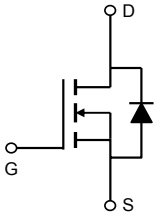
FNK3206

60V N-Channel MOSFET

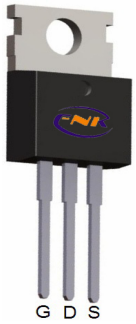
Description

The FNK 3206 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in automotive applications and a wide variety of other applications.



Features

- V_{DS}=60V; I_D=210A@V_{GS}=10V;
  $R_{DS(ON)}$< 3mΩ @ V_{GS}=10V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation



To-220 Top View

Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

Absolute Maximum Ratings T_A=25°C unless otherwise noted				
Parameter		**Symbol**	**Maximum**	**Units**
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [G]	T_C=25°C	I_D	210	A
	T_C=100°C		160	
Pulsed Drain Current [C]		I_{DM}	840	
Continuous Drain Current	T_A=25°C	I_{DSM}	18	A
	T_A=70°C		15	
Avalanche Current [C]		I_{AS}, I_{AR}	108	A
Avalanche energy L=0.3mH [C]		E_{AS}, E_{AR}	874	mJ
Power Dissipation [B]	T_C=25°C	P_D	333	W
	T_C=100°C		167	
Power Dissipation [A]	T_A=25°C	P_{DSM}	1.9	W
	T_A=70°C		1.2	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	12	15	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		54	65	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	0.35	0.45	°C/W

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=250μA, V_{GS}=0V	60			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=60V, V_{GS}=0V			1	μA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±25V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250μA	2.2	2.9	4	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V	540			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A		2.2	3	mΩ
		T_J=125°C		2.8	4	
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		60		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.67	1	V
I_S	Maximum Body-Diode Continuous Current[G]				180	A
DYNAMIC PARAMETERS						
C	Input Capacitance	V_{GS}=0V, V_{DS}=30V, f=1MHz		7750		pF
C	Output Capacitance			1370		pF
C	Reverse Transfer Capacitance			900		pF
R	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		1.37		Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=30V, I_D=20A	85	108	130	nC
Q_{gs}	Gate Source Charge		24	30	36	nC
Q_{gd}	Gate Drain Charge		27	46	65	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=30V, R_L=1.5Ω, R_{GEN}=3Ω		31		ns
t_r	Turn-On Rise Time			29		ns
$t_{D(off)}$	Turn-Off DelayTime			41		ns
t_f	Turn-Off Fall Time			13		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=500A/μs	20	35	50	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=500A/μs	190	273	355	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition：Tj=25℃,V_{DD}=30V,V_G=10V,L=0.5mH,Rg=25Ω

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

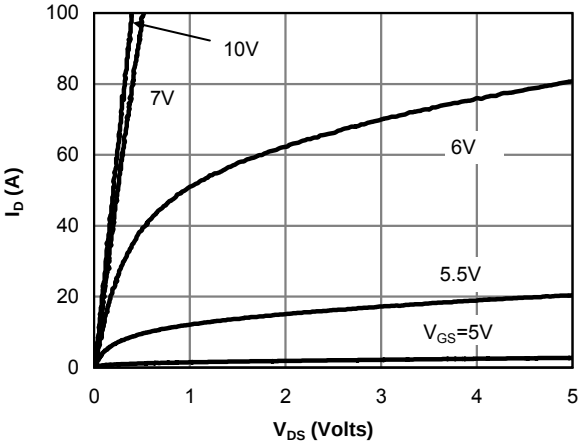


Fig 1: On-Region Characteristics (Note E)

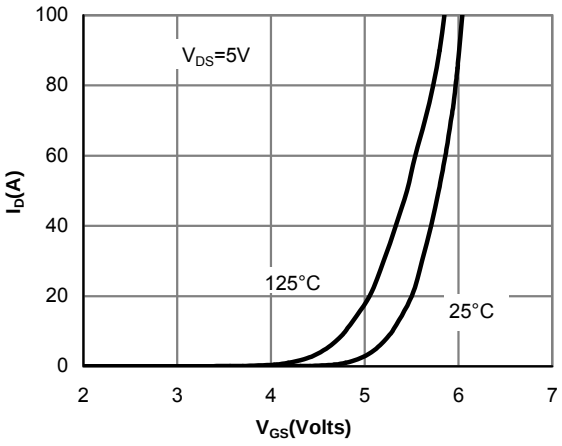


Figure 2: Transfer Characteristics (Note E)

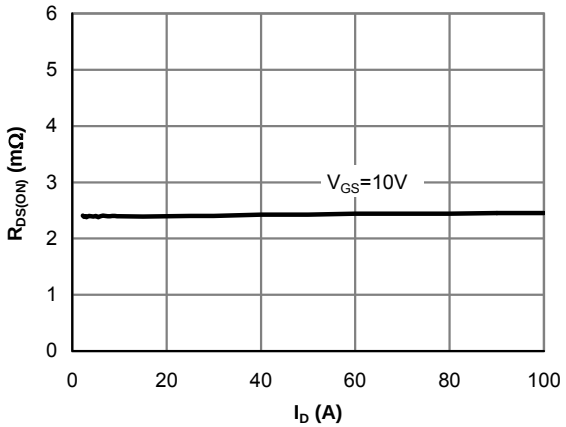


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

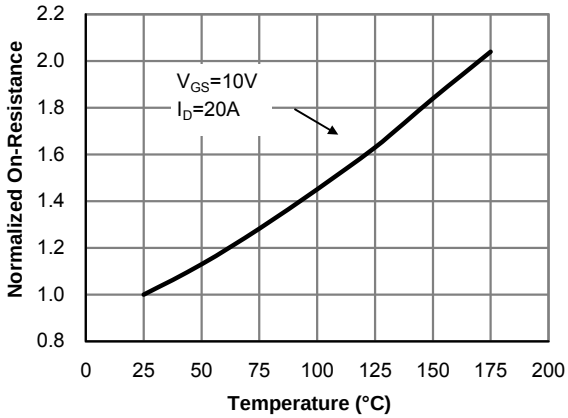


Figure 4: On-Resistance vs. Junction Temperature (Note E)

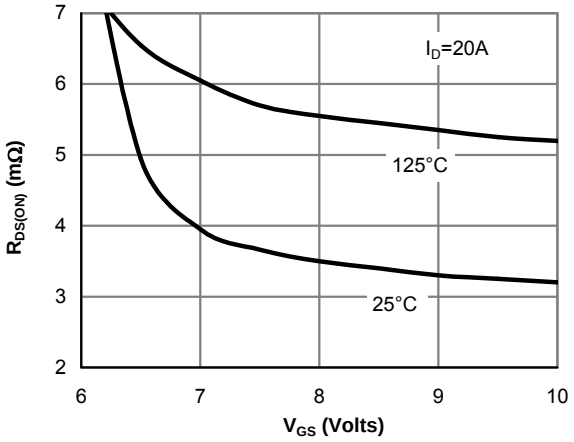


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

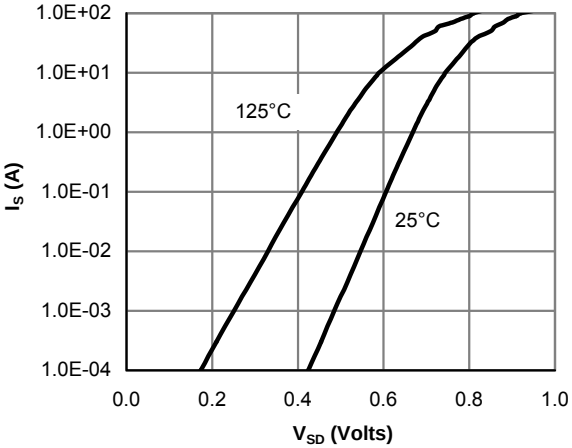


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

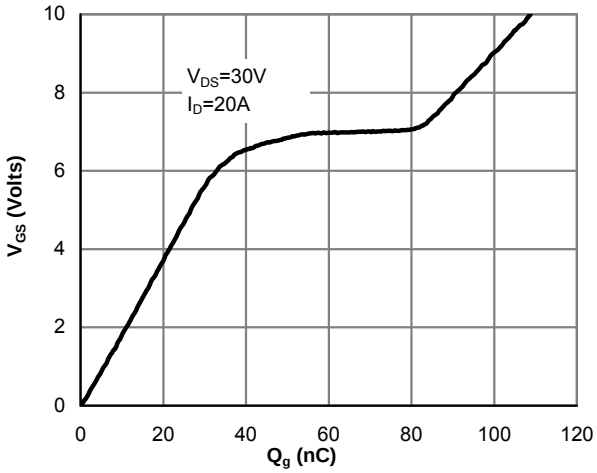


Figure 7: Gate-Charge Characteristics

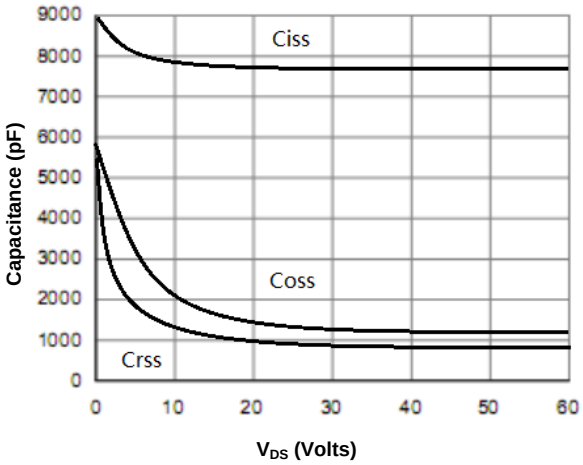


Figure 8: Capacitance Characteristics

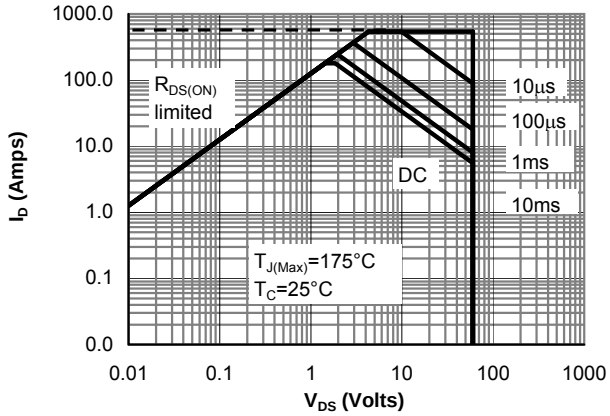


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

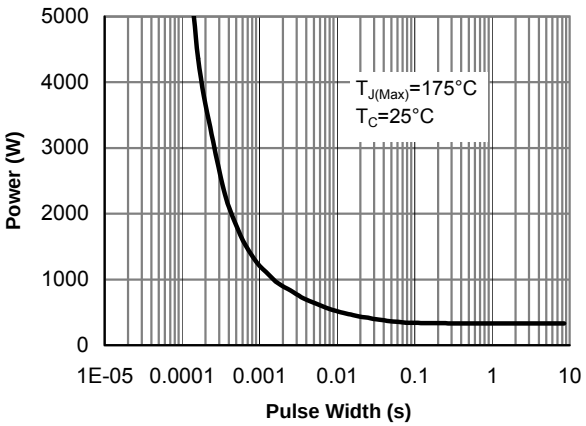


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

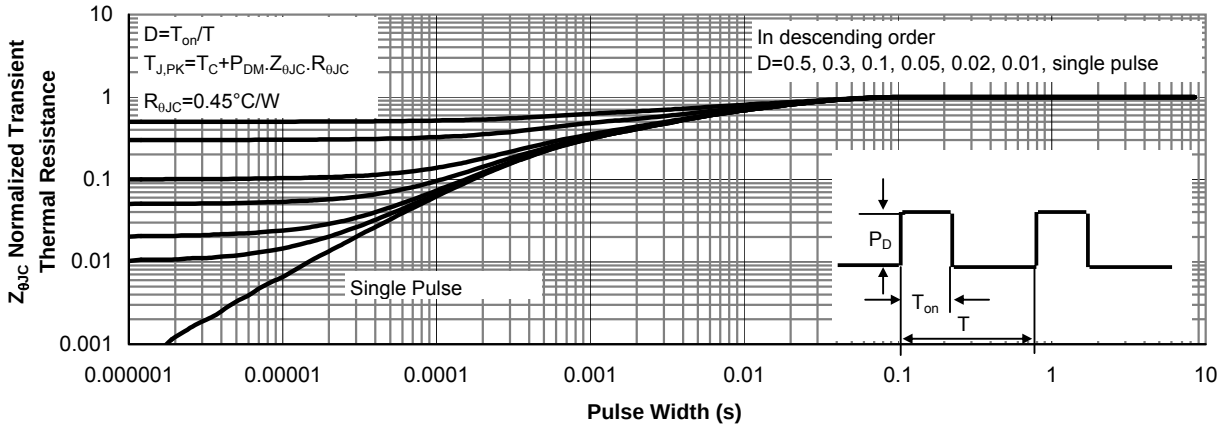


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

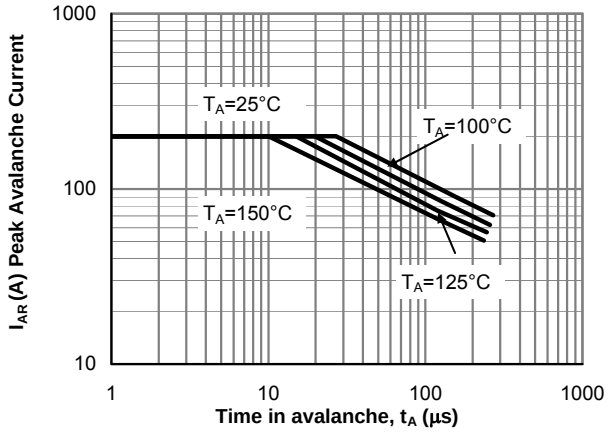


Figure 12: Single Pulse Avalanche capability (Note C)

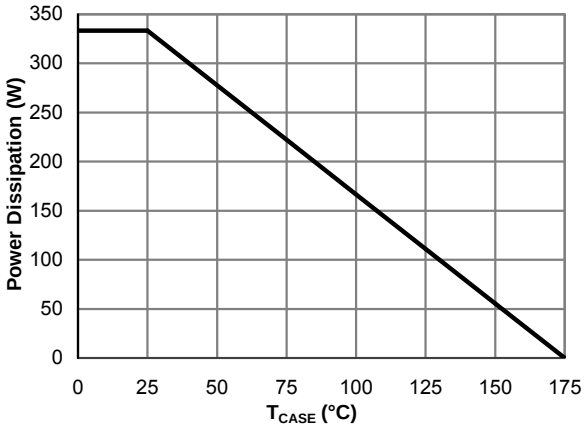


Figure 13: Power De-rating (Note F)

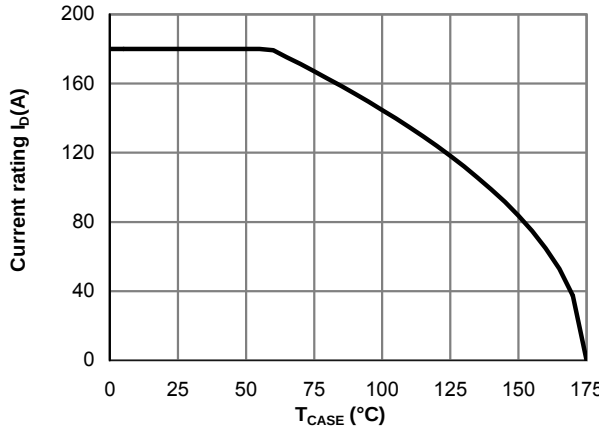


Figure 14: Current De-rating (Note F)

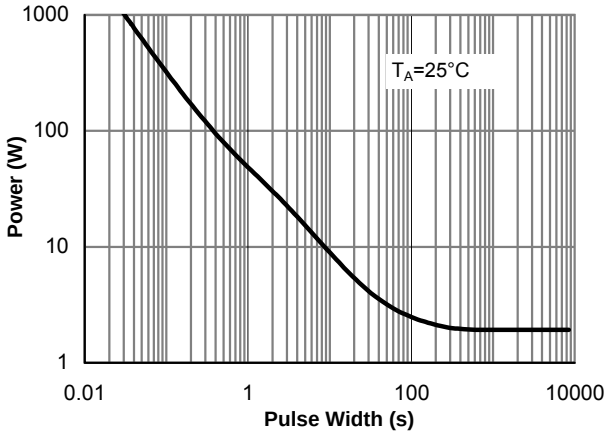


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

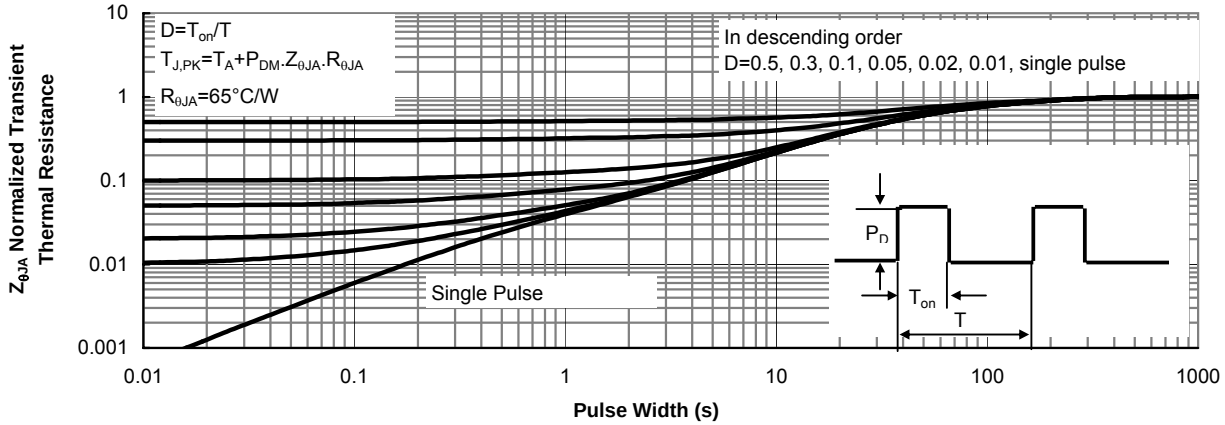
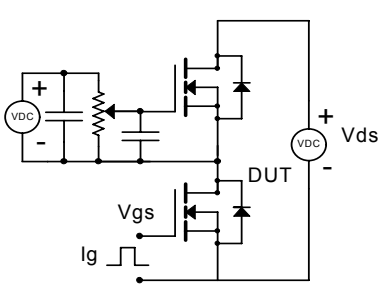
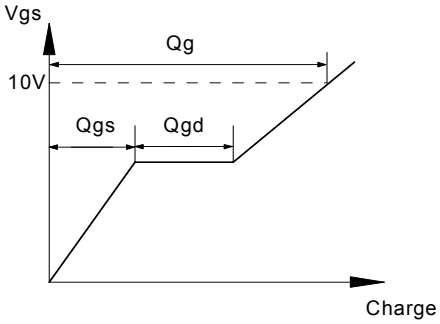


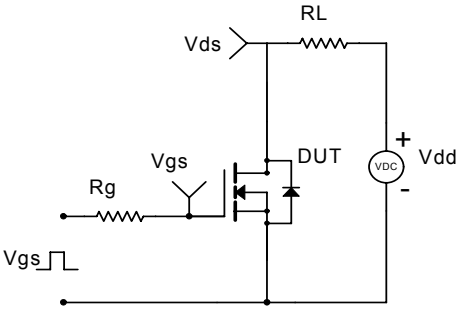
Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

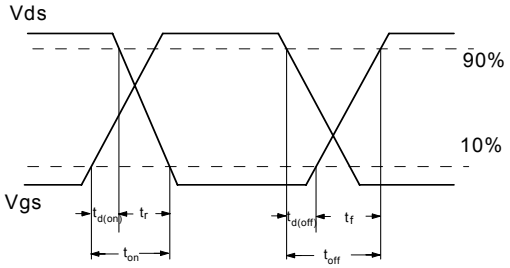
Gate Charge Test Circuit & Waveform



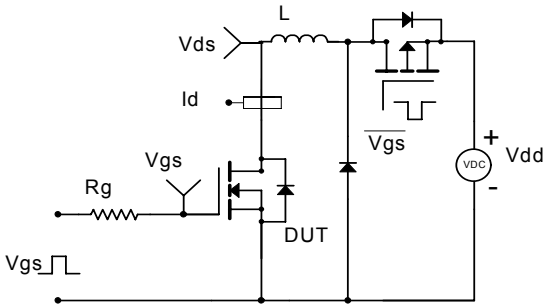


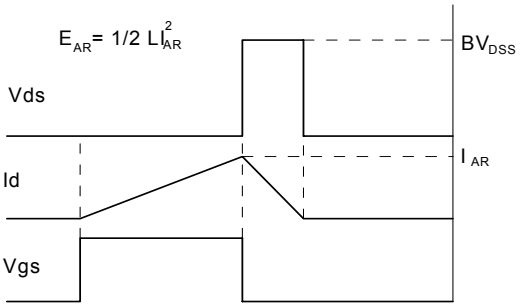
Resistive Switching Test Circuit & Waveforms



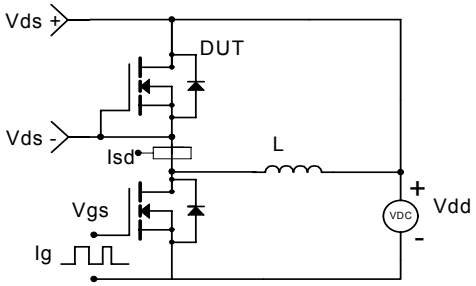


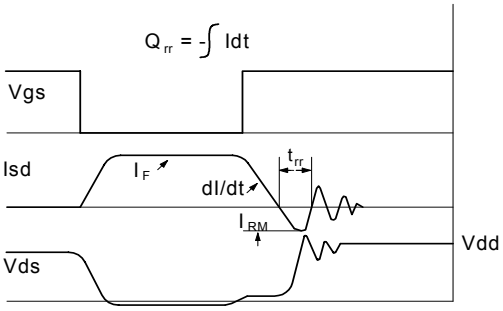
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



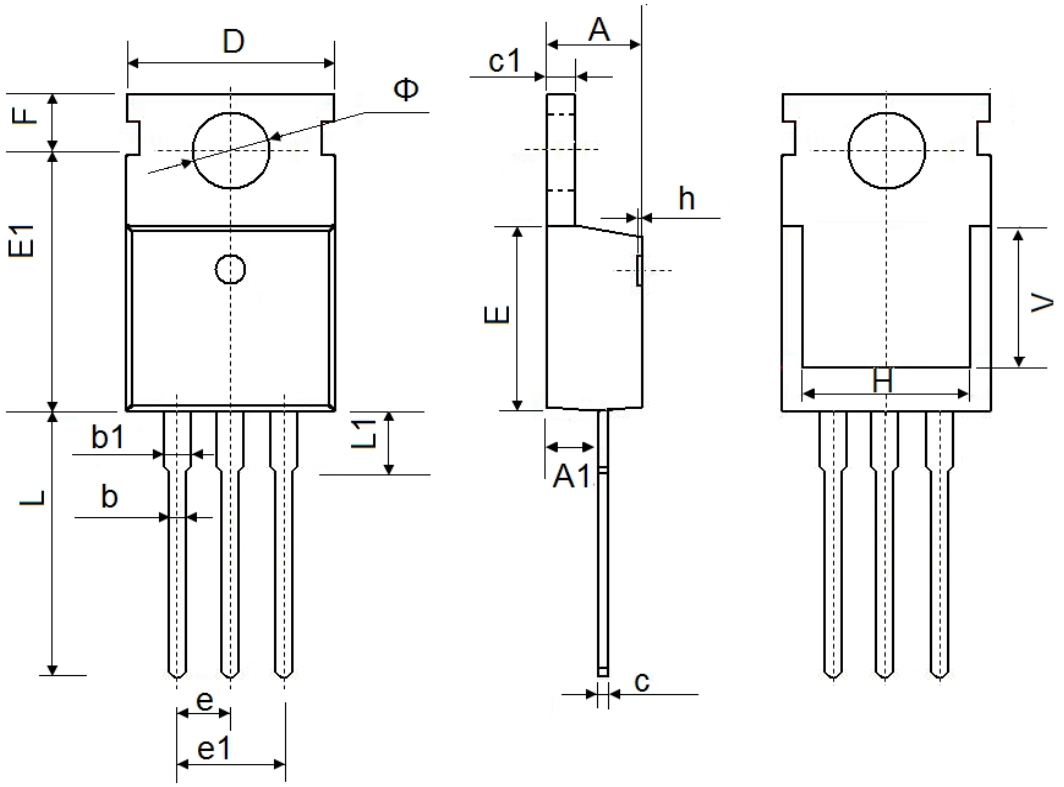


Diode Recovery Test Circuit & Waveforms





TO-220 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150

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