

650V N-Channel Planar MOSFET

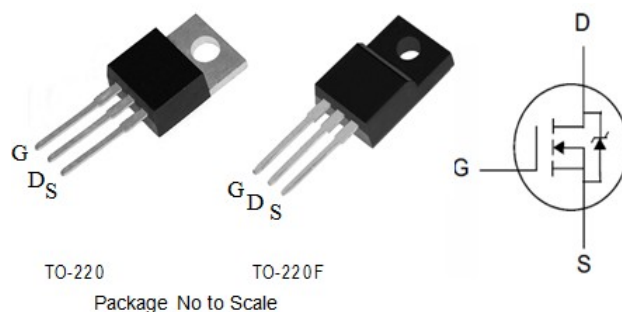
Pb Lead Free Package and Finish

- 4A, 650V, $R_{DS(ON), typ.} = 2.4 \Omega @ V_{GS} = 10V$
- Low Gate Charge Minimize Switching Loss
- 100% Avalanche Tested
- RoHS Product

Applications

- Adaptor
- Charger
- SMPS Standby Power

Features



Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

Symbol	Parameter	JMF4N65C	JMA4N65C	Units
V_{DSS}	Drain-Source Voltage	650		V
V_{GSS}	Gate-Source Voltage	± 30		
I_D	Continuous Drain Current	4.0		A
I_{DM}	Pulsed Drain Current at $V_{GS} = 10V$	16		
E_{AS}	Single Pulse Avalanche Energy	250		mJ
P_D	Power Dissipation	30		W
	Derating Factor above $25^\circ C$	0.24		W/ $^\circ C$
T_L	Soldering Temperature Distance of 1.6mm from case for 10 seconds	300		$^\circ C$
$T_J \& T_{STG}$	Operating and Storage Temperature Range	-55 ~ 150		

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	JMF4N65C	JMA4N65C	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	4.17		$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	100		

Electrical Characteristics

OFF Characteristics (TC = 25 °C unless otherwise noted)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV _{DSS}	Drain-Source Breakdown Voltage	650	--	--	V	V _{GS} =0V, I _D =250uA
I _{DSS}	Drain-Source Leakage Current	--	--	1	uA	V _{DS} =650V, V _{GS} =0V
		--	--	100		V _{DS} =520V, V _{GS} =0V, T _J =125°C
I _{GSS}	Gate-Source Leakage Current	--	--	+10	uA	V _{GS} =+20V, V _{DS} =0V
		--	--	-10		V _{GS} =-20V, V _{DS} =0V

ON Characteristics (TC = 25 °C unless otherwise noted)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
R _{DS(ON)}	Static Drain-to-Source On-Resistance	--	2.4	2.8	Ω	V _{GS} =10V, I _D =2.0A
V _{GS(TH)}	Gate Threshold Voltage	2.0	--	4.0	V	V _{DS} =V _{GS} , I _D =250uA
gfs	Forward Transconductance	--	5.0	--	S	V _{DS} =15V, I _D =2.0A

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C _{iss}	Input Capacitance	--	450	--	pF	V _{GS} =0V, V _{DS} =25V, f=1.0MHz
C _{rss}	Reverse Transfer Capacitance	--	6.0	--		
C _{oss}	Output Capacitance	--	50	--		
Q _g	Total Gate Charge	--	8.5	--	nC	V _{DD} =325V, I _D =4A, V _{GS} =0 to 10V
Q _{gs}	Gate-to-Source Charge	--	2.8	--		
Q _{gd}	Gate-to-Drain (Miller) Charge	--	2.5	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
t _{d(ON)}	Turn-on Delay Time	--	9.0	--	nS	V _{DD} =325V, I _D =4A, V _{GS} =10V R _g =4.7Ω
t _{rise}	Rise Time	--	7.0	--		
t _{d(OFF)}	Turn-Off Delay Time	--	22	--		
t _{fall}	Fall Time	--	9.0	--		

Source-Drain Body Diode Characteristics (TC = 25 °C unless otherwise noted)

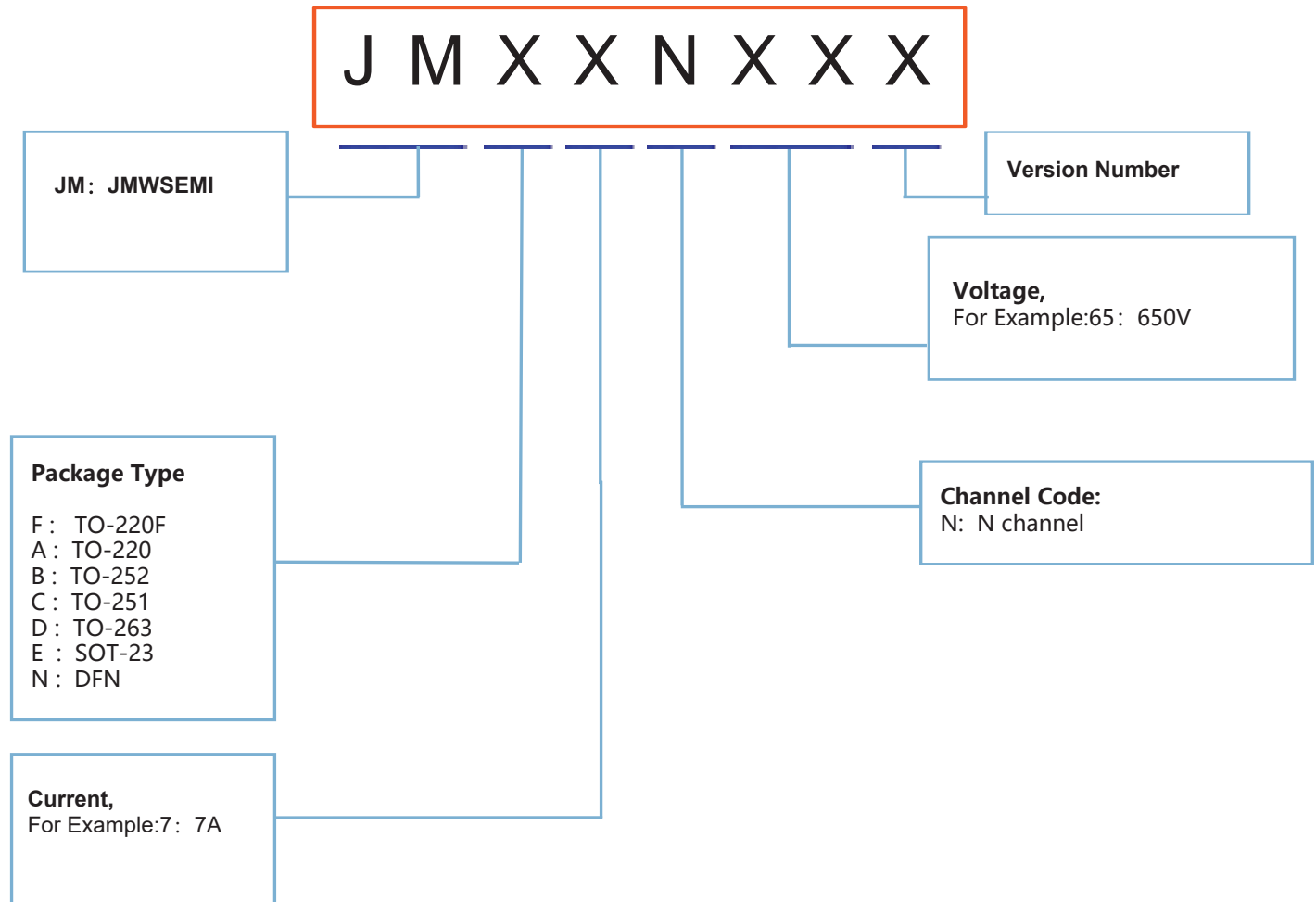
Symbol	Parameter	Min	Typ.	Max.	Units	Test Conditions
I_{SD}	Continuous Source Current ^[2]	--	--	4.0	A	Integral pn-diode in MOSFET
I_{SM}	Pulsed Source Current ^[2]	--	--	16		
V_{SD}	Diode Forward Voltage	--	--	1.5	V	$I_S=4A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time	--	235	--	ns	$V_{GS}=0V$ $I_F=I_S, di/dt=100A/\mu s$
Q_{rr}	Reverse Recovery Charge	--	750	--	nC	

Note:

[1] $T_J=+25^{\circ}C \sim +150^{\circ}C$

[2] Pulse width $\leq 380\mu s$; duty cycle $\leq 2\%$.

VD MOS Product Names Rules



Typical Characteristics

Figure 1. Maximum Transient Thermal Impedance

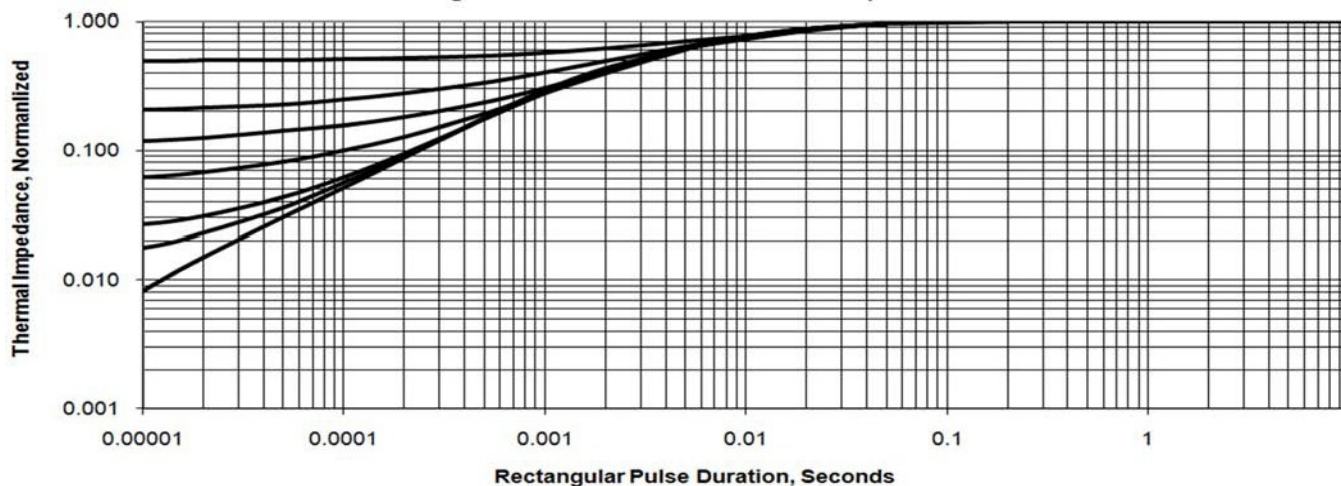


Figure 2 . Maximum Power Dissipation vs Case Temperature

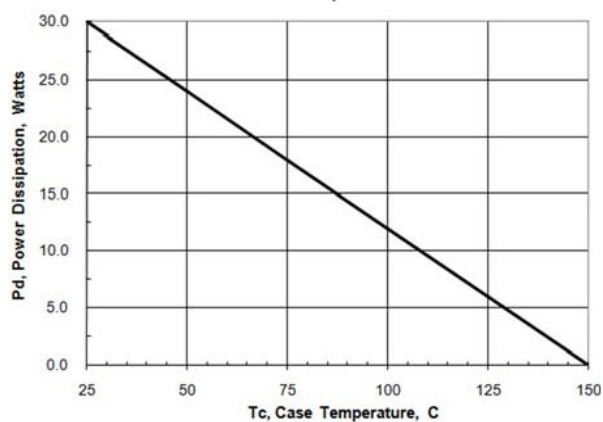


Figure 3 .Maximum Continuous Drain Current vs Case Temperature

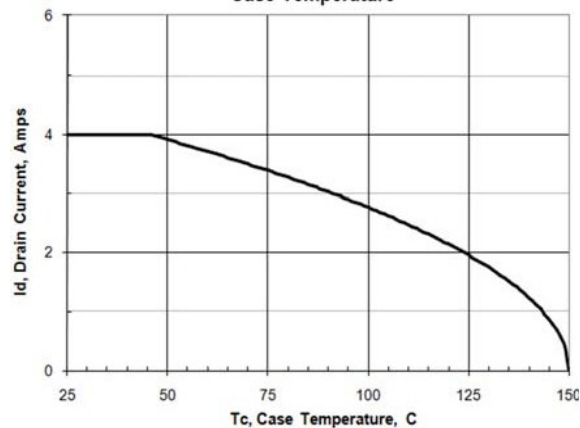
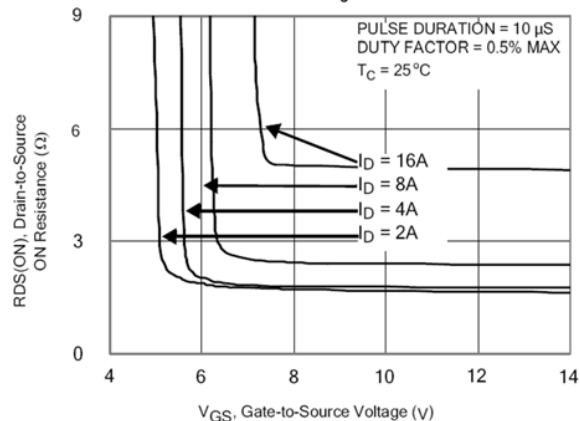


Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current



Typical Characteristics(Cont.)

Figure 6. Maximum Peak Current Capability

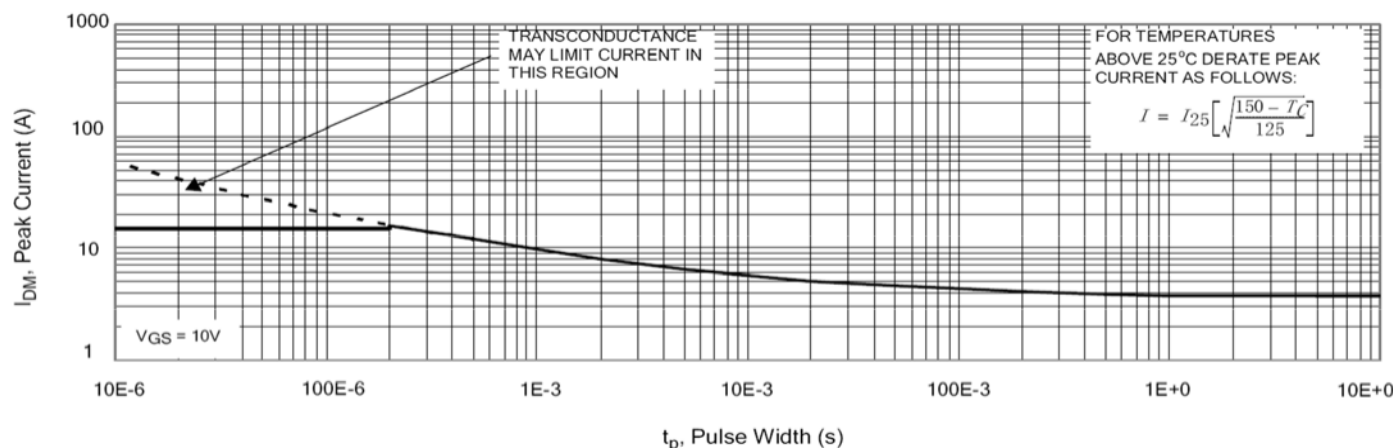


Figure 7. Typical Transfer Characteristics

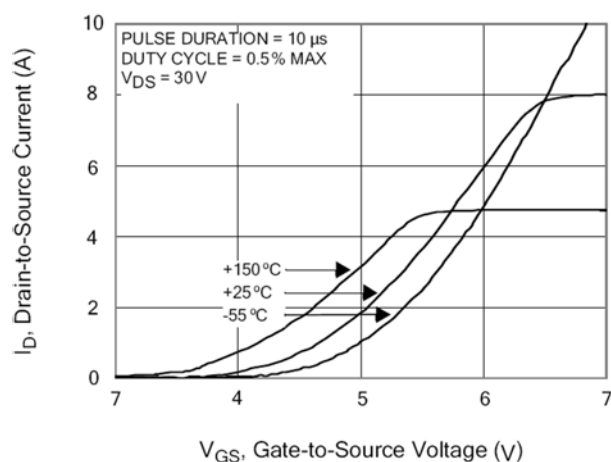


Figure 8. Unclamped Inductive Switching Capability

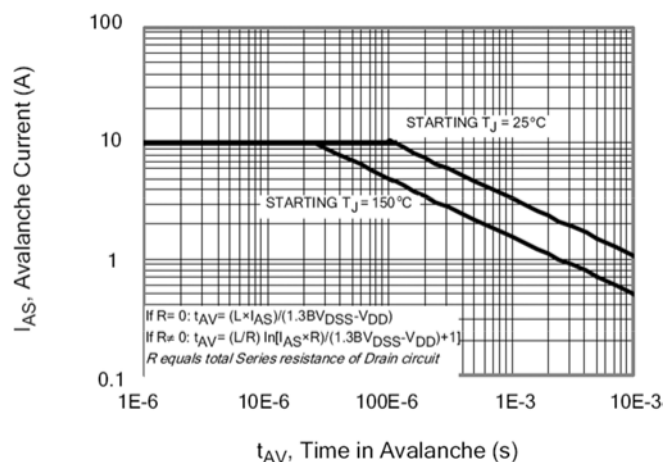


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

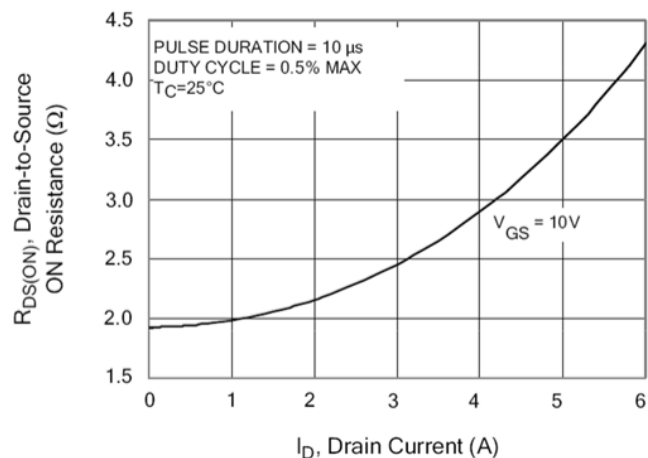
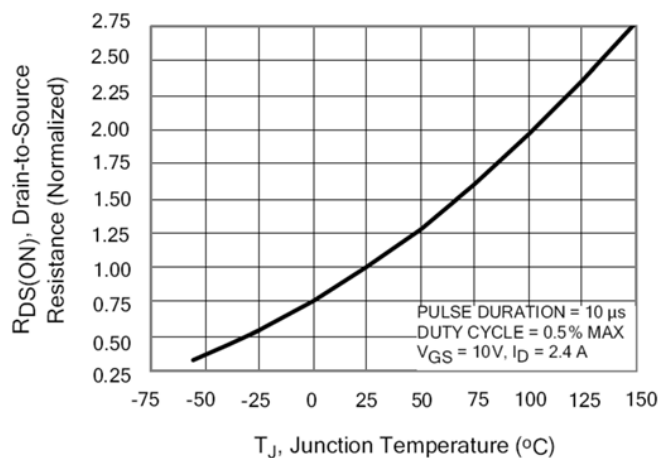


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature



Typical Characteristics(Cont.)

Figure 11. Typical Breakdown Voltage vs Junction Temperature

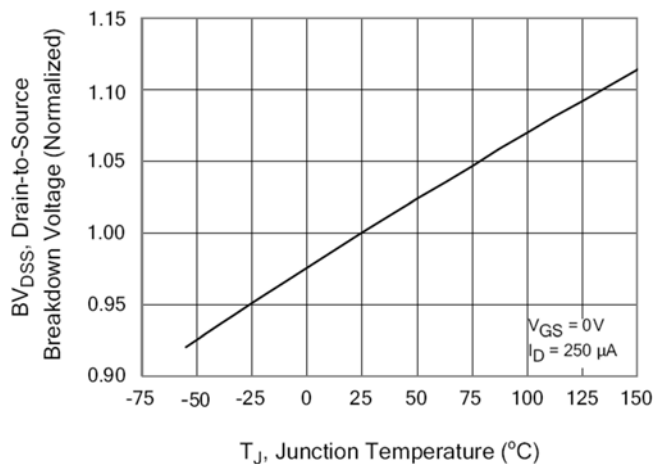


Figure 12. Typical Threshold Voltage vs Junction Temperature

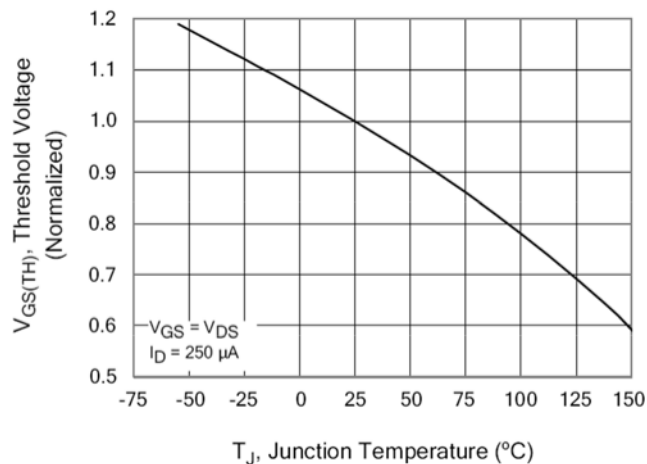


Figure 13. Maximum Safe Operating Area

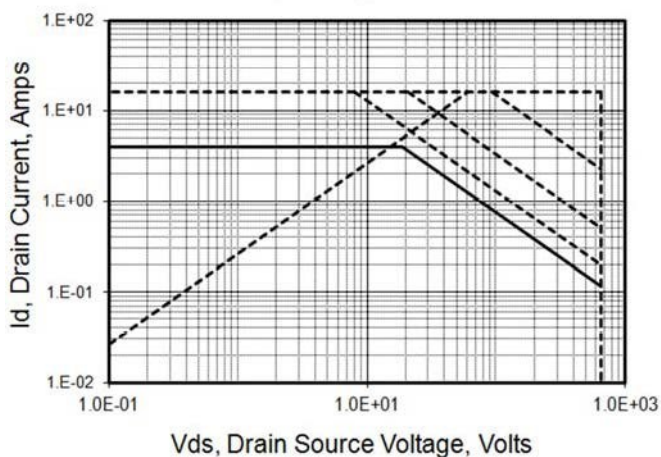


Figure 14. Typical Capacitance vs Drain-to-Source Voltage

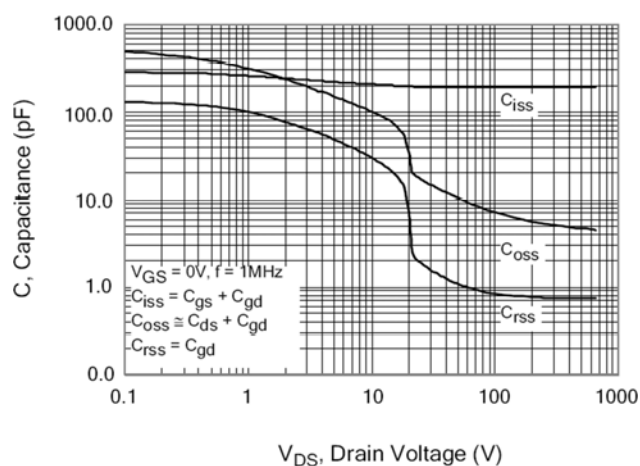


Figure 15. Typical Gate Charge

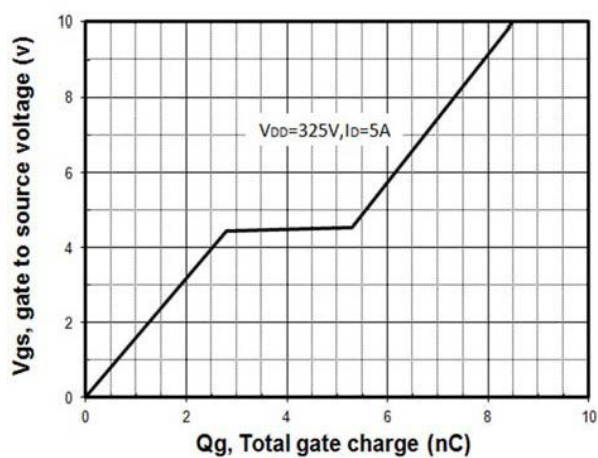
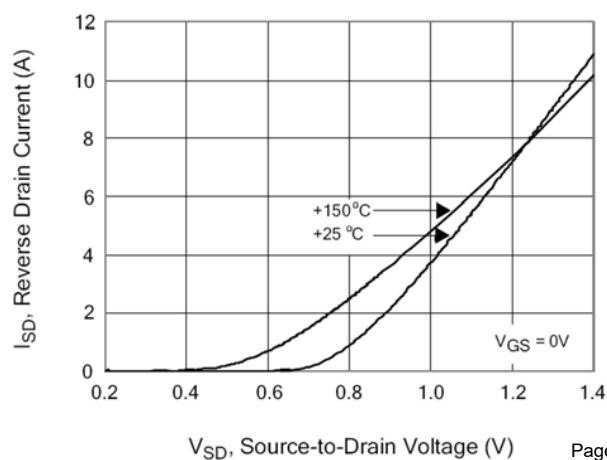


Figure 16. Typical Body Diode Transfer Characteristics



Test Circuits and Waveforms

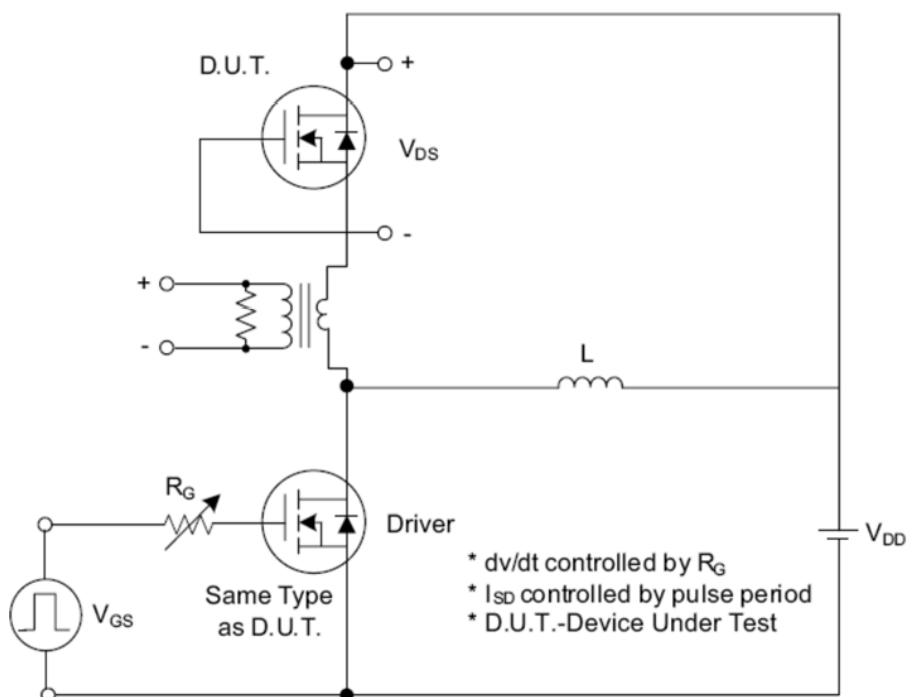


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

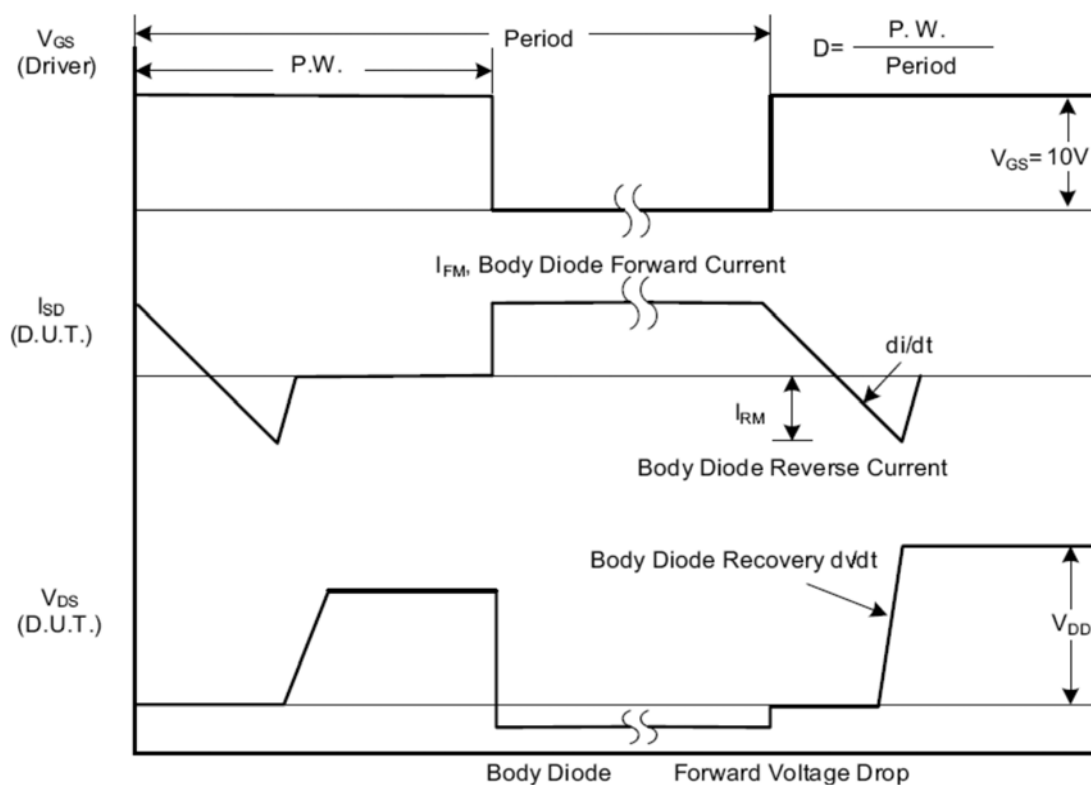


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

Test Circuits and Waveforms (Cont.)

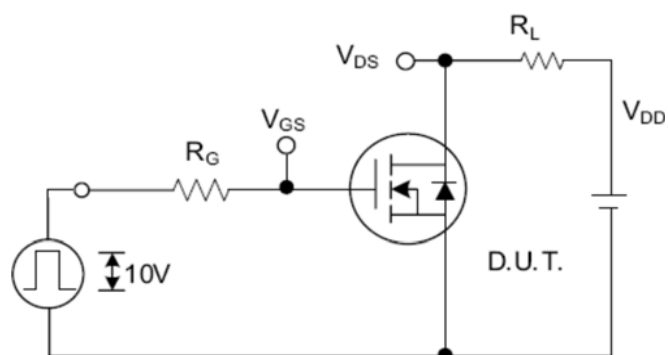


Fig. 2.1 Switching Test Circuit

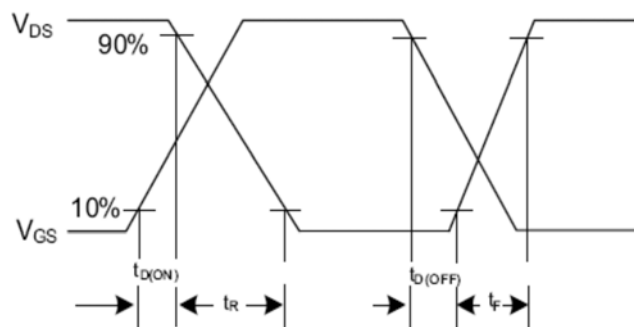


Fig. 2.2 Switching Waveforms

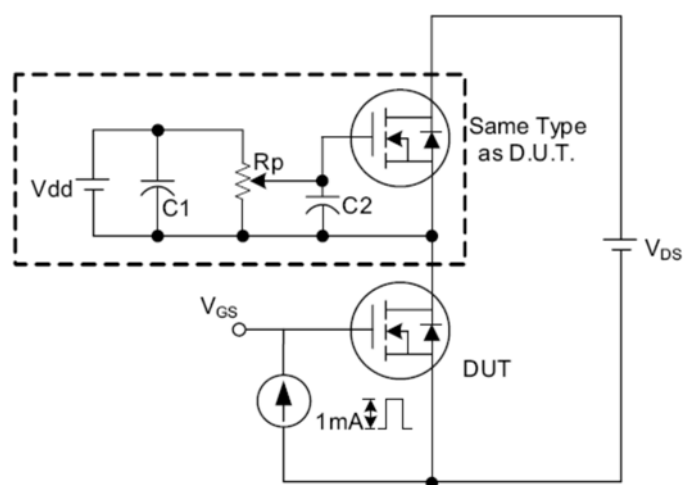


Fig. 3.1 Gate Charge Test Circuit

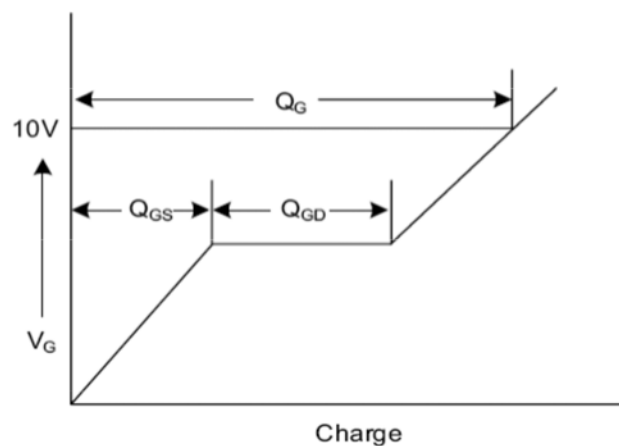


Fig. 3.2 Gate Charge Waveform

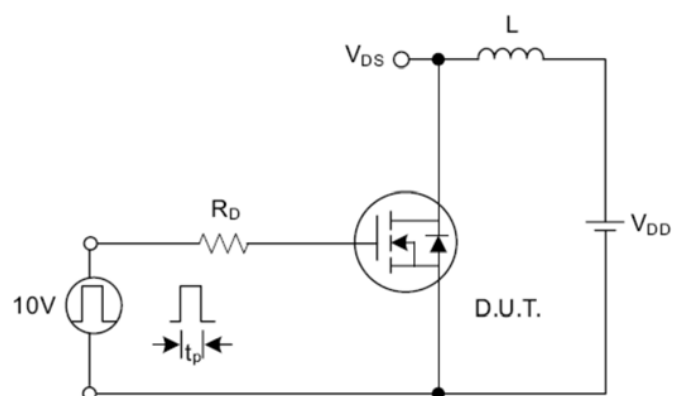


Fig. 4.1 Unclamped Inductive Switching Test Circuit

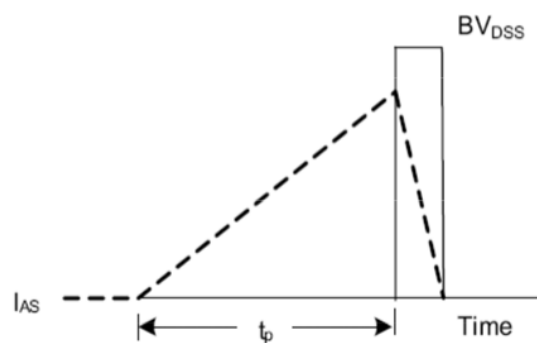


Fig. 4.2 Unclamped Inductive Switching Waveforms

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