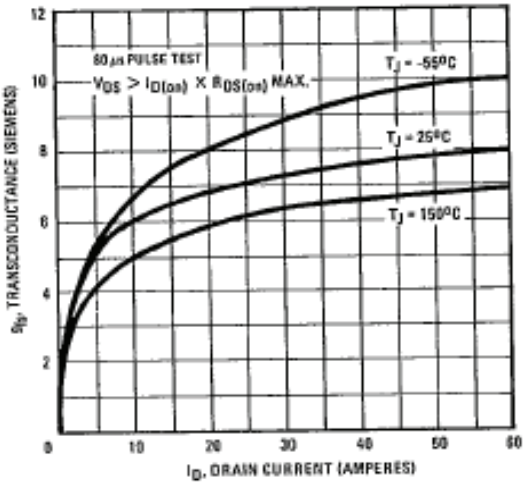


Fig. 13 - Typical Transconductance vs. Drain Current

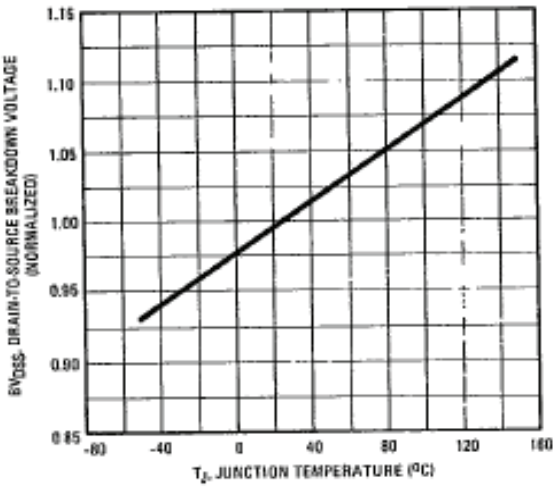


Fig. 14 - Breakdown Voltage vs. Temperature

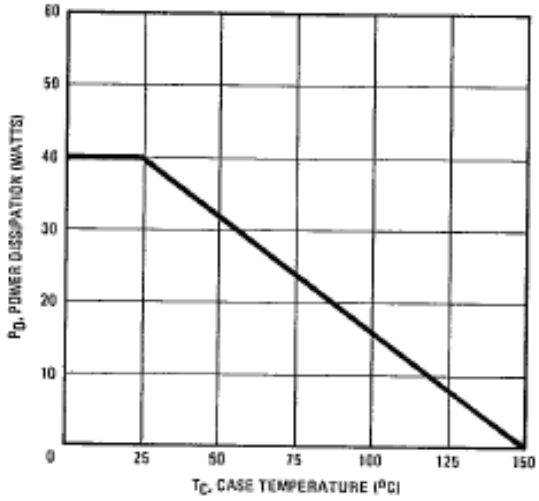


Fig. 16 - Power vs. Temperature Derating Curve

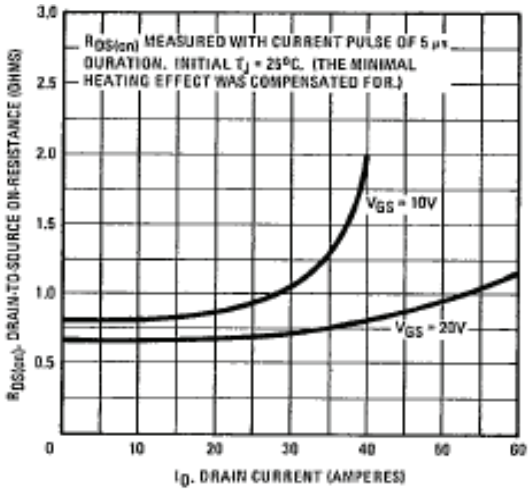


Fig. 15 - Typical On-Resistance vs. Drain Current

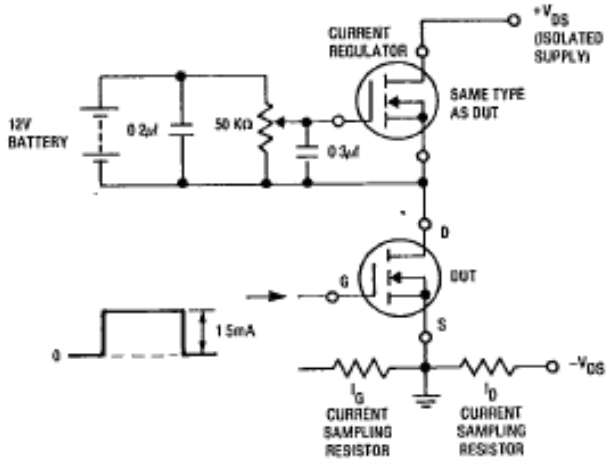
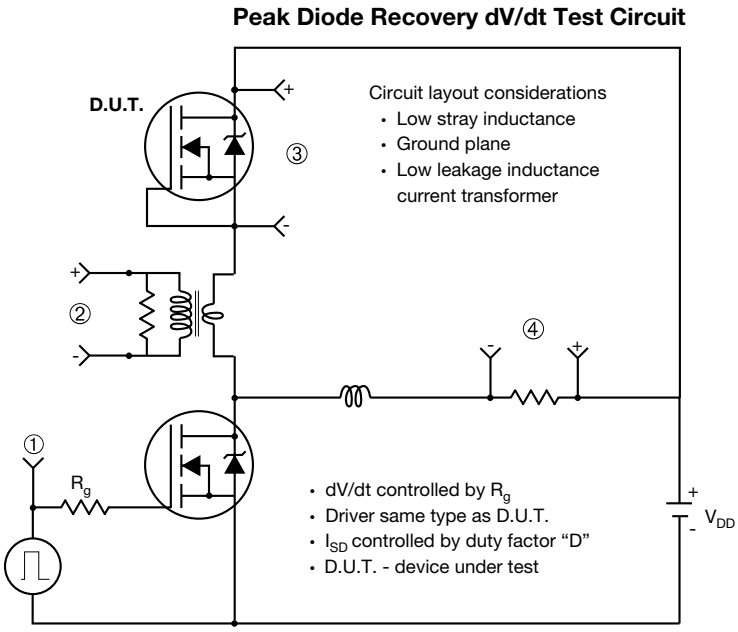
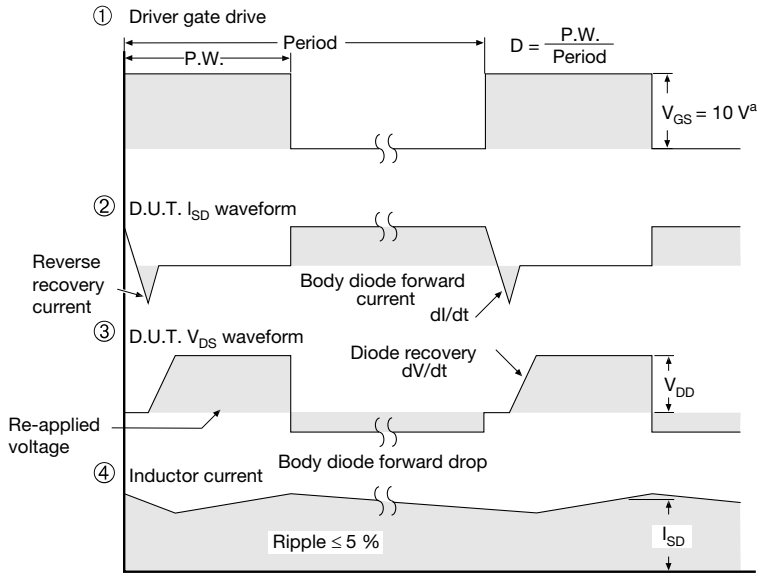


Fig. 17 - Gate Charge Test Circuit





Note

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

Fig. 14 - For N-Channel

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.