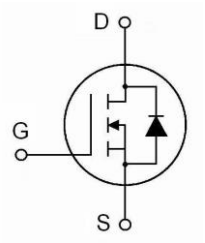
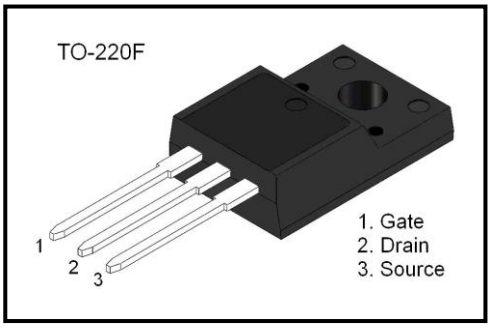
General Description

The IRF640 is an N-channel enhancement mode power MOSFET using advanced technology to provide customers withplanar stripe and DMOS technology. This technology is specializedin allowing a minimum on-state resistance andsuperior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

Features

- V_{DS} 200V
- I_D 18A
- $R_{DS(ON)}$ (V_{GS} = 10V) < 0.18Ω
- High switching speed
- Improved dv/dt capability





Absolute Maximum Ratings (T_A = 25℃, unless otherwise noted)

Parameter		Symbol	Ratings	Units
Gate-Drain Voltage		V_{DSS}	200	V
Gate-Source Voltage		V_{GSS}	±30	V
Continuous Drain Current	T_A=25 °C	I_D	18	A
	Pulsed (Note 1)	I_{DM}	72	
Avalanche Current (Note 1)		I_{AR}	18	A
Single Pulsed Avalanche Energy (Note 2)		E_{AS}	250	mJ
Repetitive Avalanche Energy (Note 1)		E_{AR}	13.9	mJ
dv/dtPeak Diode Recovery dv/dt (Note 3)		dv/dt	5.5	V/ns
Power Dissipation		P_D	43	W
Junction Temperature		T_J	150	°C
Storage Temperature		T_{STG}	-55～155	°C

Thermal Characteristic

Parameter	Symbol	Value	Units
Maximum Thermal Resistance, Junction-case	$R_{\theta JC}$	3.3	°C/W
Maximum Thermal Resistance, Junction-Ambient	$R_{\theta JA}$	62.5	°C/W

Electrical Characteristics (T_j = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ	Max.	Units
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V,I_D=-250μA	200			V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	I_D= 1mA, Referenced to 25 °C		0.2		V/ °C
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}= 200V, V_{GS}= 0V			10	μA
		V_{DS}=160V, V_{GS}= 0V T_C= 125 °C			100	
Gate Leakage Current	I_{GSS}	V_{DS}=0V,V_{GS}=±30V			±100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	2.0		4.0	V
Drain-source On-Resistance	$R_{DS(ON)}$	V_{GS} = 10V,I_D = 9.0A			0.18	Ω
Forward Transconductance(Note4)	g_{FS}	V_{DS}=40V ,I_D=9.0A		13		S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS} = 25V,V_{GS} = 0V, f = 1.0MHz		1173		pF
Output Capacitance	C_{oss}			140		
Reverse Transfer Capacitance	C_{rss}			67		
Switching Characteristics)						
Turn-On Delay Time	$t_{d(on)}$	V_{DS} = 100V, V_{GS} = 10V R_G = 10Ω (Note4, 5)		15.3		ns
Turn-on Rise Time	t_r			0.7		
Turn-Off elay Time	$t_{d(off)}$			33.5		
Turn-Off Fall	t_f			20.5		
Total Gate Charge	Q_g	V_{DS} = 160V, I_D = 18A V_{GS} = 10V (Note 4, 5)		41.1		nC
Gate-Source Charge	Q_{gs}			7.3		
Gate-Drain Charge	Q_{gd}			19		
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S =18A			1.5	V
Diode Forward Current	I_S	-			18	A
Pulsed Diode Forward Current	I_{SM}	-			72	A
Reverse Recovery Time	t_{rr}	I_F = 1A, V_{GS} = 0V dI_F/dt =100A/μs (Note 4)		195		ns
Reverse Recovery Charge	Q_{rr}			1.47		μC

Note: 1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 1.16mH, I_{AS} = 18A, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
3. I_{SD} ≤ 18A, di/dt ≤ 300A/μs, V_{DD} ≤ B_{VDSS}, Starting T_J = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Characteristics

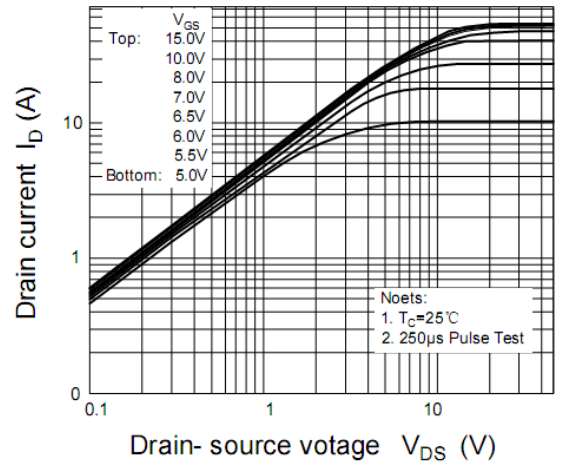


Figure 1. Typical Output Characteristics

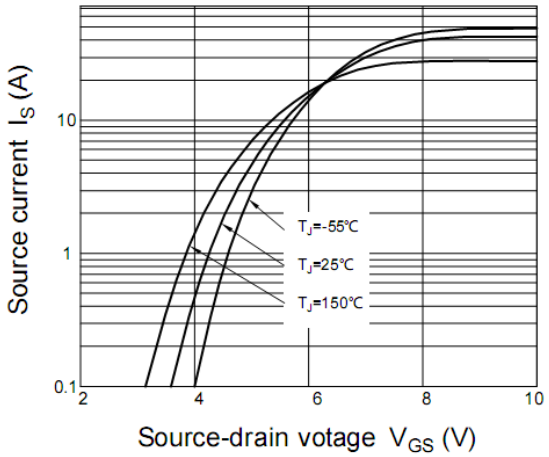


Figure 2. Transfer Characteristics

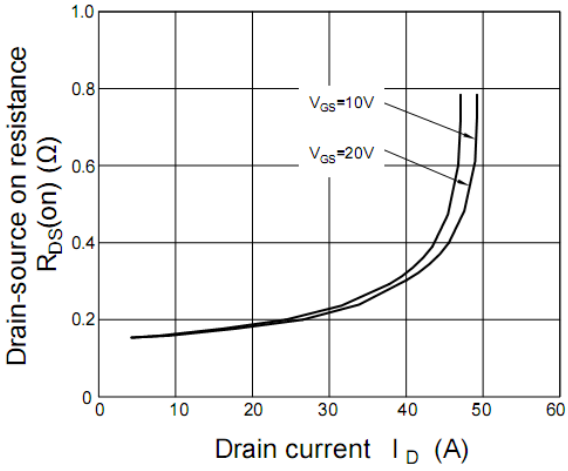


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

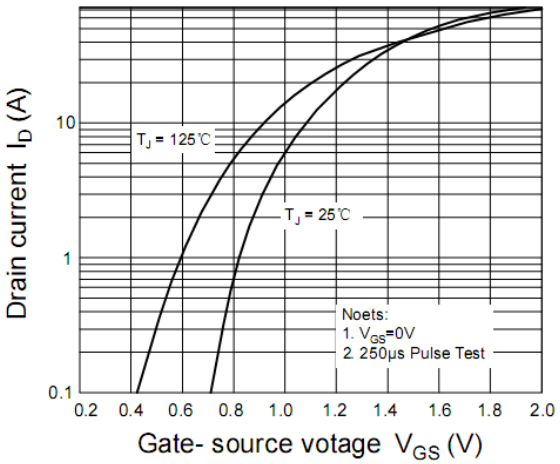


Figure 4. Body Diode Characteristics

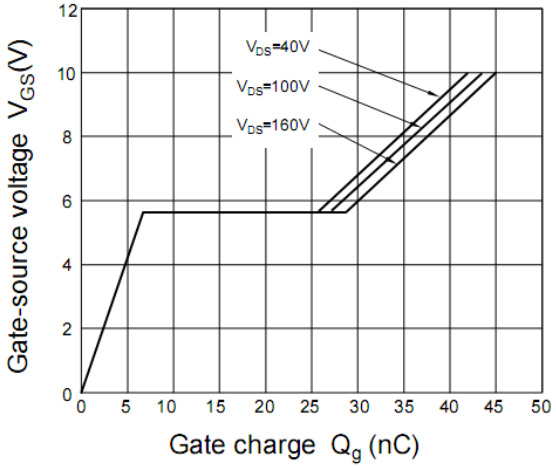


Figure 5. Drain to Source ON Resistance vs Drain Current

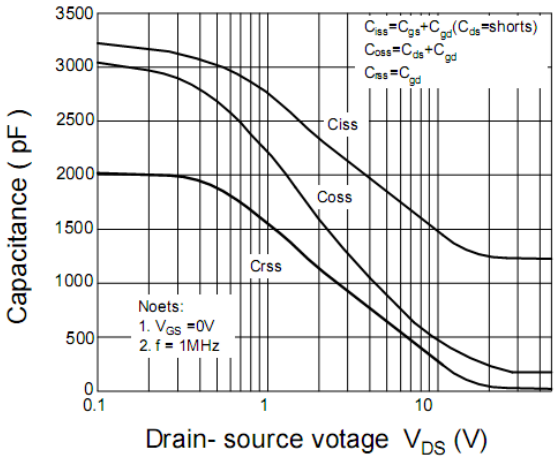


Figure 6. Gate Charge Characteristics

Typical Characteristics

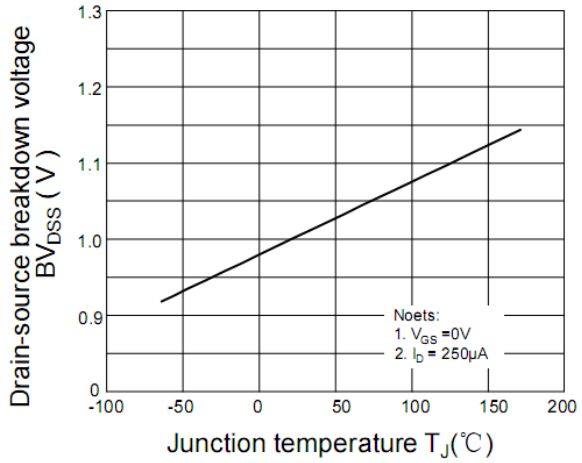


Figure 7. Breakdown Voltage Variation vs Temperature

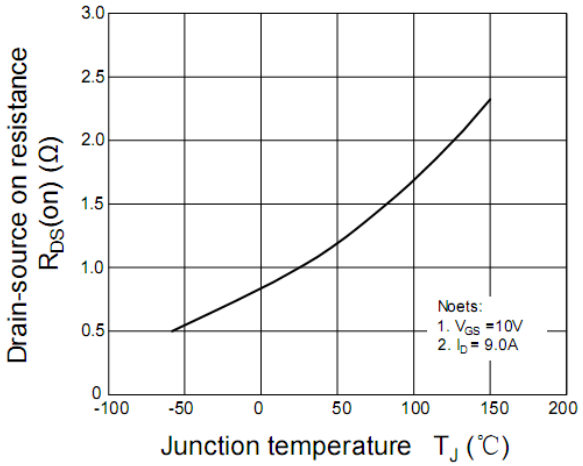


Figure 8. On-Resistance Variation vs Temperature

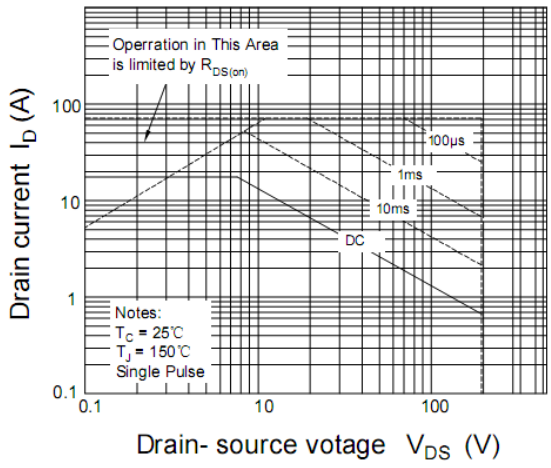


Figure 9. Safe Operating Area

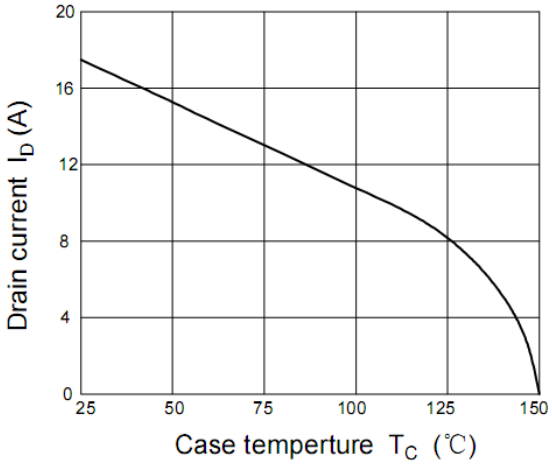


Figure 10. Maximum Drain Current vs Case Temperature

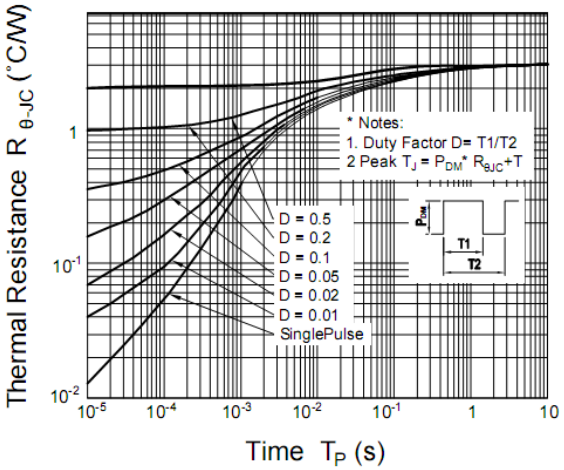


Figure 11. Transient Thermal Response Curve

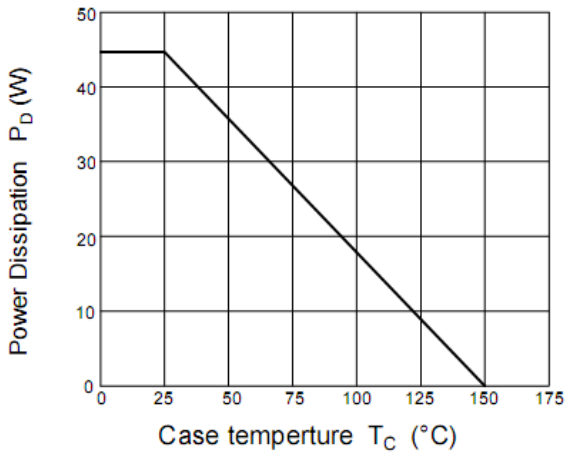


Figure 12. Power Derating

Test Circuits and waveforms

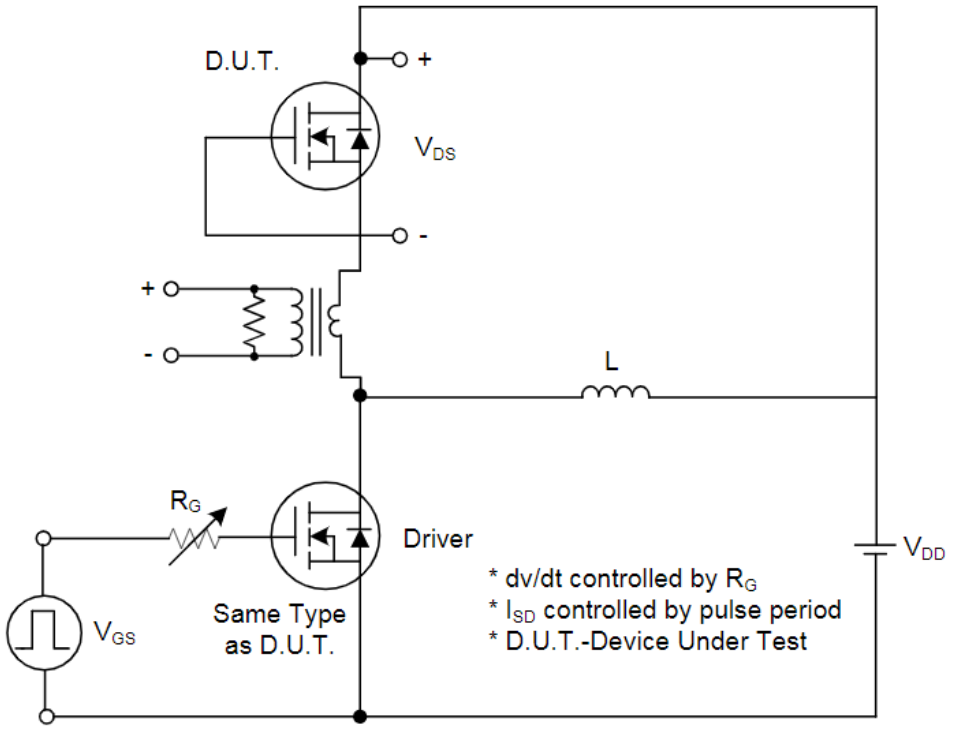


Figure 13. Peak Diode Recovery dv/dt Test Circuit

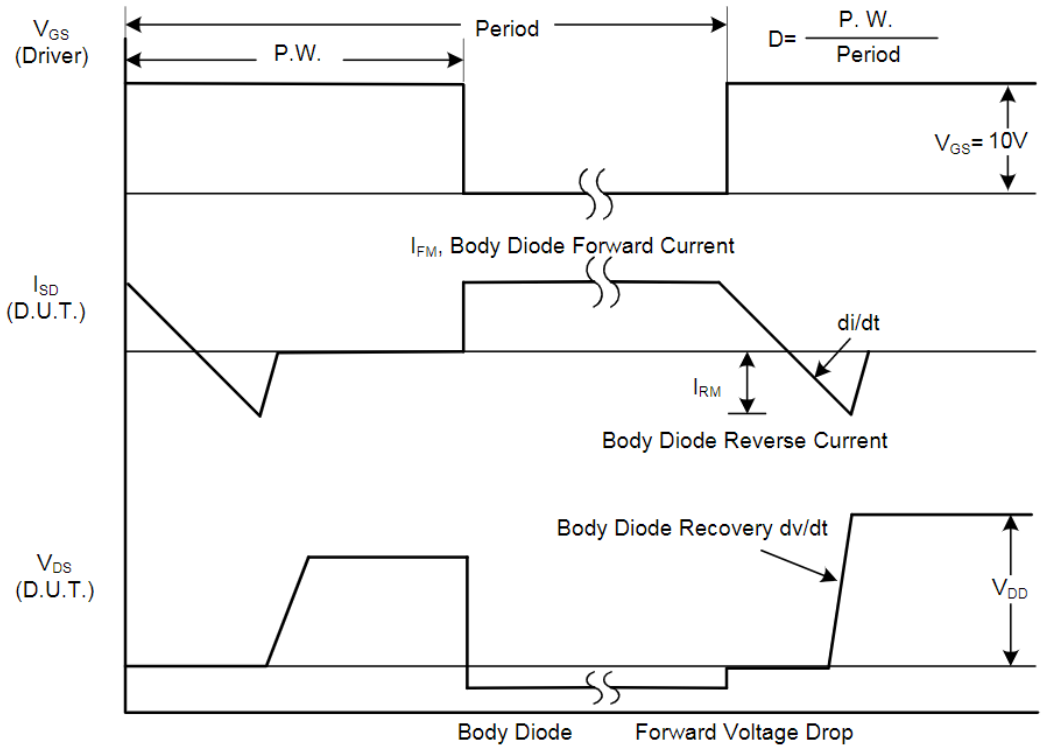


Figure 14. Peak Diode Recovery dv/dt Waveforms

Test Circuits and waveforms

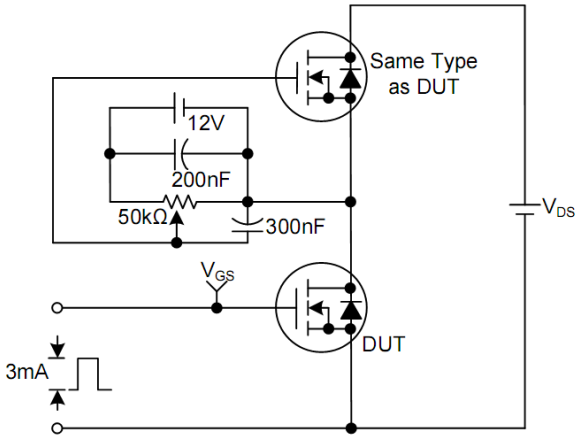


Figure 15. Gate Charge Test Circuit

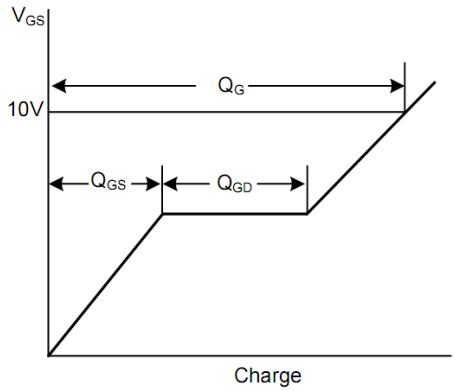


Figure 16. Gate Charge Waveforms

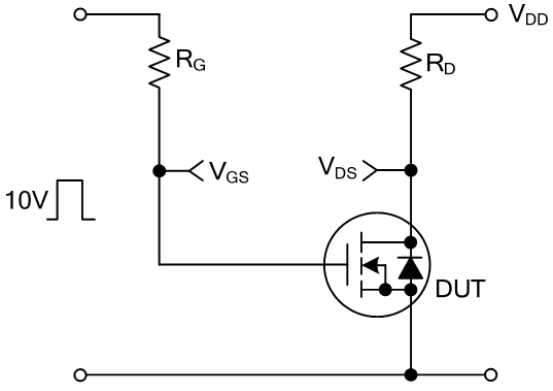


Figure 17. Resistive Switching Circuit

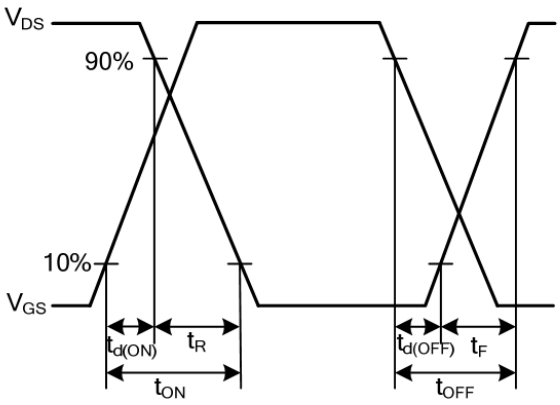


Figure 18. Resistive Switching Waveforms

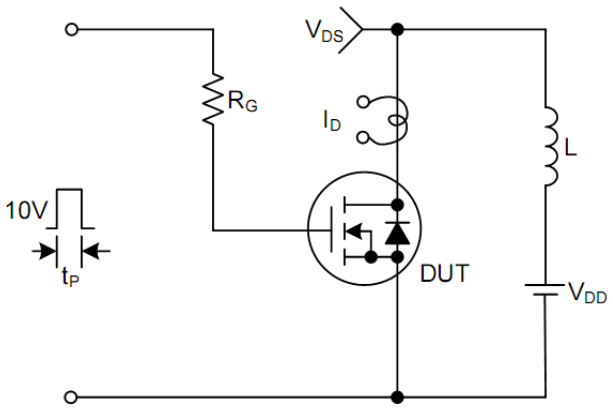


Figure 19. Unclamped Inductive Switching Test Circuit

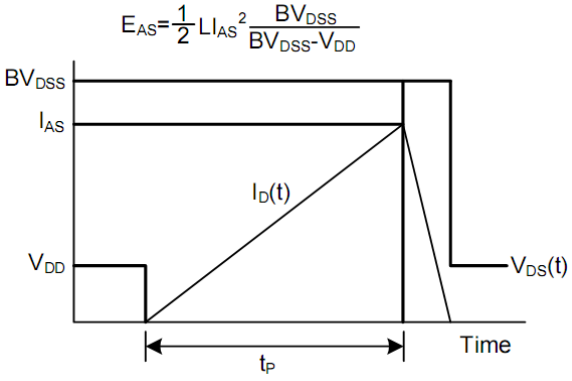
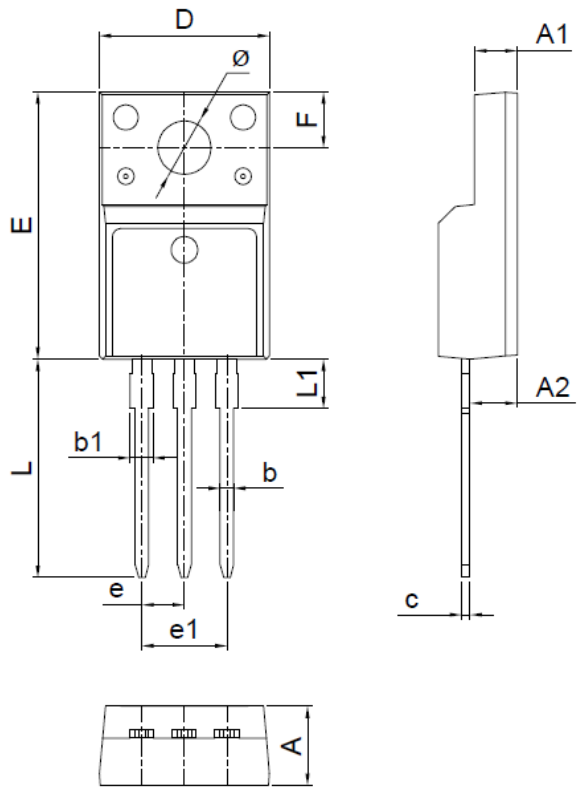


Figure 20. Unclamped Inductive Switching Waveforms

Package Dimensions



Dim	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.50	4.90	0.177	0.193
A1	2.34	2.74	0.092	0.108
A2	2.66	2.86	0.105	0.113
b	0.75	0.85	0.030	0.033
b1	1.24	1.44	0.049	0.057
c	0.40	0.60	0.016	0.024
D	10.00	10.32	0.394	0.406
E	15.75	16.05	0.620	0.632
e	2.44	2.64	0.096	0.104
e1	4.88	5.28	0.192	0.208
F	3.10	3.5	0.122	0.138
L	12.90	13.50	0.508	0.531
L1	2.90	3.30	0.114	0.130
Φ	3.10	3.30	0.122	0.130