1. Features
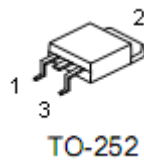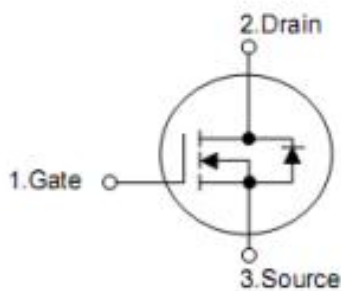
- n $R_{DS(on)}$=1.25Ω(typ) @Vgs=10V
- n RoHS compliant
- n Low on resistance
- n Low gate charge
- n Peak current vs pulse width curve

2. Applications

- n Adaptor
- n Charger
- n SMPS standby power

3.Symbol

TO-252

2.Drain

1.Gate

3.Source

Pin	Function
1	Gate
2	Drain
3	Source

4. Absolute maximum ratings

Parameter	Symbol	Rating	Units
Drain-source voltage 　　　　　（note*1）	V_{DSS}	500	V
Continuous drain current	I_D	5.0*	A
	I_D@100℃	Figure 3	A
Pulsed drain current，V_{GS}@10V 　　（note*2）	I_{DM}	Figure 6	A
Power dissipation	P_D	100	W
Derating factor above 25℃		0.8	W/℃
Gate-source voltage	V_{GS}	±20	V
Single pulse Avalanche Engergy	E_{AS}	260	mJ
Pulse avalanche rating	I_{AS}	Figure 8	A
Peak diode recovery dv/dt 　　　　（note*3）	dv/dt	5.0	V/ns
Maximum temperature for soldering Leads at 0.063 in（1.6mm）from case for 10 seconds package body for 10 seconds	T_L T_{PKG}	300 260	ºC
Operating junction and storage temperature range	T_J ,T_{STG}	-55 to150	ºC

*Drain current limited by maximum junction temperature
Caution：Stresses greater than those listed in the"Absolute maximum ratings"table may cause permanent
　　　　Damage to the device

5. Thermal characteristics

Parameter	Symbol	Rating	Unit	Test condition
Junction-ambient	$R_{\theta JA}$	62	ºC/W	1 cubic foot chamber,free air
Junction-case	$R_{\theta JC}$	1.25	ºC/W	Drain lead soldered to water cooled heatsink,P_D adjusted for a peak junction temperature of +150℃

6. Electrical characteristics

(T$_J$=25°C,unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Drain-source breakdown voltage	BV$_{DSS}$	V$_{GS}$=0V,I$_{DS}$=250μA	500	-	-	V
Breakdown voltage temperature coeffcient，Figure 11	△BV$_{DSS}$/△T$_J$	Reference to 25℃ I$_D$=250uA		0.61		V/℃
Drain-source leakage current	I$_{DSS}$	V$_{DS}$=500V, V$_{GS}$=0V	-	-	1	μA
		V$_{DS}$=400V, V$_{GS}$=0V T$_J$=125°C	-	-	100	
Gate threshold voltage,Figure 12	V$_{GS(th)}$	V$_{DS}$=V$_{GS}$, I$_D$=250μA	2.0	-	4.0	V
Gate-source forward leakage	I$_{GSS}$	V$_{GS}$=20V	-	-	1	uA
Gate-source reverse leakage		V$_{GS}$=-20V	-	-	-1	
Static drain-source on-resistance Figure 9 and 10	R$_{DS(on)}$	V$_{GS}$=10V,I$_D$=2.5A （note*4）	-	1.25	1.5	Ω
Forward transconductance	gfs	V$_{DS}$=15V, I$_D$=2.5A （note*4）	-	6	-	S
Input capacitance	C$_{iss}$	V$_{DS}$=25V,V$_{GS}$=0V	-	525	-	pF
Output capacitance	C$_{oss}$	f=1MHz	-	64	-	
Reverse transfer capacitance	C$_{rss}$	Figure 14	-	12	-	
Turn-on delay time	t$_{d(on)}$		-	9.0	-	ns
Rise time	t$_r$	V$_{DD}$=250V, I$_D$=5A,	-	11	-	
Turn-off delay time	t$_{d(off)}$	R$_G$=12Ω,V$_{GS}$=10V	-	30	-	
Fall time	t$_f$		-	16	-	
Total gate charge	Q$_g$	V$_{DD}$=250V, I$_D$=5A,	-	14	-	nC
Gate-source charge	Q$_{gs}$	Figure 15	-	3.0	-	
Gate-drain charge	Q$_{gd}$		-	6.0	-	
Continuous source current（body biode）	I$_S$	Integral pn-diode in MOSFET	-	-	5	A
Maximum pulsed current（body biode）	I$_{SM}$		-	-	20	
Diode forward voltage	V$_{SD}$	I$_S$=5A, V$_{GS}$=0V	-	-	1.5	V
Reverse recovery time	t$_{rr}$	I$_F$=5A, V$_{GS}$=0V	-	400	-	nS
Reverse recovery charge	Q$_{rr}$	di/dt=100A/μs	-	1700	-	nC

Note:1.T$_J$=25℃ to 150℃.

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

3.I$_{SD}$=5A di/dt≤100A/μs,V$_{DD}$≤ BV$_{DSS}$,T$_J$=150℃.

4.pulse widt≤380us;duty cycle≤2%.

7. Typical operating characteristics

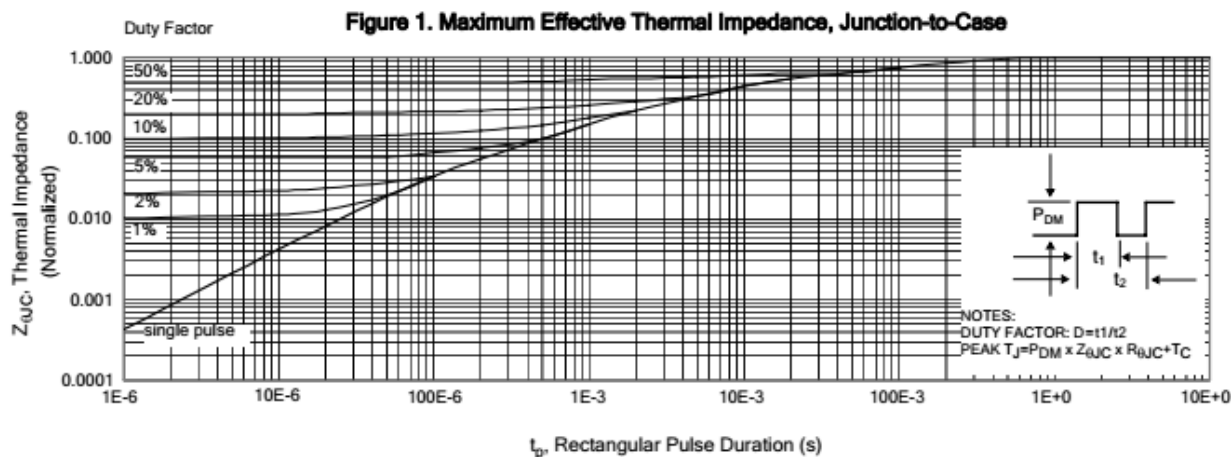Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

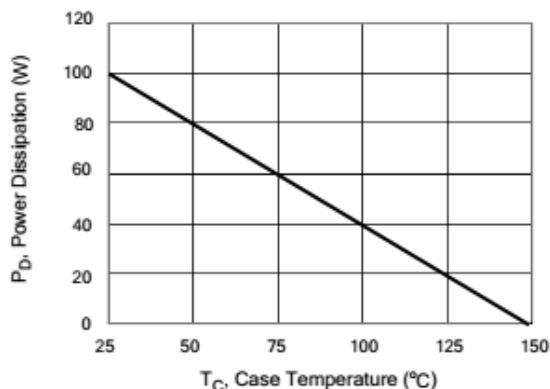Figure 2. Maximum Power Dissipation vs Case Temperature

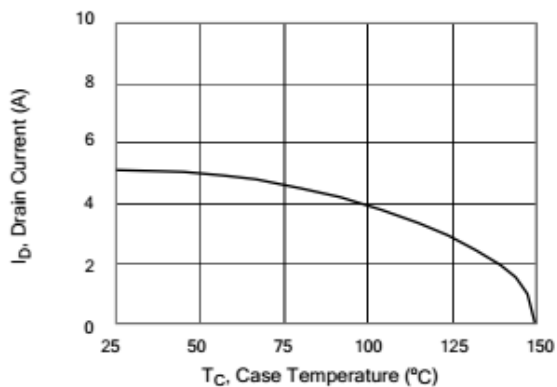Figure 3. Maximum Continuous Drain Current vs Case Temperature
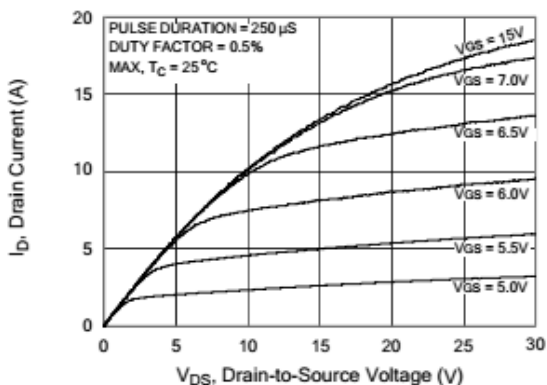

Figure 4. Typical Output Characteristics

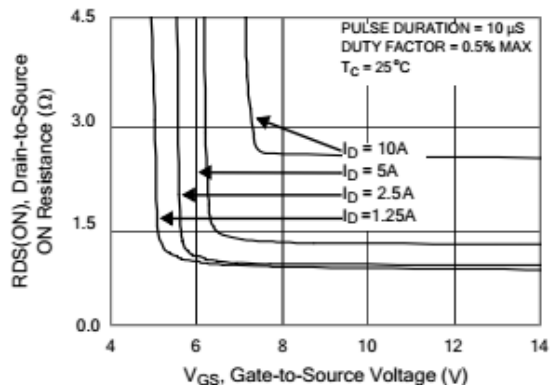Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current

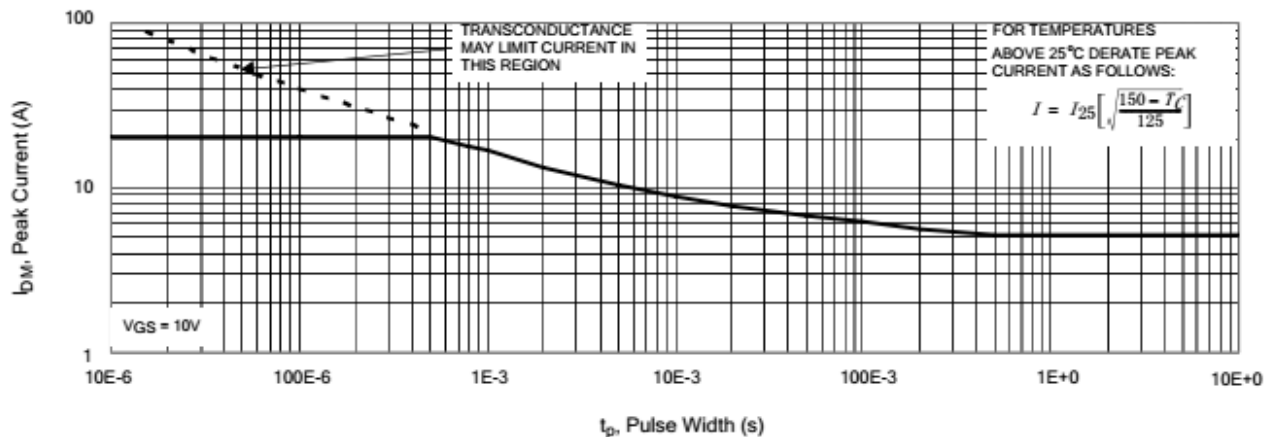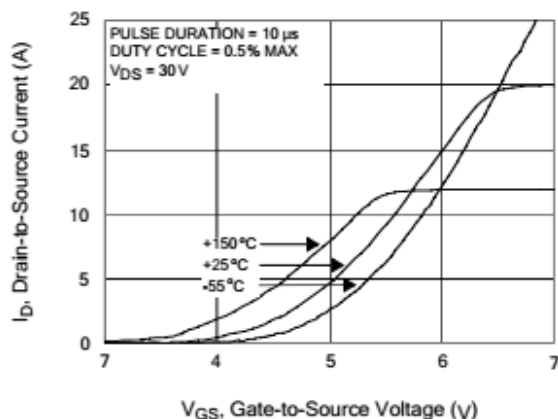## Figure 6. Maximum Peak Current Capability

TRANSCONDUCTANCE MAY LIMIT CURRENT IN THIS REGION

FOR TEMPERATURES ABOVE 25°C DERATE PEAK CURRENT AS FOLLOWS:

$$I = I_{25}\left[\sqrt{\frac{150 - T_C}{125}}\right]$$

VGS = 10V

t_p, Pulse Width (s)

I_{DM}, Peak Current (A)

Figure 7. Typical Transfer Characteristics

PULSE DURATION = 10 μs
DUTY CYCLE = 0.5% MAX
V_{DS} = 30 V

+150°C
+25°C
-55°C

V_{GS}, Gate-to-Source Voltage (V)

I_D, Drain-to-Source Current (A)

Figure 8. Unclamped Inductive Switching Capability

STARTING T_J = 25°C
STARTING T_J = 150°C

If R= 0: t_{AV}= (L×I_{AS})/(1.3BV_{DSS}-V_{DD})
If R≠ 0: t_{AV}= (L/R) ln[I_{AS}×R)/(1.3BV_{DSS}-V_{DD})+1]
R equals total Series resistance of Drain circuit

t_{AV}, Time in Avalanche (s)

I_{AS}, Avalanche Current (A)

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

PULSE DURATION = 10 μs
DUTY CYCLE = 0.5% MAX
T_C=25°C

V_{GS} = 10V

I_D, Drain Current (A)

$R_{DS(ON)}$, Drain-to-Source ON Resistance (Ω)

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

PULSE DURATION = 10 μs
DUTY CYCLE = 0.5% MAX
V_{GS} = 10V, I_D =2.5A

T_J, Junction Temperature (°C)

$R_{DS(ON)}$, Drain-to-Source Resistance (Normalized)

Figure 11. Typical Breakdown Voltage vs Junction Temperature

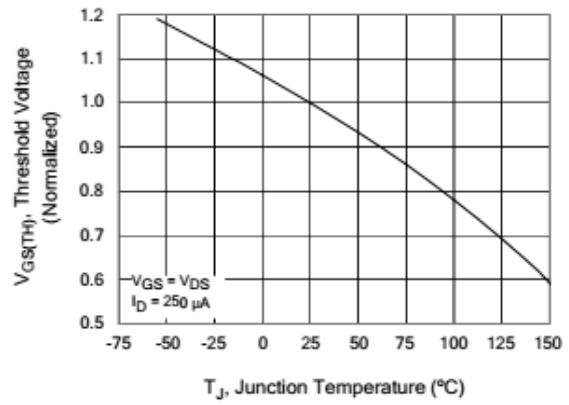Figure 12. Typical Threshold Voltage vs Junction Temperature

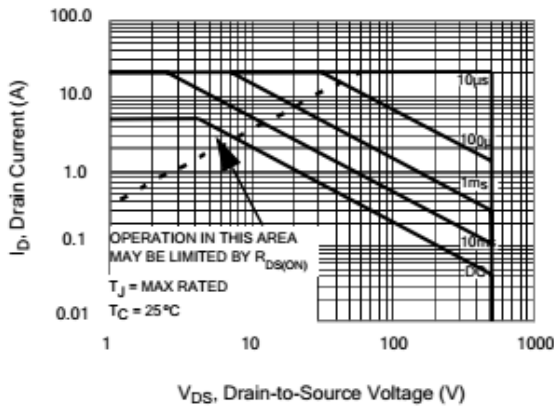Figure 13. Maximum Forward Bias Safe Operating Area

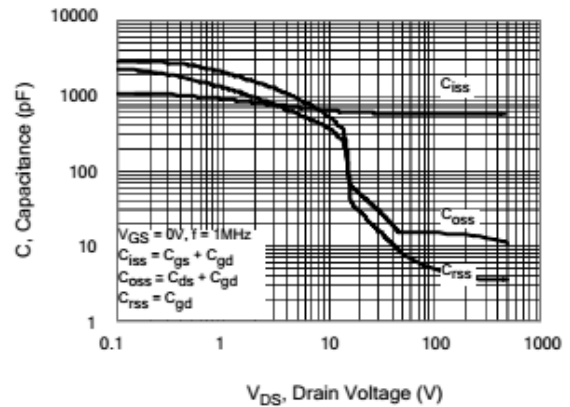Figure 14. Typical Capacitance vs Drain-to-Source Voltage

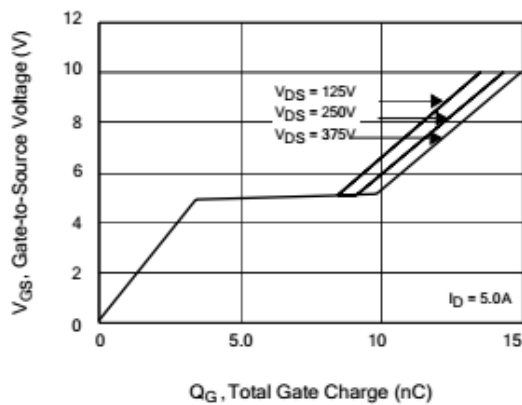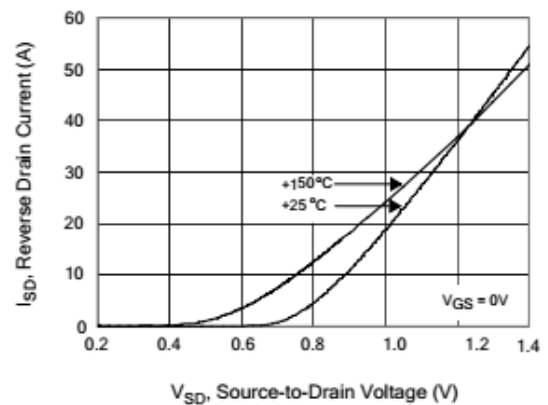Figure 15. Typical Gate Charge vs Gate-to-Source Voltage

Figure 16. Typical Body Diode Transfer Characteristics
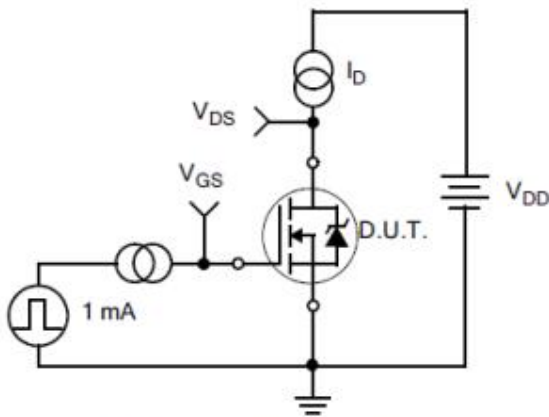
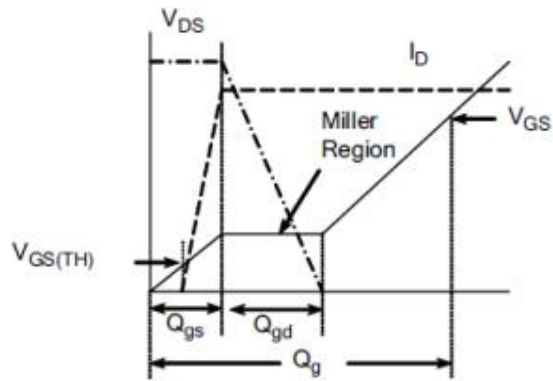# 8. Test Circuits and Waveforms

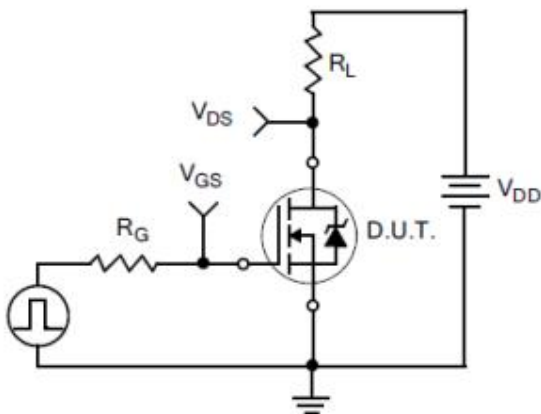Figure 17. Gate Charge Test Circuit

Figure 18. Gate Charge Waveform

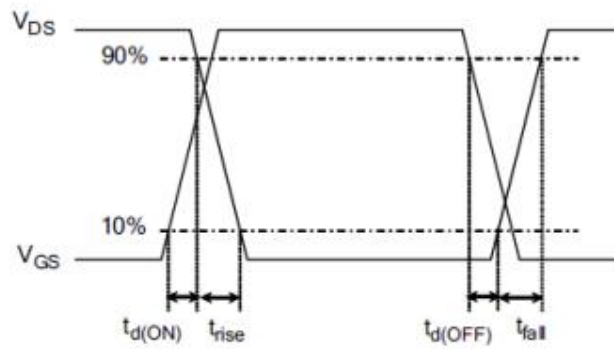Figure 19. Resistive Switching Test Circuit
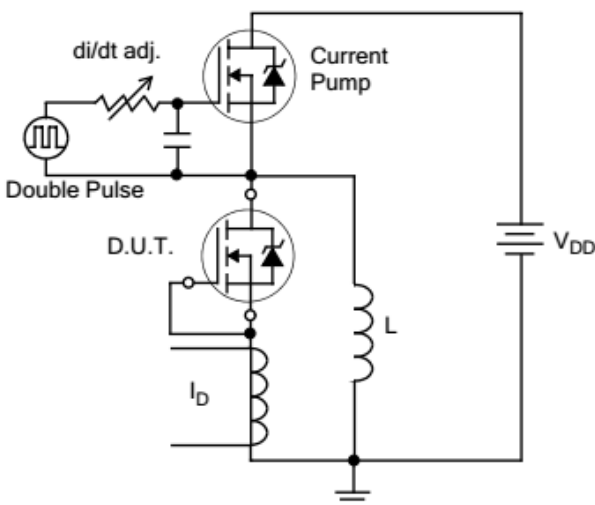

Figure 20. Resistive Switching Waveforms

Figure 21. Diode Reverse Recovery Test Circuit

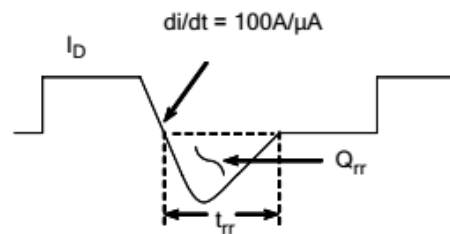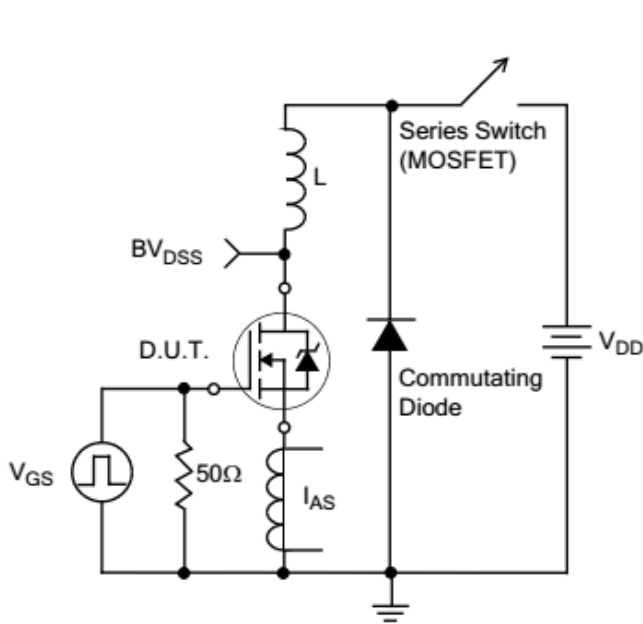Figure 22. Diode Reverse Recovery Waveform

Figure 23. Unclamped Inductive Switching Test Circuit
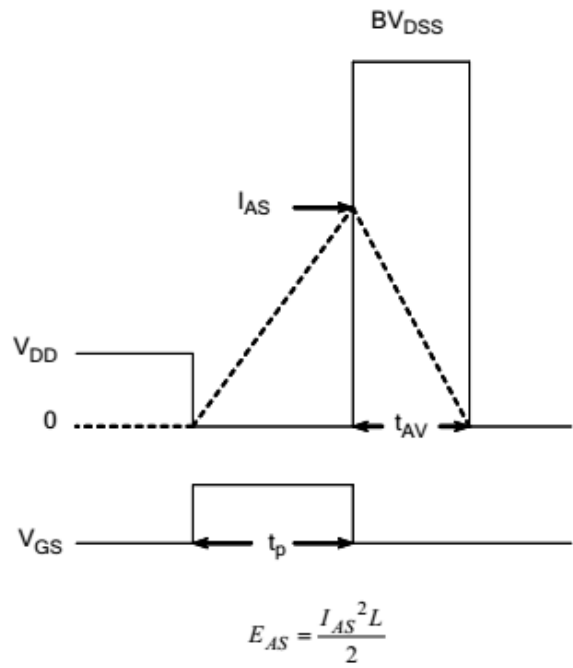

$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

Figure 24. Unclamped Inductive Switching Waveforms

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