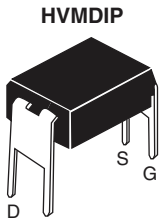
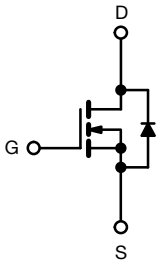
Power MOSFET





N-Channel MOSFET

FEATURES

- For automatic insertion
- Compact plastic package
- End stackable
- Fast switching
- Low drive current
- Easily paralleled
- Excellent temperature stability
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

DESCRIPTION

The HVMDIP technology is the key to Vishay's advanced line of power MOSFET transistors. The efficient geometry and unique processing of the HVMDIP design achieves very low on-state resistance combined with high transconductance and extreme device ruggedness. HVMDIPs feature all of the established advantages of MOSFETs such as voltage control, very fast switching, ease of paralleling, and temperature stability of the electrical parameters.

The HVMDIP 4 pin, dual-in-line package brings the advantages of HVMDIPs to high volume applications where automatic PC board insertion is desireable, such as circuit boards for computers, printers, telecommunications equipment, and consumer products. Their compatibility with automatic insertion equipment, low-profile and end stackable features represent the stat-of-the-art in power device packaging.

PRODUCT SUMMARY		
V_{DS} (V)	60	
$R_{DS(on)}$ (Ω)	V_{GS} = 10 V	0.8
Q_g (Max.) (nC)	7	
Q_{gs} (nC)	2	
Q_{gd} (nC)	7	
Configuration	Single	

ORDERING INFORMATION	
Package	HVMDIP
Lead (Pb)-free	IRFD113PbF

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-source Voltage[a]			V_{DS}	60	V
Gate-source voltage			V_{GS}	± 20	
Continuous drain current	V_{GS} at 10 V	T_C = 25 °C	I_D	0.8	A
Pulsed drain current[b]			I_{DM}	6.4	
Linear derating factor				0.008	W/°C
Inductive current, clamped	L = 100 µH		I_{LM}	6.4	A
Maximum power dissipation	T_C = 25 °C		P_D	1.0	W
Operating junction and storage temperature range			T_J, T_{stg}	- 55 to + 150	°C
Soldering recommendations (peak temperature)	for 10 s			300[c]	

Notes

a. T_J = 25 °C to 150 °C

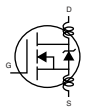
b. Repetitive rating; pulse width limited by maximum junction temperature

c. 1.6 mm from case

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THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum Junction-to-Ambient	R_{thJA}	-	120	°C/W

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		60	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		2.0	-	4.0	
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 20 V		-	-	± 500	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = max. rating, V_{GS} = 0 V		-	-	250	µA
		V_{DS} = max. rating x 0.8, V_{GS} = 0 V, T_C = 125 °C		-	-	1000	
On-State Drain Current[b]	$I_{D(on)}$	V_{GS} = 10 V	V_{DS} > $I_{D(on)}$ x $R_{DS(on)}$ max.	0.8	-	-	A
Drain-Source On-State Resistance[b]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 0.8 A	-	0.6	0.8	Ω
Forward Transconductance[b]	g_{fs}	V_{DS} > $I_{D(on)}$ x $R_{DS(on)}$ max., I_D = 0.8 A		0.8	1.2	-	S
Dynamic							
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz		-	135	200	pF
Output Capacitance	C_{oss}			-	80	100	
Reverse Transfer Capacitance	C_{rss}			-	20	25	
Total Gate Charge	Q_g	V_{GS} = 10 V	I_D = 4 A, V_{DS} = 0.8 max. rating	-	5	7	nC
Gate-Source Charge	Q_{gs}			-	2	-	
Gate-Drain Charge	Q_{gd}			-	7	-	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 0.5 V_{DS} , I_D = 0.8 A, R_g = 50 Ω		-	10	20	ns
Rise Time	t_r			-	15	25	
Turn-Off Delay Time	$t_{d(off)}$			-	15	25	
Fall Time	t_f			-	10	20	
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 		-	4.0	-	nH
Internal Source Inductance	L_S			-	6.0	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	0.8	A
Pulsed Diode Forward Current	I_{SM}			-	-	6.4	
Body Diode Voltage[a]	V_{SD}	T_A = 25 °C, I_S = 0.8 A, V_{GS} = 0 V		-	-	2	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 150 °C, I_F = 1.0 A, dI/dt = 100 A/µs		-	100	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	0.2	-	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. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)

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

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TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

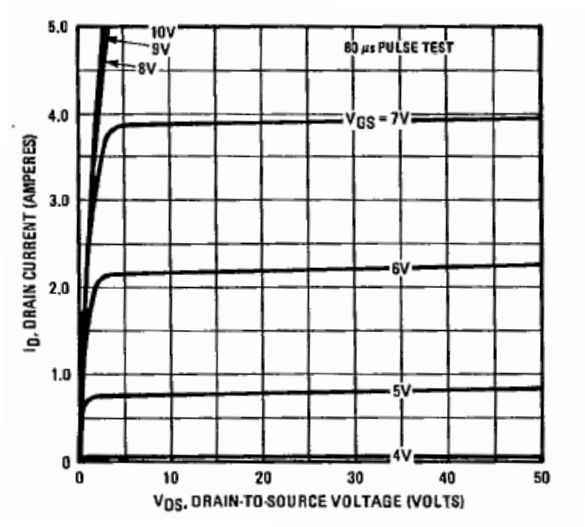


Fig. 1 - Typical Output Characteristics

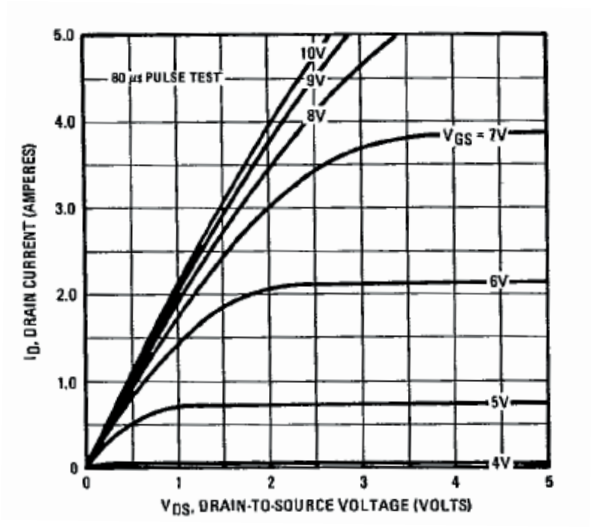


Fig. 2 - Typical Saturation Characteristics

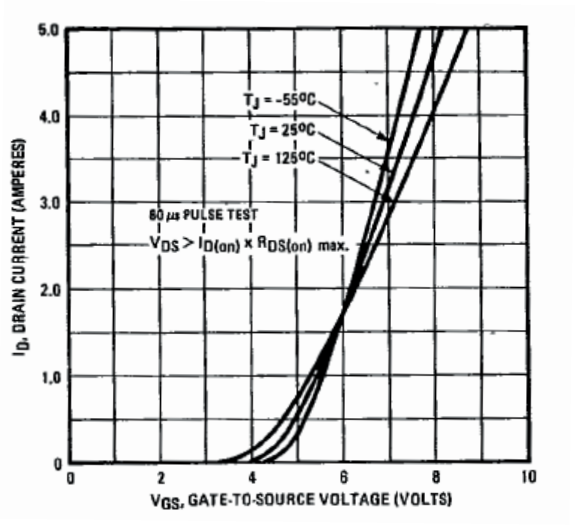


Fig. 1 - Typical Transfer Characteristics

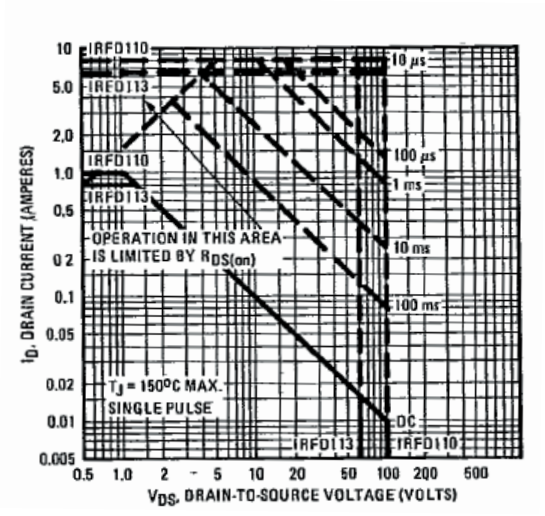


Fig. 3 - Maximum Safe Operatung Area

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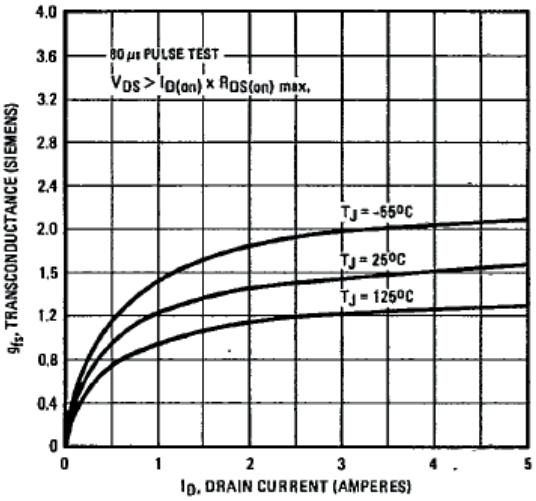


Fig. 4 - Typical Transconductance vs. Drain Current

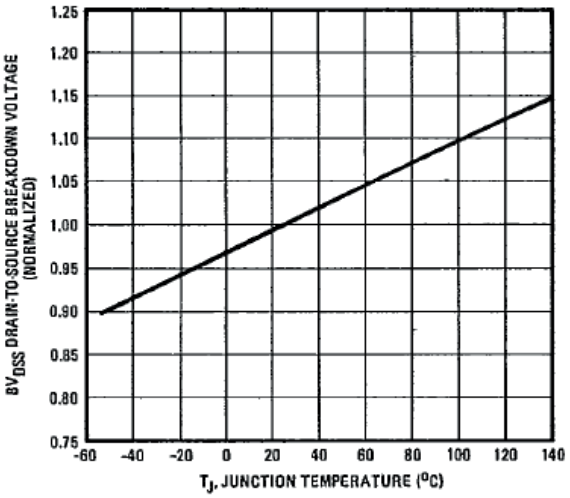


Fig. 6 - Breakdown Voltage vs. Temperature

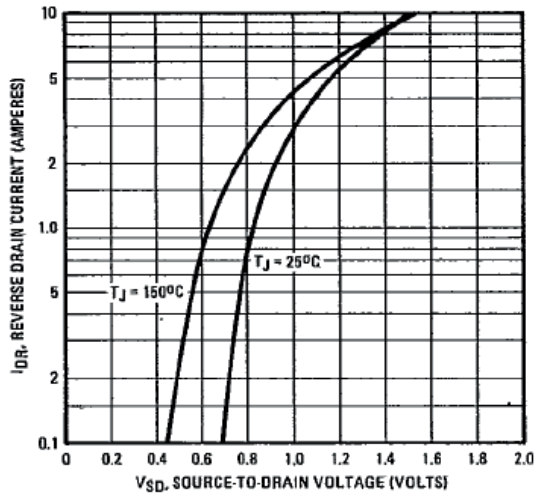


Fig. 5 - Typical Source-Drain Diode Forward Voltage

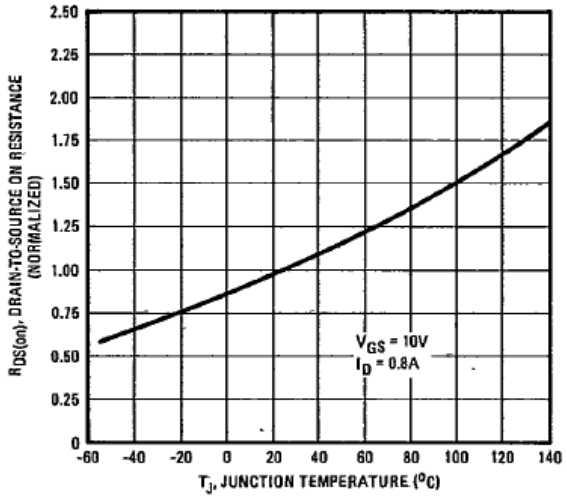


Fig. 7 - Normalized On-Resistance vs. Temperature

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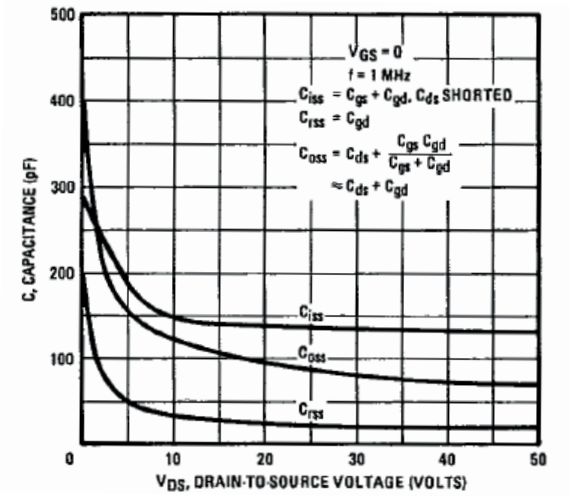


Fig. 8 - Typical Capacitance vs. Drain-to-Source Voltage

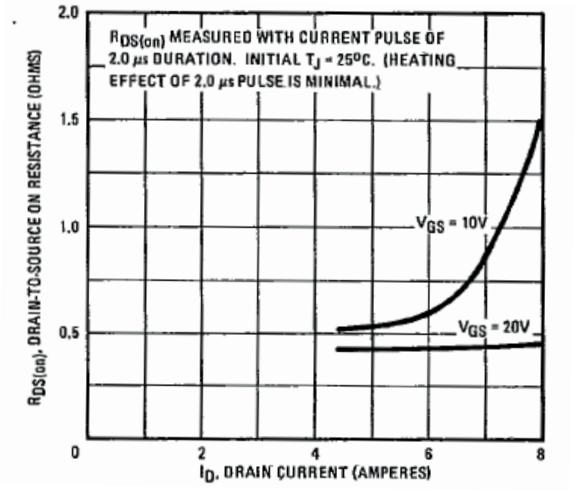


Fig. 10 - Typical On-Resistance vs. Darin Current

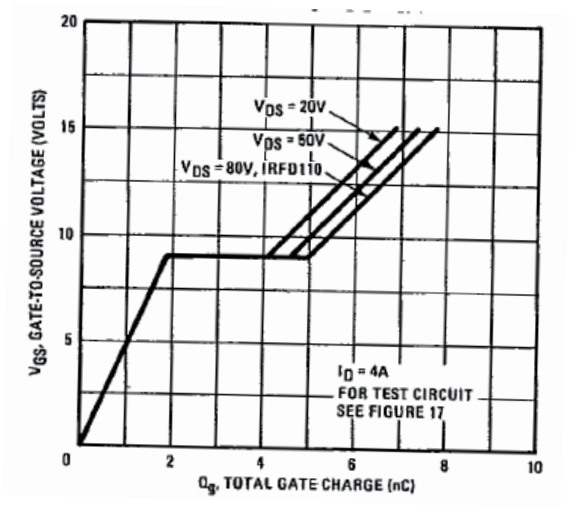


Fig. 9 - Typical Gate Charge vs. Gate-to-Source Voltage

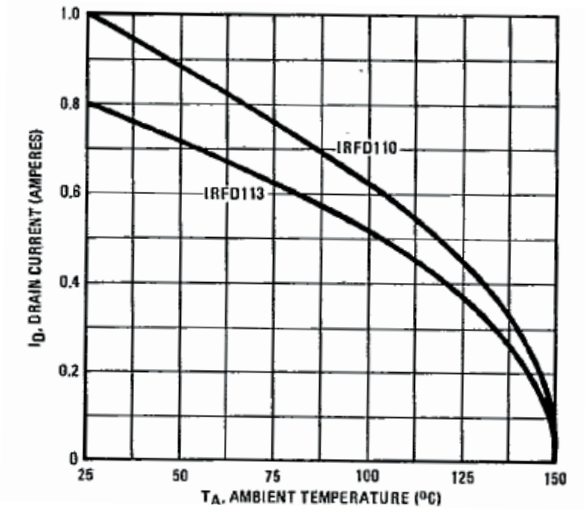


Fig. 11 - Maximum Darin Current vs. Case Temperature

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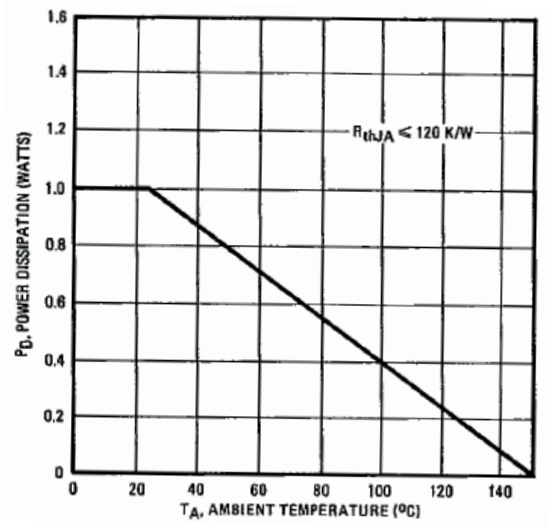


Fig. 12 - Power vs. Temperature Derating

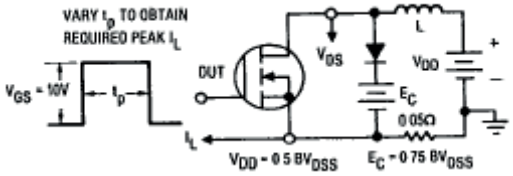


Fig. 13 - Clamped Inductive Test Circuit

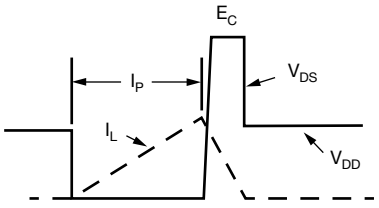


Fig. 14 - Clamped Inductive Waveforms

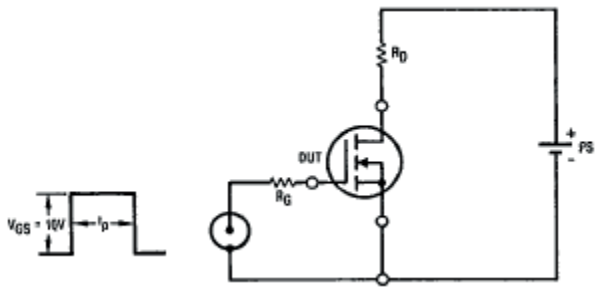


Fig. 15 - Switching Time Test Circuit

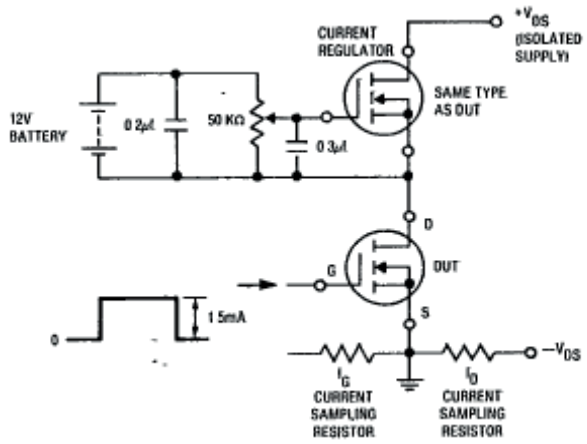


Fig. 16 - Gate Charge Test Circuit

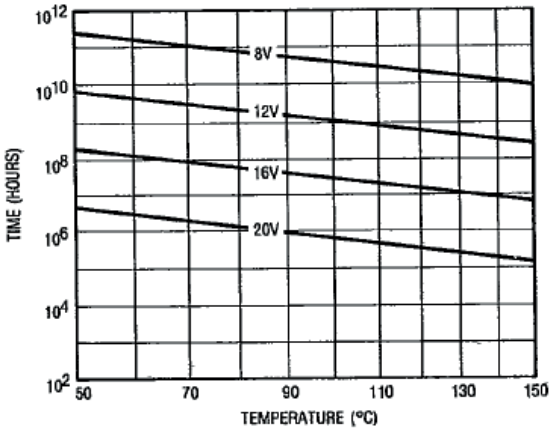


Fig. 17 - Typical Time to Accumulated 1 % Gate Failure

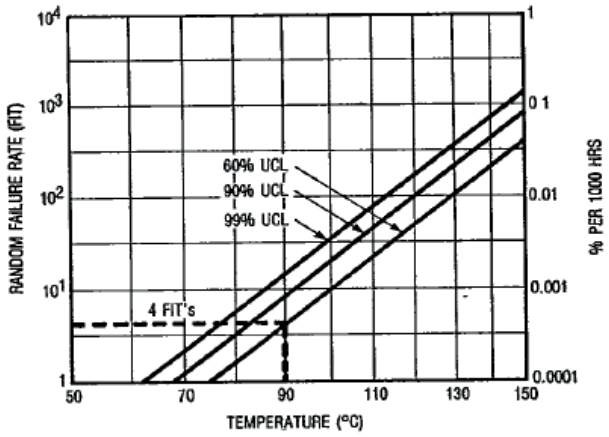
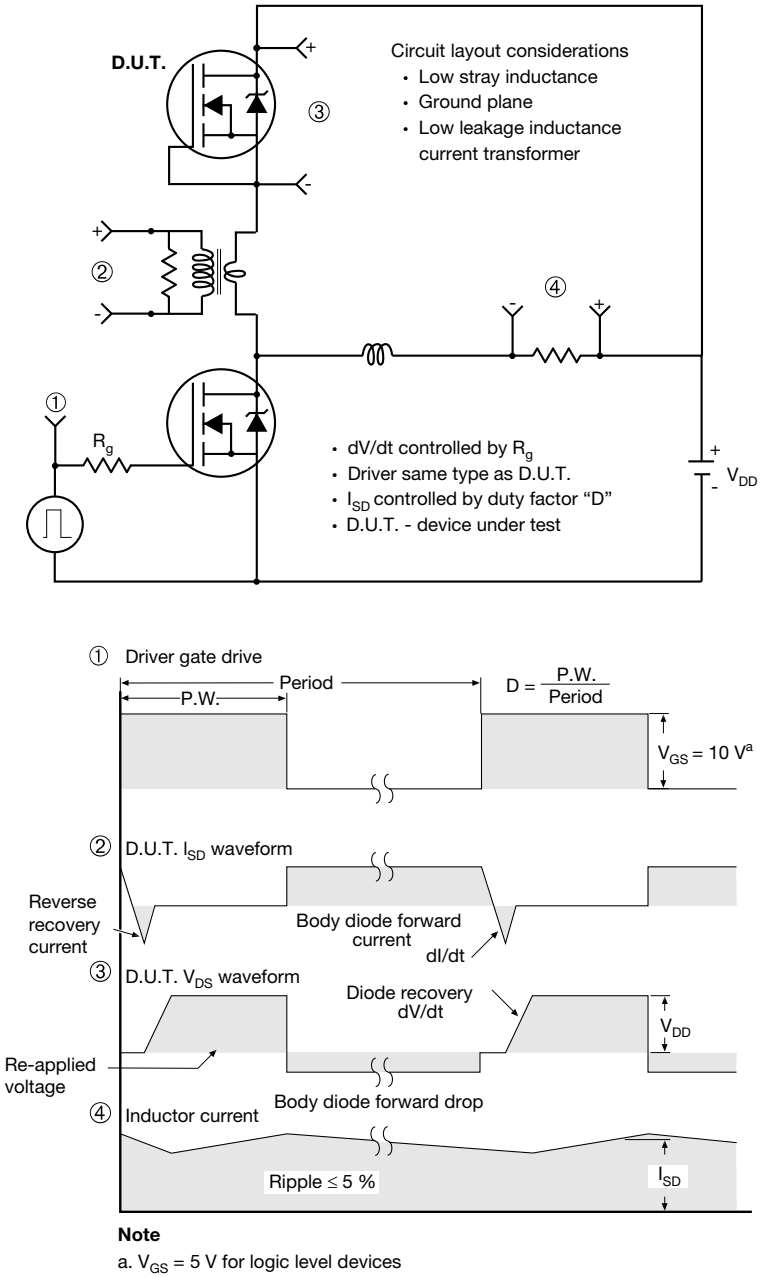


Fig. 18 - Typical High Temperature Reverse Bias (HTRB) Failure Rate

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Peak Diode Recovery dV/dt Test Circuit



Note

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

Fig. 19 - For N-Channel

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