

60V N-Channel MOSFET

Description

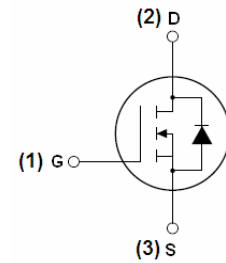
The FNK 3206T uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in automotive applications and a wide variety of other applications.

Features

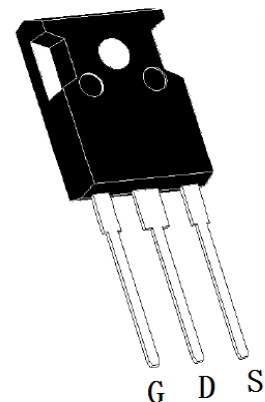
- $V_{DS}=60V$; $I_D=210A@V_{GS}=10V$;
 $R_{DS(ON)} < 3m\Omega @ V_{GS}=10V$
- High density cell design for ultra low $R_{DS(on)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

Application

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



Schematic diagram



TO-247 top view

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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	$T_C=25^\circ\text{C}$	210	A	
	$T_C=100^\circ\text{C}$	160		
Pulsed Drain Current ^C	I_{DM}	840		
Continuous Drain Current	$T_A=25^\circ\text{C}$	18	A	
	$T_A=70^\circ\text{C}$	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	$T_C=25^\circ\text{C}$	333	W	
	$T_C=100^\circ\text{C}$	167		
Power Dissipation ^A	$T_A=25^\circ\text{C}$	1.9	W	
	$T_A=70^\circ\text{C}$	1.2		
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ\text{C}$	

Thermal Characteristics					
Parameter	Symbol	Typ	Max	Units	
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	12	15	$^\circ\text{C/W}$	
Maximum Junction-to-Ambient ^{A D}		54	65	$^\circ\text{C/W}$	
Maximum Junction-to-Case	$R_{\theta JC}$	0.35	0.45	$^\circ\text{C/W}$	

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 T _J =55°C			1 5	μA
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 T _J =125°C		2.2 2.8	3 4	mΩ
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: T_J=25°C, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25Ω

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

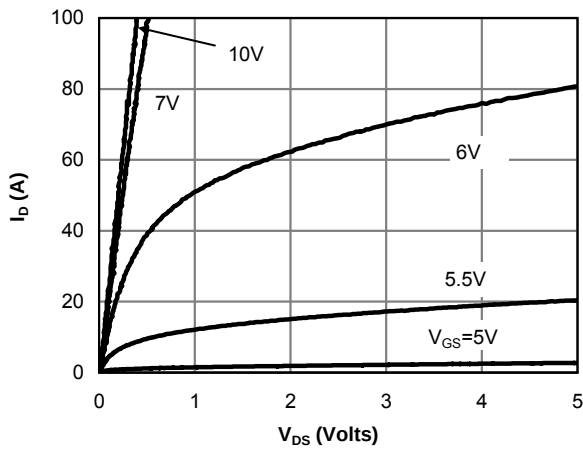


Fig 1: On-Region Characteristics (Note E)

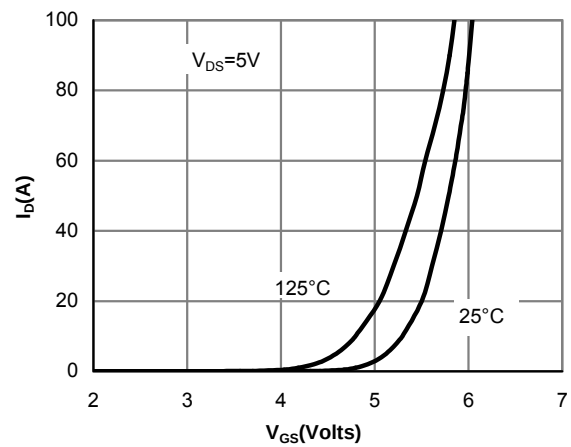


Figure 2: Transfer Characteristics (Note E)

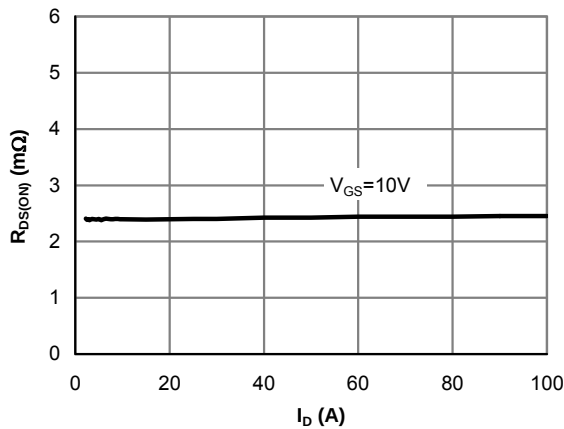


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

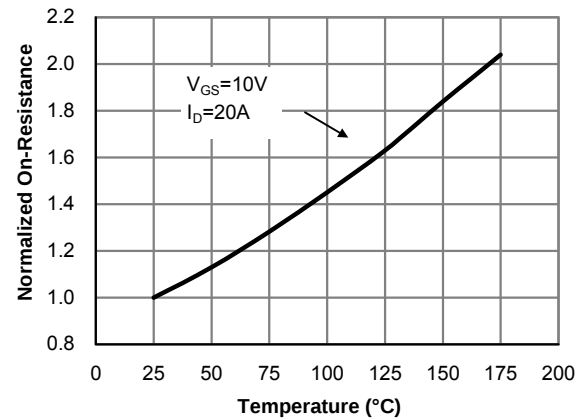


Figure 4: On-Resistance vs. Junction Temperature (Note E)

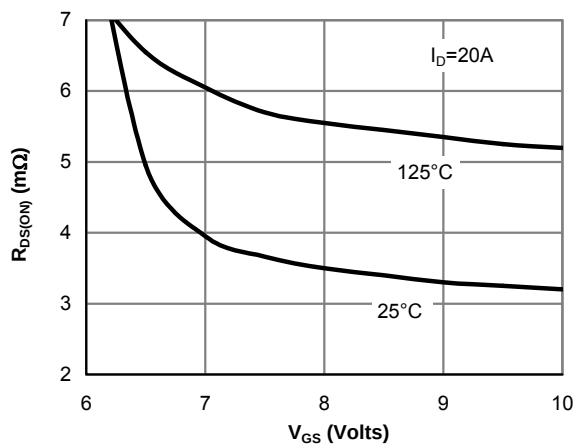


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

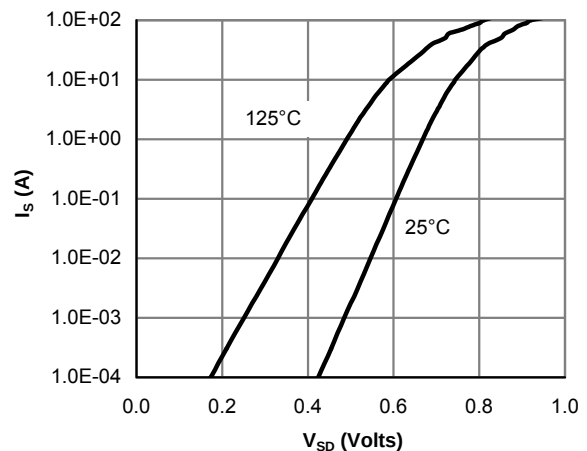


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

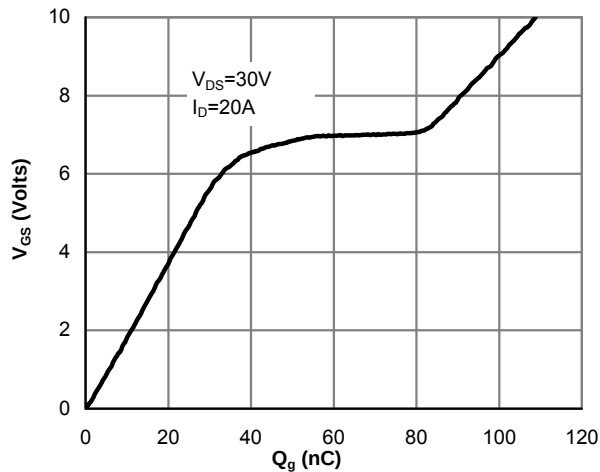


Figure 7: Gate-Charge Characteristics

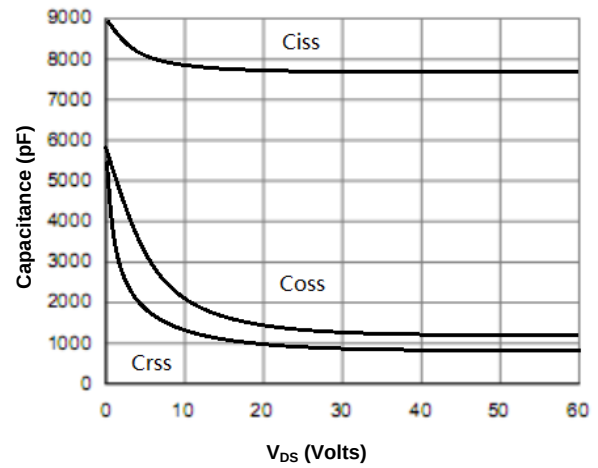


Figure 8: Capacitance Characteristics

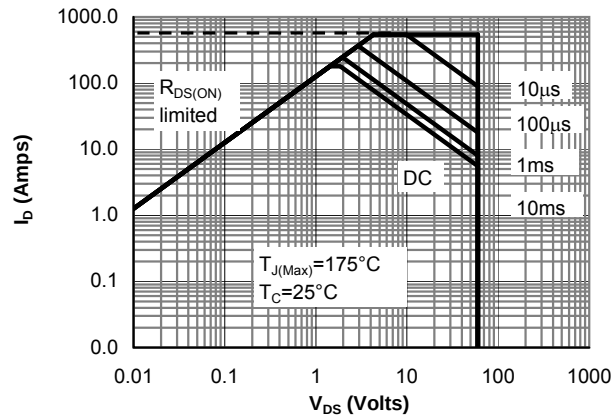


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

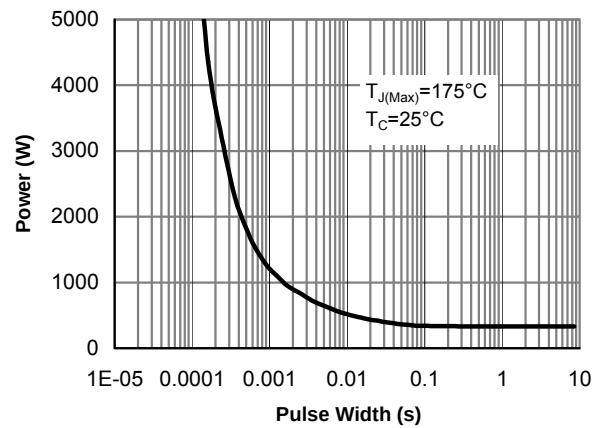


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

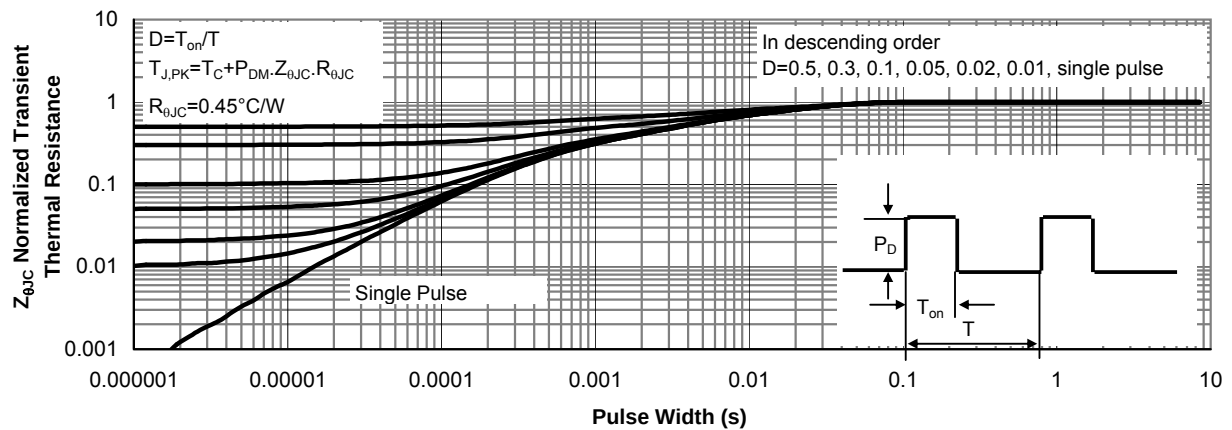


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

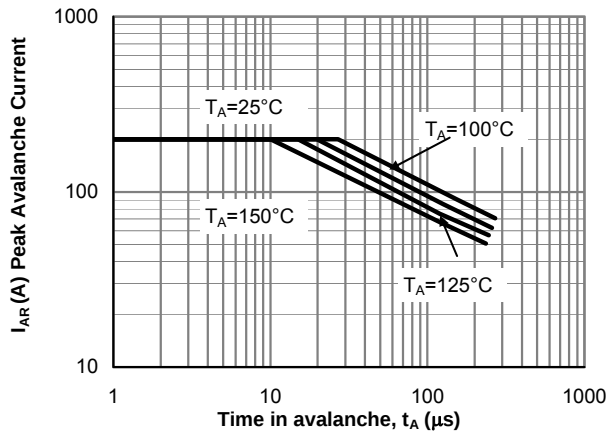


Figure 12: Single Pulse Avalanche capability (Note C)

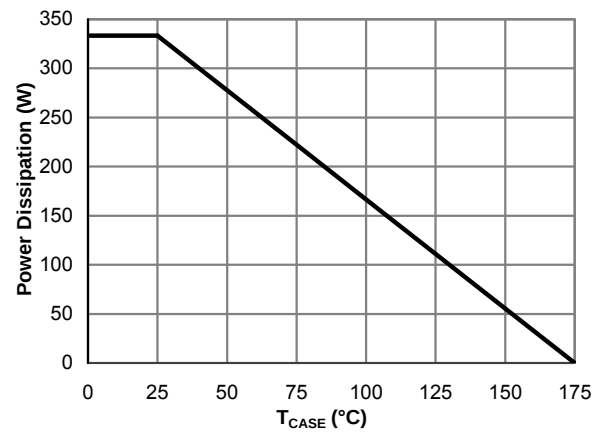


Figure 13: Power De-rating (Note F)

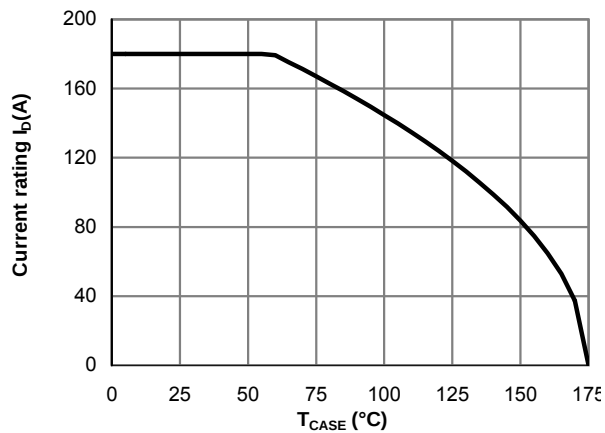


Figure 14: Current De-rating (Note F)

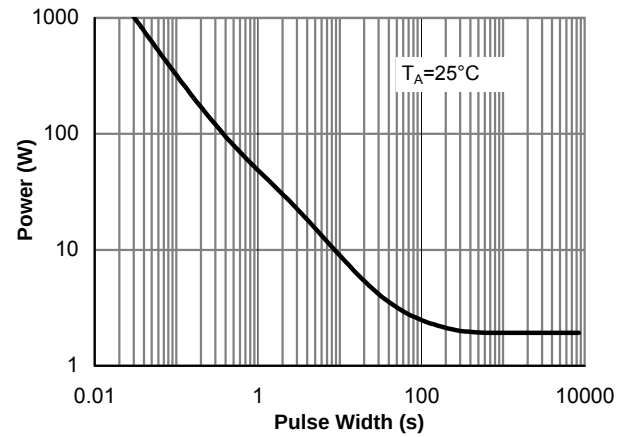


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

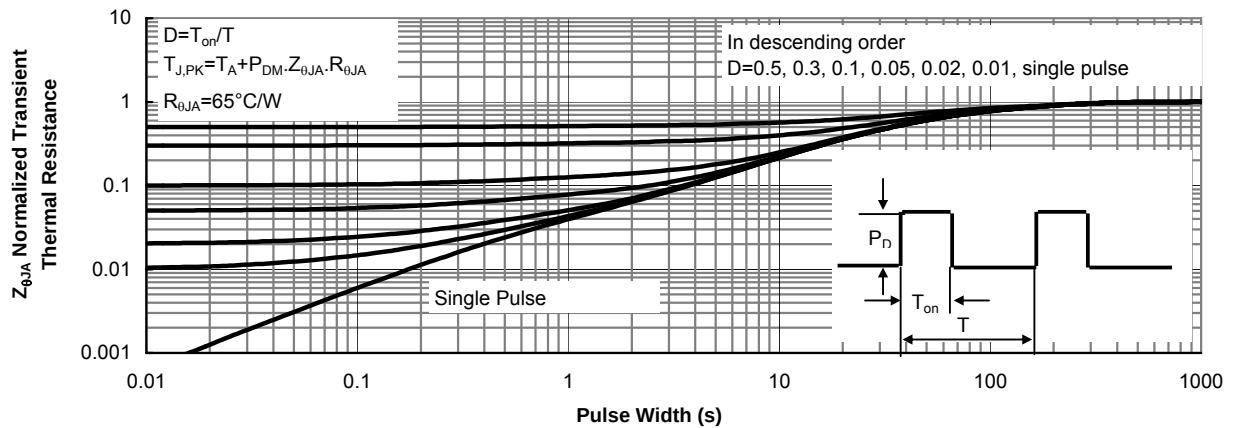
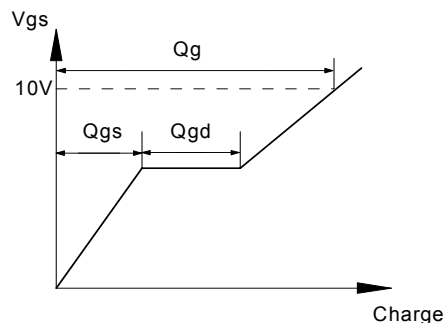
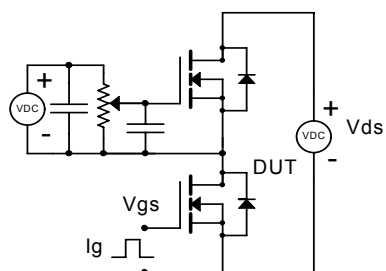
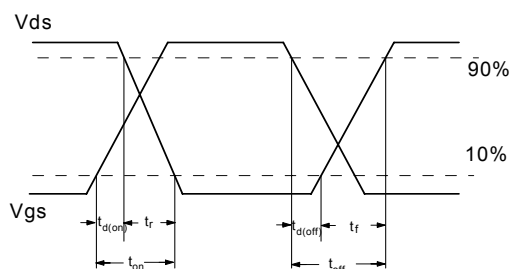
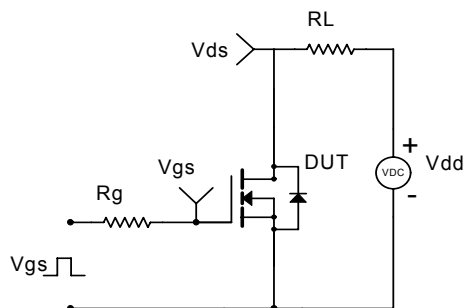


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

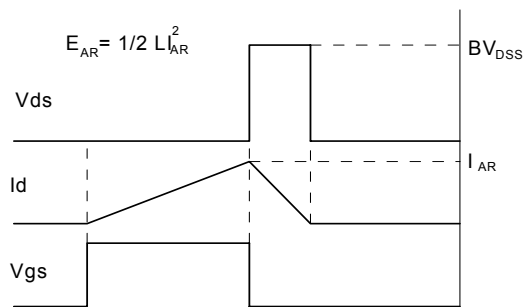
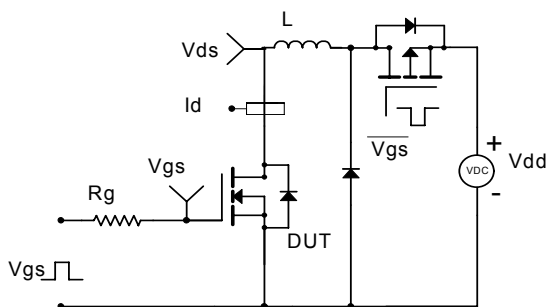
Gate Charge Test Circuit & Waveform



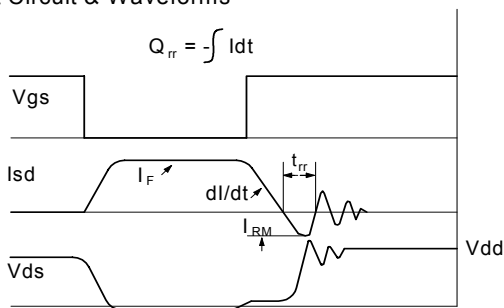
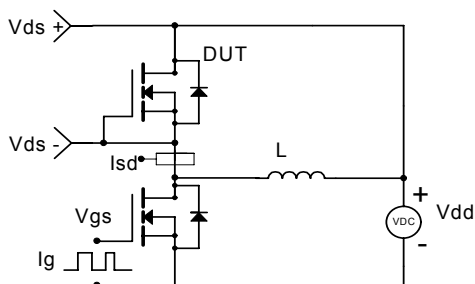
Resistive Switching Test Circuit & Waveforms



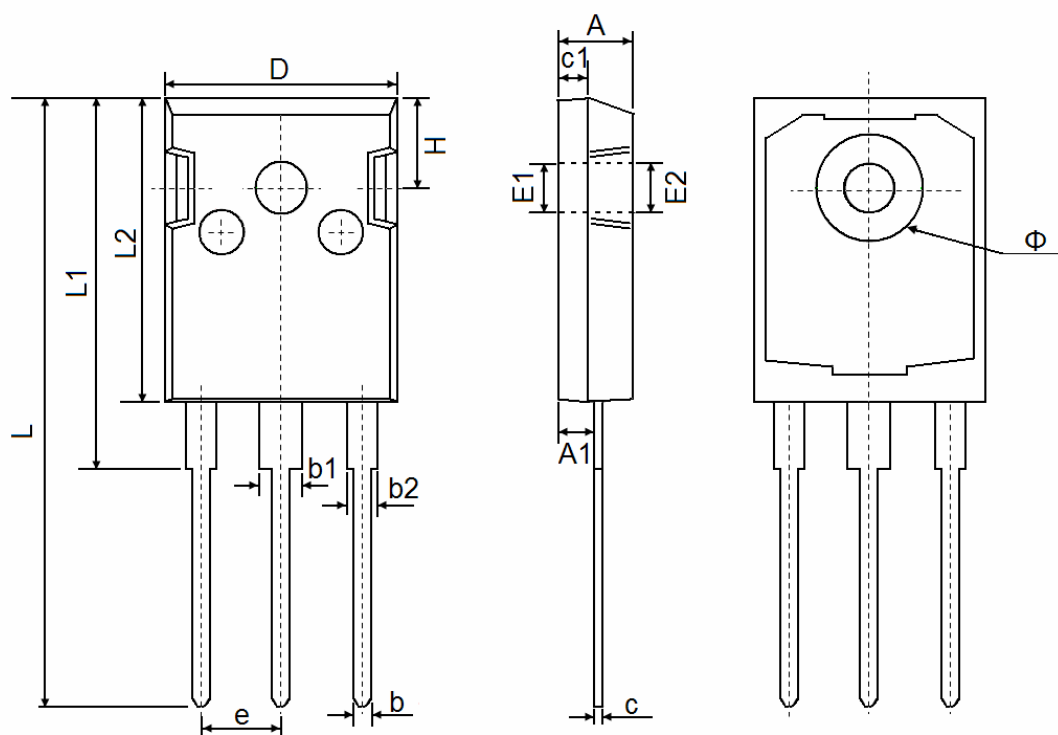
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



TO-247 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
Φ	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	

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