

600V N-Channel MOSFET

Features

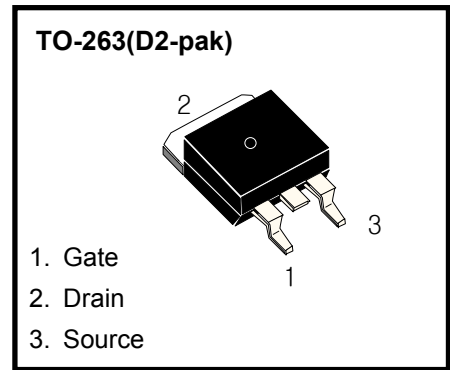
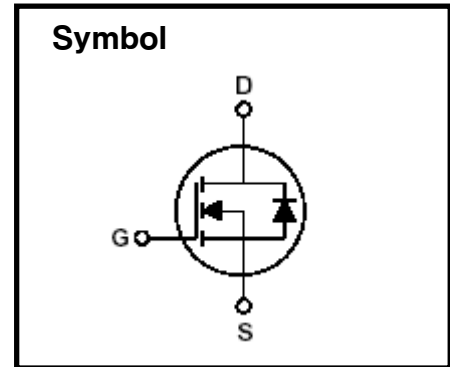
- ◇ 1.8A, 600V, $R_{DS(on)} = 5.0 \Omega @ V_{GS}=10V$
- ◇ Low gate charge (typical 12.5nC)
- ◇ Low Crss (typical 7.6pF)
- ◇ Fast switching
- ◇ 100% avalanche tested
- ◇ Improved dv/dt capability

General Description

These N-Channel enhancement mode power field effect transistors are produced using planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are well suited for high efficiency switch mode power supplies.



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

Symbol	Parameter	WSK2N60D	Units
V_{DSS}	Drain-Source Voltage	600	V
I_D	Drain Current - Continuous($T_c=25^\circ C$) - Continuous($T_c=100^\circ C$)	1.8	A
		1.1	A
I_{DM}	Drain Current - Pulsed (Note 1)	6.0	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	120	mJ
I_{AR}	Avalanche Current (Note 1)	1.8	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	4.4	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5	V/ns
P_D	Power Dissipation ($T_c=25^\circ C$) *	2.5	W
	Power Dissipation ($T_c=25^\circ C$) - Derate above $25^\circ C$	44	W
		0.35	W/ $^\circ C$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to + 150	$^\circ C$
T_L	Maximum lead temperature for soldering purposes, 1/8 " from case for 5 seconds	300	$^\circ C$

Electrical Characteristics ($T_c=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0\text{ V}, I_D=250\mu\text{A}$	600	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D=250\mu\text{A}$, Referenced to 25°C	--	0.65	--	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=600\text{V}, V_{GS}=0\text{ V}$	--	--	10	μA
		$V_{DS}=480\text{V}, T_c=125^\circ\text{C}$	--	--	100	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS}=30\text{V}, V_{DS}=0\text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS}=-30\text{V}, V_{DS}=0\text{ V}$	--	--	-100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=0.9\text{A}$	--	3.8	5.0	Ω
g_{FS}	Forward Transconductance	$V_{DS}=40\text{V}, I_D=0.9\text{A}$ (Note 4)	--	1.85	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS}=25\text{V}, V_{GS}=0\text{ V}, f=1.0\text{MHz}$	--	380	490	pF
C_{oss}	Output Capacitance		--	35	46	pF
C_{rss}	Reverse Transfer Capacitance		--	7.6	9.9	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=300\text{V}, I_D=2.0\text{A}, R_G=25\Omega$ (Note 4, 5)	--	16	40	ns
t_r	Turn-On Rise Time		--	50	110	ns
$t_{d(off)}$	Turn-Off Delay Time		--	40	90	ns
t_f	Turn-Off Fall Time		--	40	90	ns
Q_g	Total Gate Charge	$V_{DS}=480\text{V}, I_D=2.0\text{A}, V_{GS}=10\text{V}$ (Note 4, 5)	--	12.5	17	nC
Q_{gs}	Gate-Source Charge		--	2.2	--	nC
G_{gd}	Gate-Drain Charge		--	5.4	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	1.8	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	6.0	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS}=0\text{ V}, I_S=1.8\text{A}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$V_{GS}=0\text{ V}, I_S=2.0\text{A},$ $di_F / dt=100\text{A}/\mu\text{S}$ (Note 4)	--	250	--	ns
Q_{rr}	Reverse Recovery Charge		--	1.31	--	

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L=68\text{mH}, I_{AS}=2.0\text{A}, V_{DD}=50\text{V}, R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$
3. $I_{SD}\leq 2.0\text{A}, di/dt\leq 300\text{A}/\mu\text{S}, V_{DD}\leq BV_{DSS}$, Starting $T_J=25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\mu\text{S}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Thermal Characteristic

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	2.87	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient *	--	50	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	110	$^{\circ}\text{C}/\text{W}$

Typical Characteristics

Fig 1. On-Region Characteristics

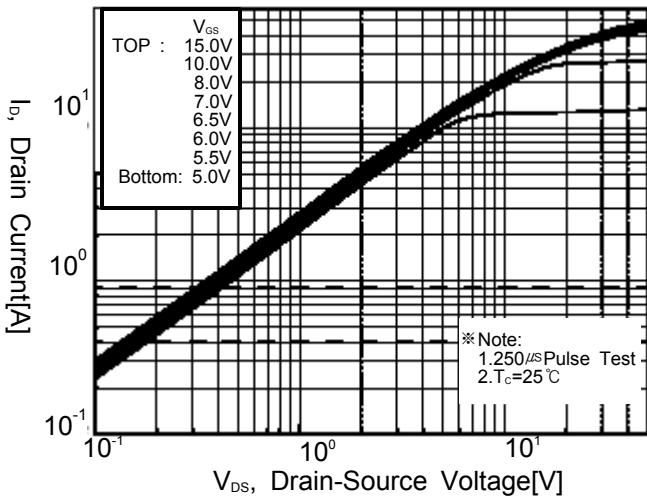


Fig 2. Transfer Characteristics

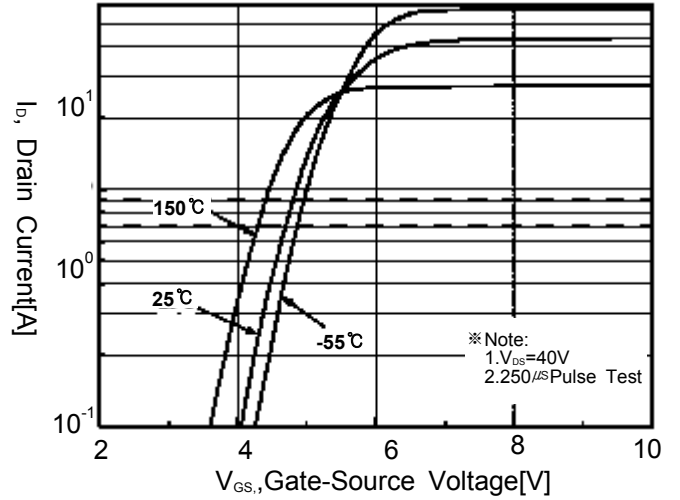


Fig 3. On-Resistance Variation vs Drain Current and Gate Voltage

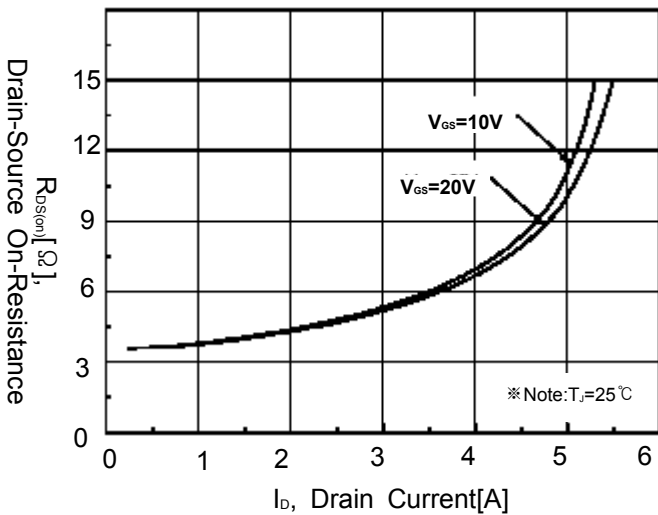


Fig 4. Body Diode Forward Voltage Variation With Source Current and Temperature

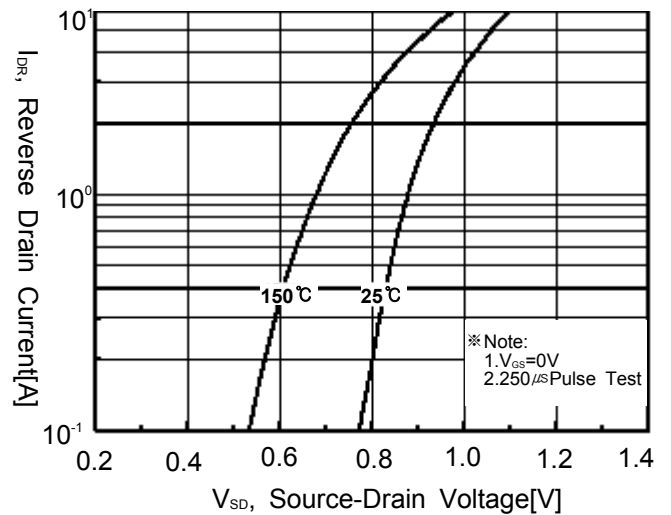


Fig 5. Capacitance Characteristics

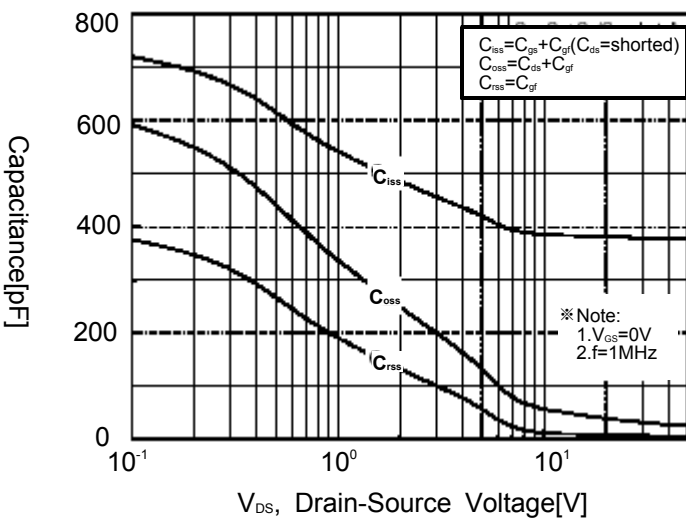


Fig 6. Gate Charge Characteristics

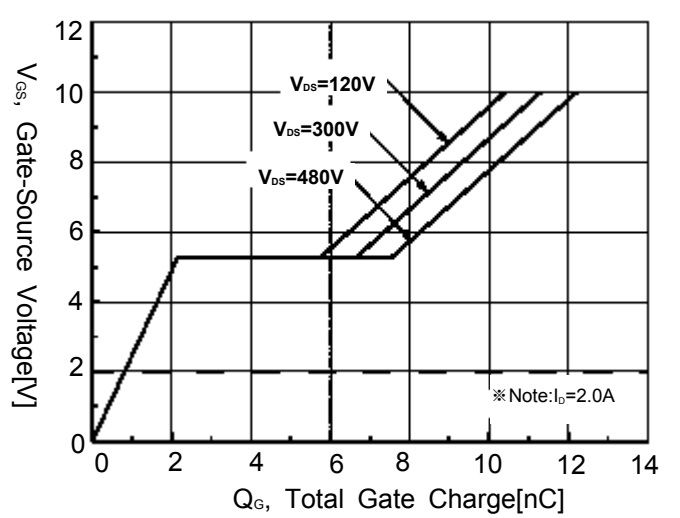


Fig 7. Breakdown Voltage Variation vs. Temperature

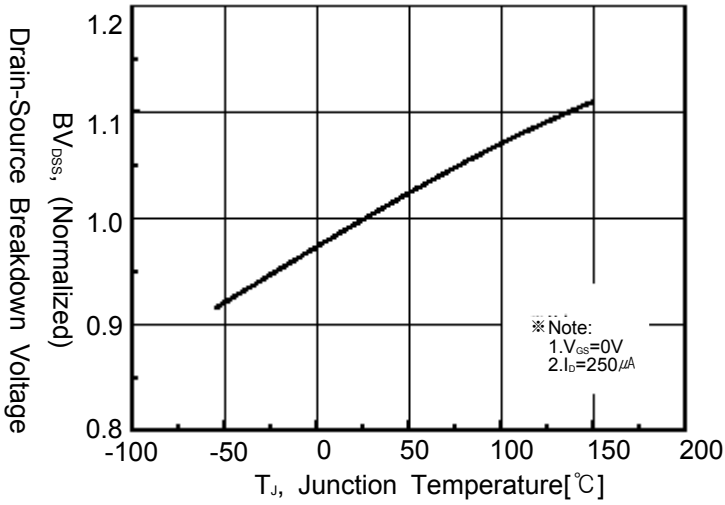


Fig 8. On-Resistance Variation vs. Temperature

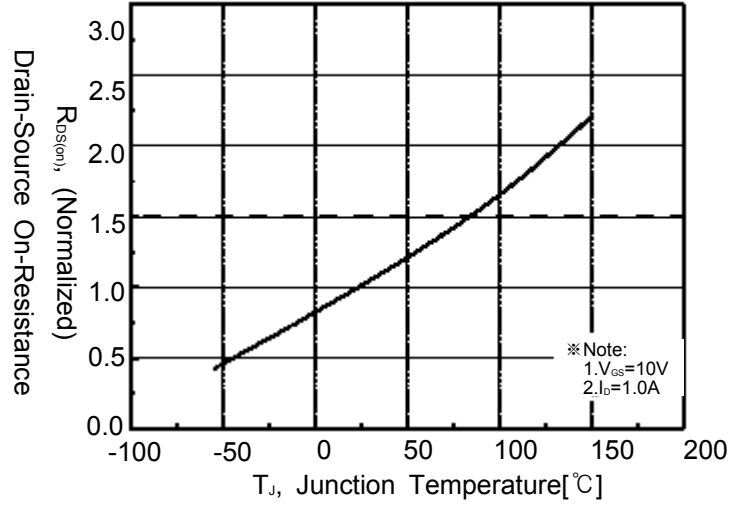


Fig 9. Maximum Safe Operating Area

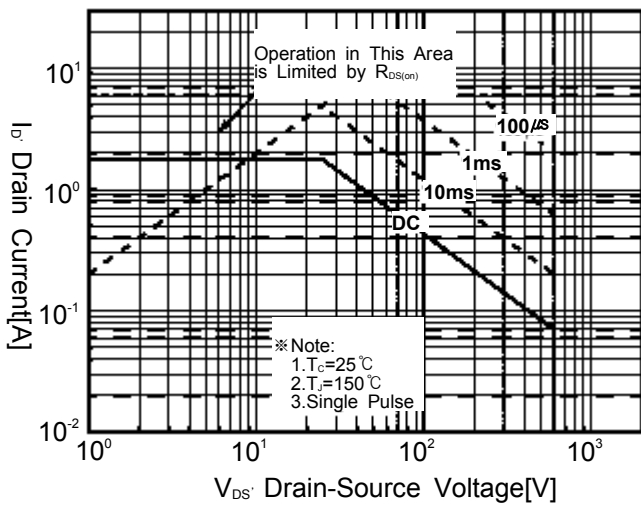


Fig 10. Maximum Drain Current

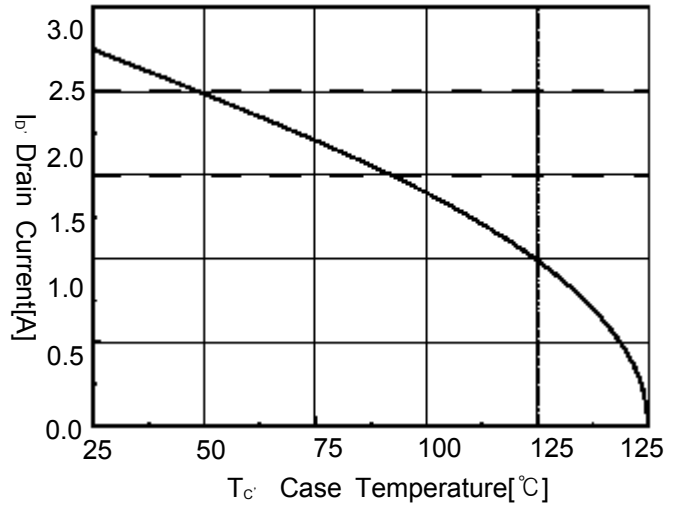
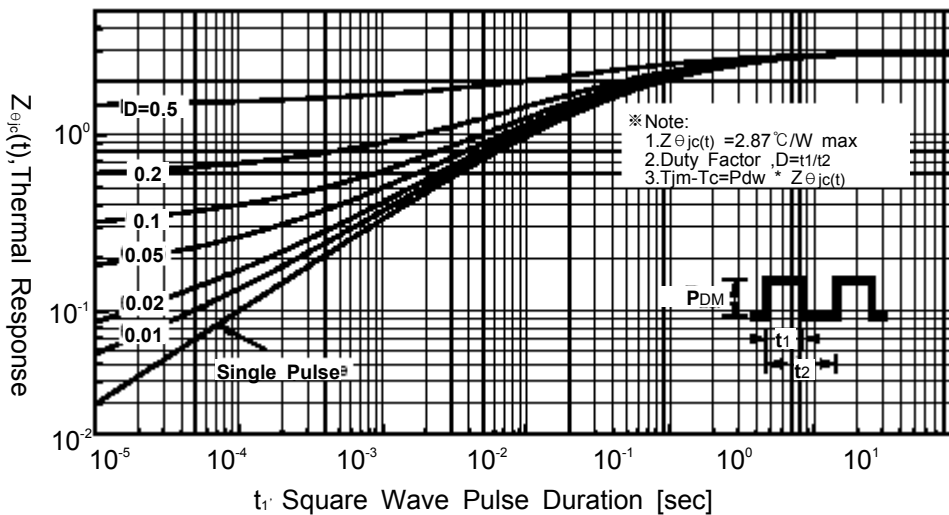
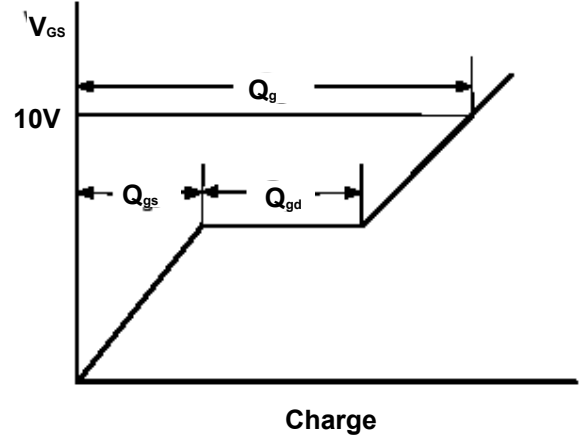
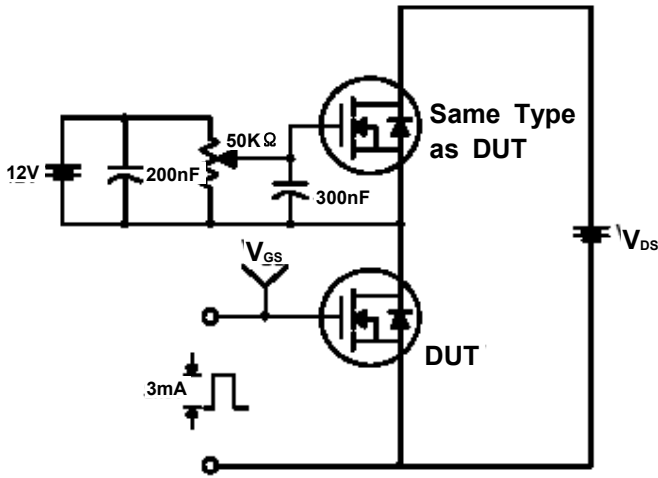


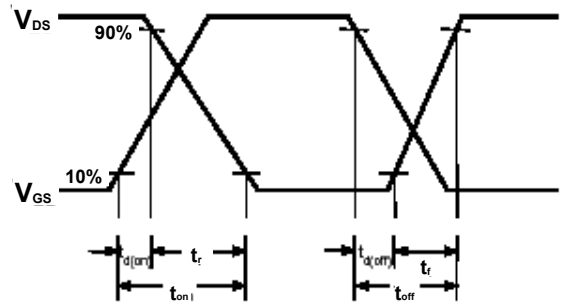
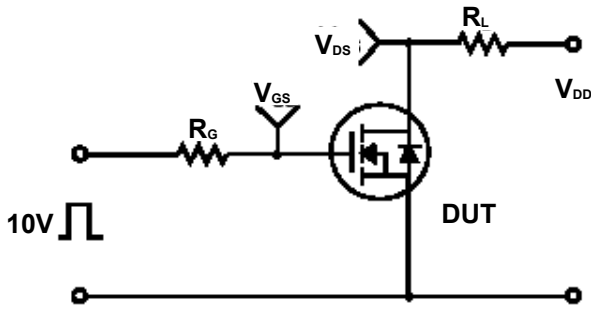
Fig 11. Transient Thermal Response Curve



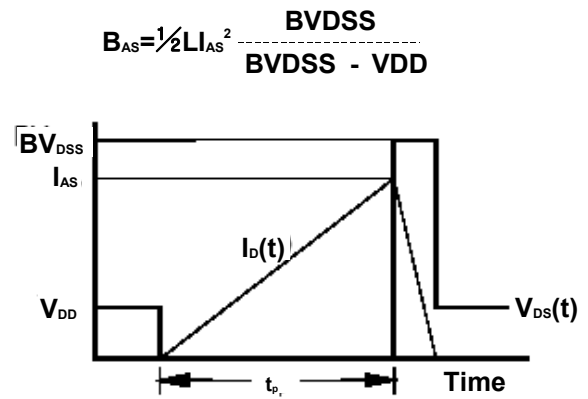
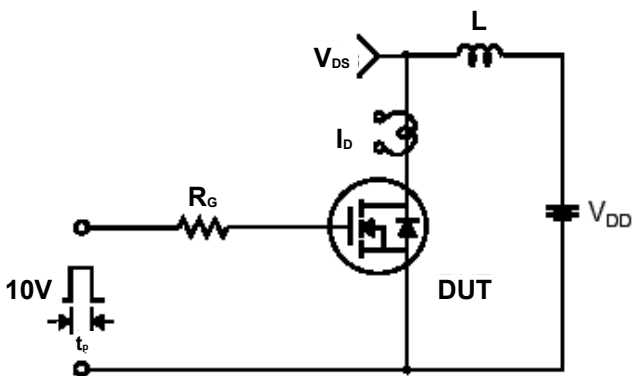
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms

