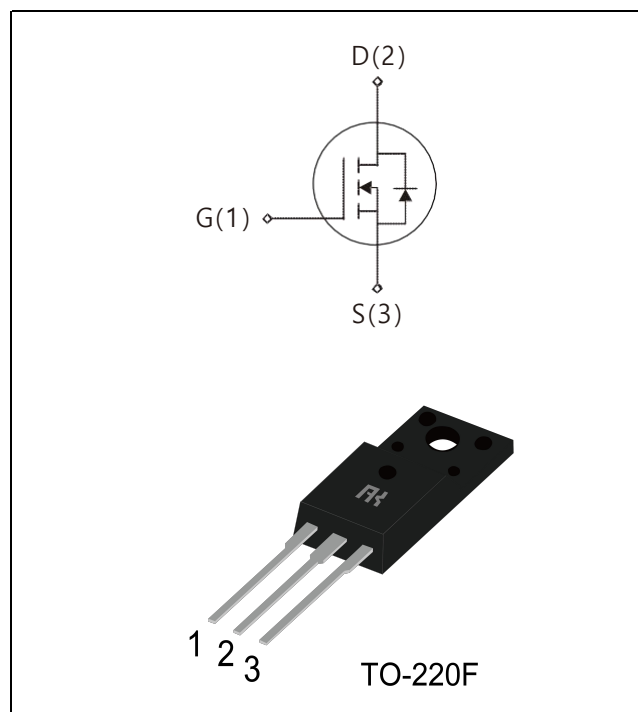


650V,5A N-CHANNEL POWER MOSFET
GENERAL DESCRIPTION

The AKF4N65P is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics .

Features:

- ◆ Low Intrinsic Capacitances.
- ◆ Excellent Switching Characteristics.
- ◆ Extended Safe Operating Area.
- ◆ Unrivalled Gate Charge :Qg=14nC (Typ.)
- ◆ BVDSS=650 V,I_D=5A
- ◆ R_{DS(on)} : 2.50Ω (Max) @V_G=10V
- ◆ 100% Avalanche Tested


Absolute Maximum Ratings (T_a=25°C unless otherwise noted)

Symbol	Parameter	Value	Unit
V _{DSS}	Drain-Source Voltage	650	V
I _D	Drain Current	T _j =25°C	5.0
		T _j =100°C	2.7
V _{GSS}	Gate Threshold Voltage	30	V
E _{AS}	Single Pulse Avalanche Energy (note1)	120	mJ
I _{AR}	Avalanche Current (note2)	5.0	A
P _D	Power Dissipation (T _j =25 °C)	50	W
T _j	Junction Temperature(Max)	150	°C
T _{stg}	Storage Temperature	-55~+150	°C
TL	Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	300	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R _{θJC}	Thermal Resistance, Junction to Case	-	2.4	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient		62.5	°C/W

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu A, V_{GS}=0$	650	-	-	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown voltage temperature Coefficient	$I_D=250\mu A$, reference to 25°C	-	0.67	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=650V, V_{GS}=0V$	-	-	10	μA
		$V_{DS}=520V, T_J=125^\circ C$	-	-	100	
I_{GSSF}	Gate-body leakage Current, Forward	$V_{GS}=+30V, V_{DS}=0V$	-	-	100	nA
I_{GSSR}	Gate-body leakage Current, Reverse	$V_{GS}=-30V, V_{DS}=0V$	-	-	-100	
On Characteristics						
$V_{GS(TH)}$	Gate Threshold Voltage	$I_D=250\mu A, V_{DS}=V_{GS}$	2	-	4	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$I_D=2.0A, V_{GS}=10V$	-	-	2.5	Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS}=25V, V_{GS}=0, f=1.0MHz$	-	560	-	μF
C_{oss}	Output Capacitance		-	48	-	
C_{rss}	Reverse Transfer Capacitance		-	5.4	-	
Switching Characteristics						
$T_d(on)$	Turn-On Delay Time	$V_{DD}=325V, I_D=5A, R_G=25\Omega$ (Note 3,4)	-	25	-	nS
T_r	Turn-On Rise Time		-	45	-	
$T_d(off)$	Turn-Off Delay Time		-	25	-	
T_f	Turn-Off Rise Time		-	35	-	
Q_g	Total Gate Charge	$V_{DS}=520V, V_{GS}=10V, I_D=5A$ (Note 3,4)	-	14.3	-	nC
Q_{gs}	Gate-Source Charge		-	2.8	-	
Q_{gd}	Gate-Drain Charge		-	4.5	-	
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Max. Diode Forward Current	-	-	-	4	A
I_{SM}	Max. Pulsed Forward Current	-	-	-	16	
V_{SD}	Diode Forward Voltage	$I_D=5A$	-	-	1.4	V
T_{rr}	Reverse Recovery Time	$I_S=5A, V_{GS}=0V, diF/dt=100A/\mu s$ (Note 3)	-	393	-	nS
Q_{rr}	Reverse Recovery Charge		-	1.5	-	μC

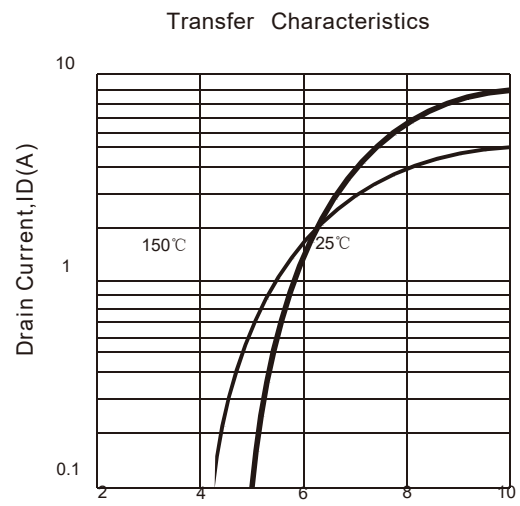
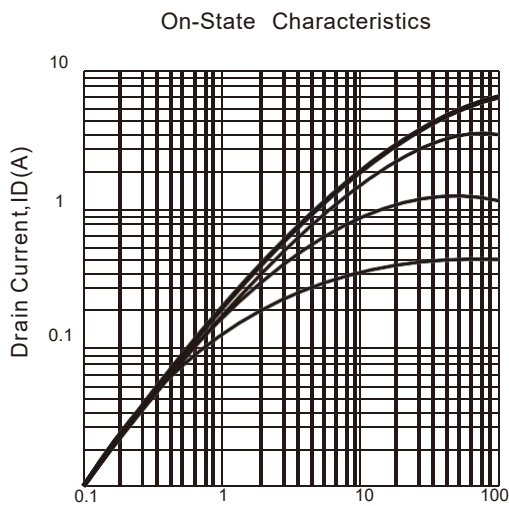
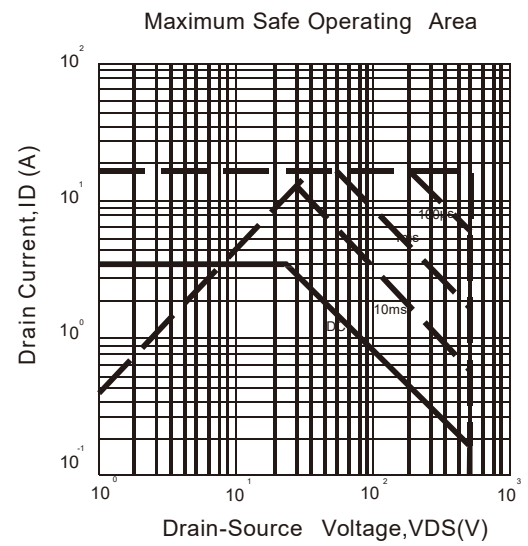
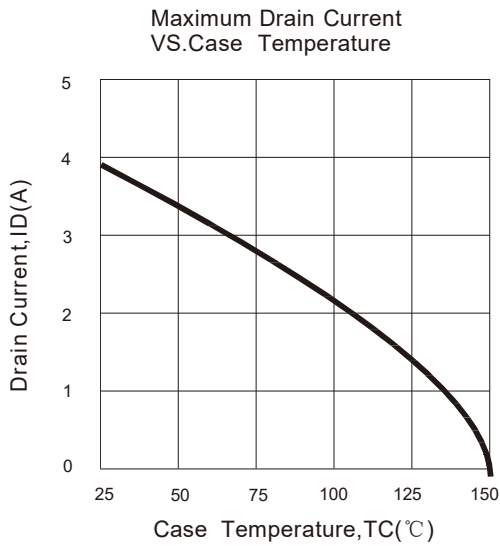
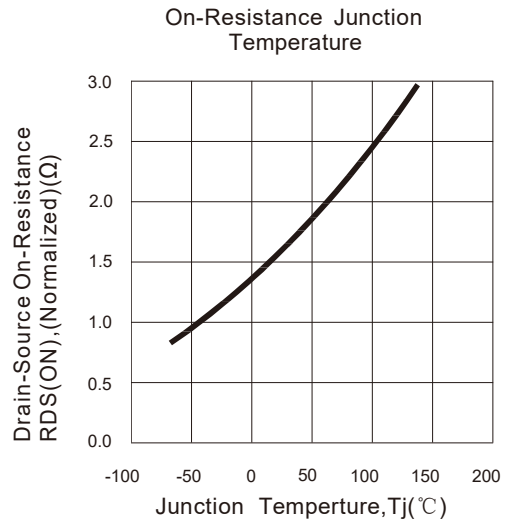
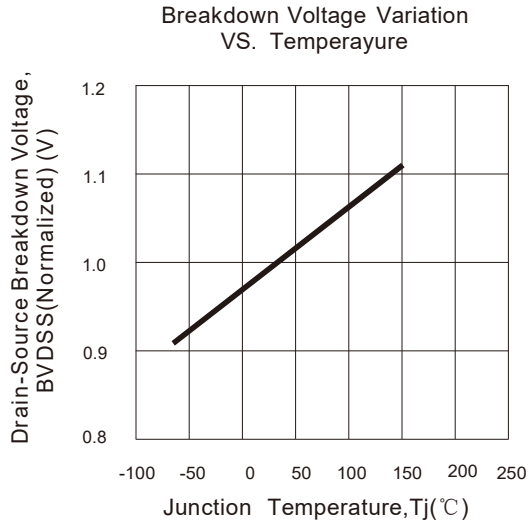
Notes : 1, L=0.5mH, IAS= 5A, VDD=50V, RG=25 Ω , Starting T_J =25°C

2, Repetitive Rating : Pulse width limited by maximum junction temperature

3, Pulse Test : Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

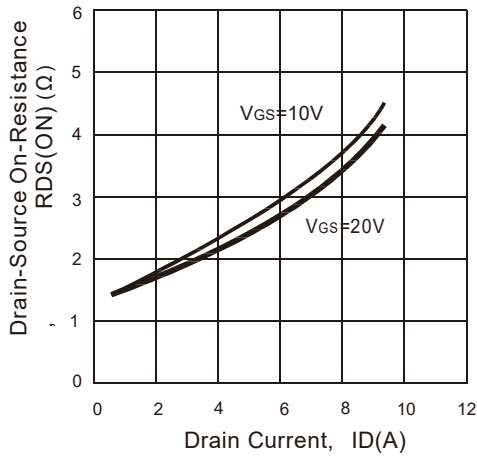
4, Essentially Independent of Operating Temperature

Typical Characteristics

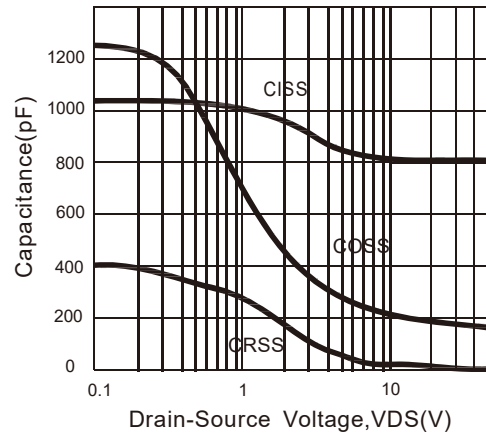


Typical Characteristics (Continued)

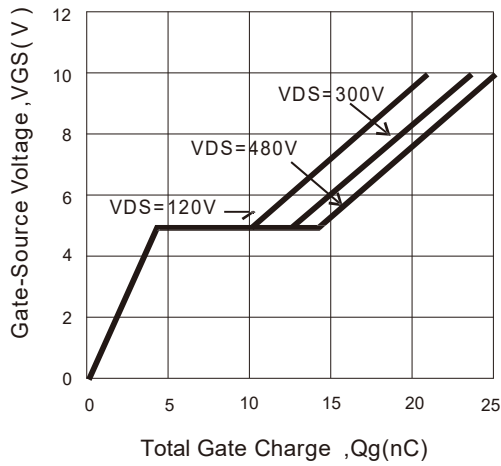
On-Resistance Variation vs. Drain Current and Gate Voltage



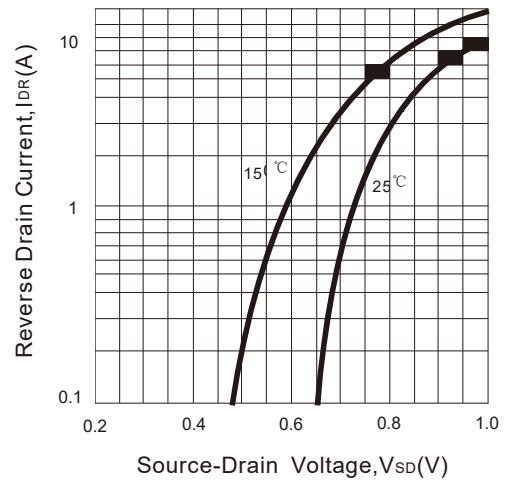
Capacitance Characteristics (Non-Repetitive)



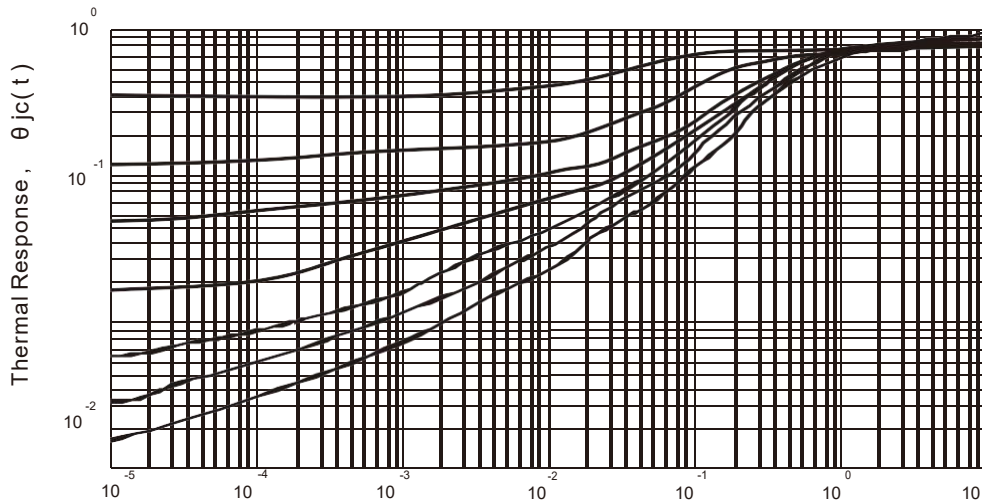
Gate Charge Characteristics



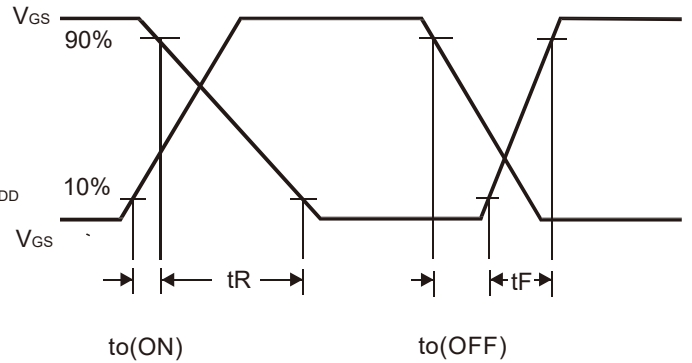
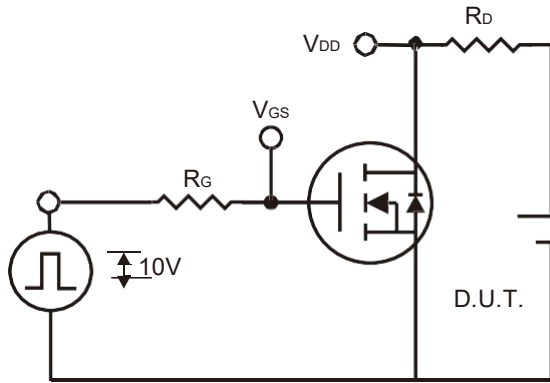
Body Diode Forward Voltage Variation With Source Current and Temperature



Transient Thermal Response Curve

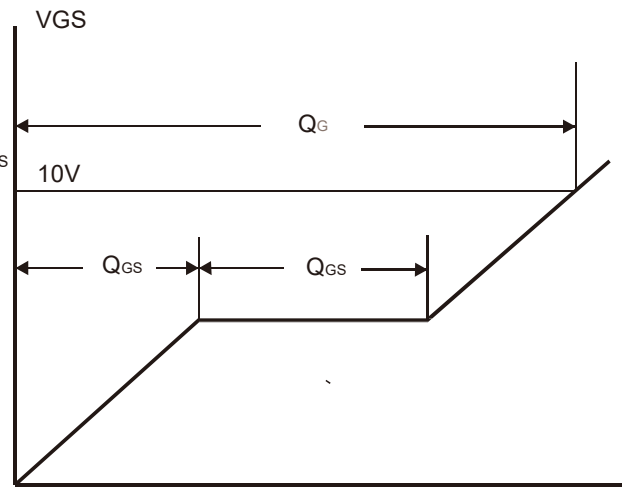
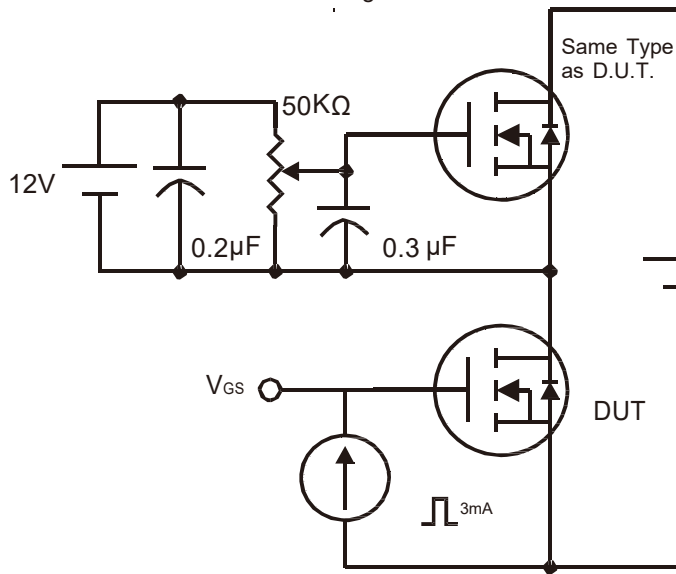


Gate Charge Test Circuit & Waveform



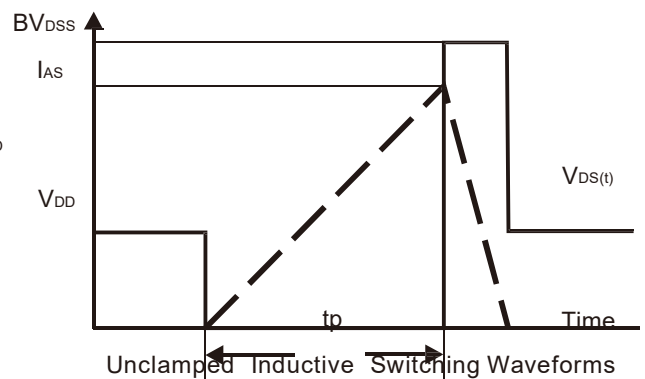
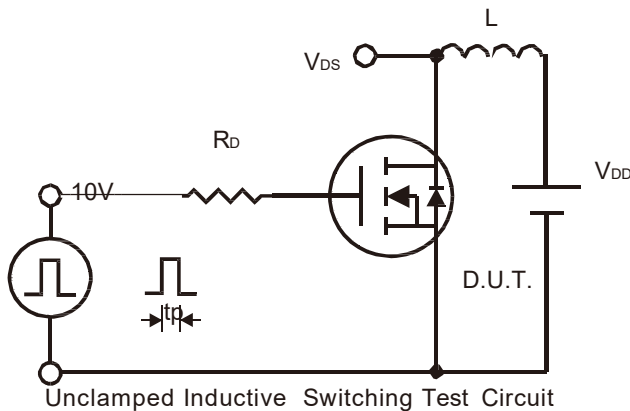
Switching Test Circuit

Switching Waveforms



Gate Charge Test Circuit

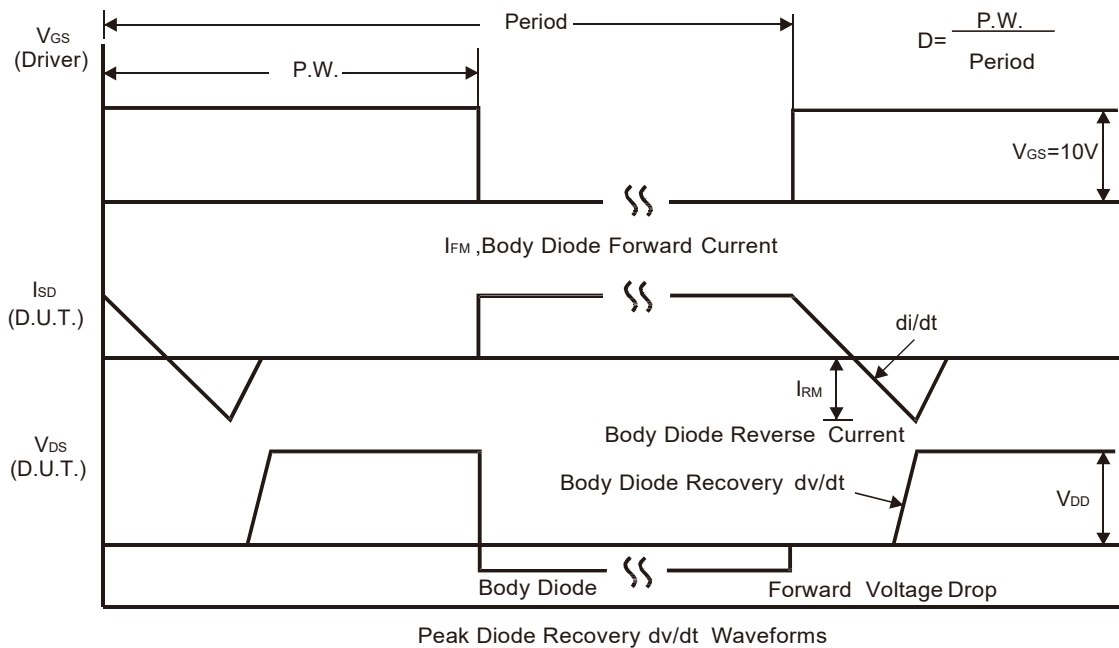
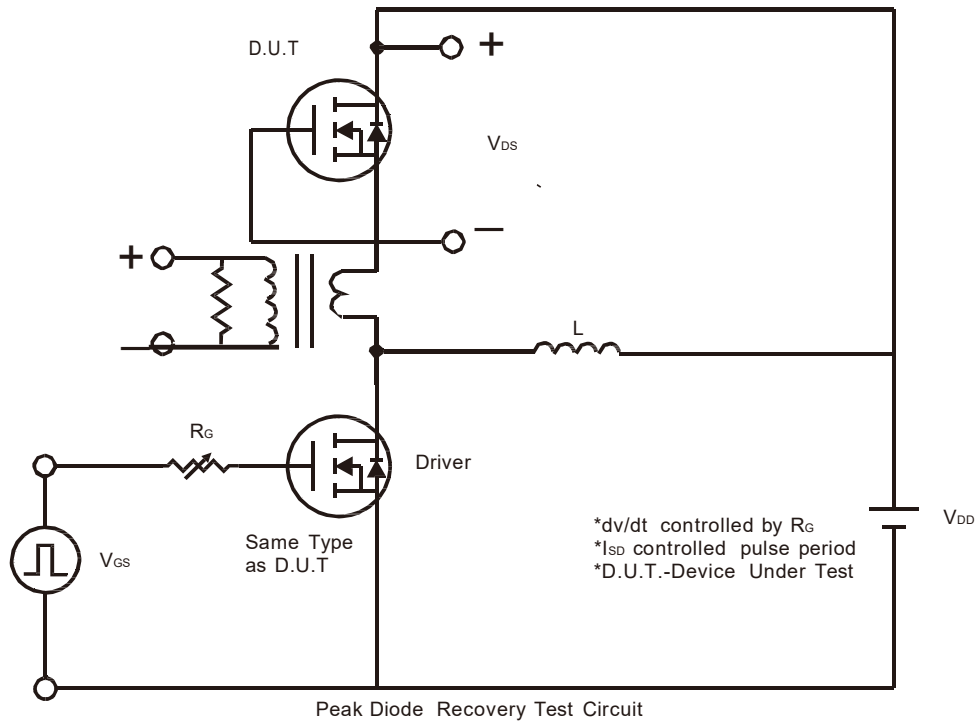
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit

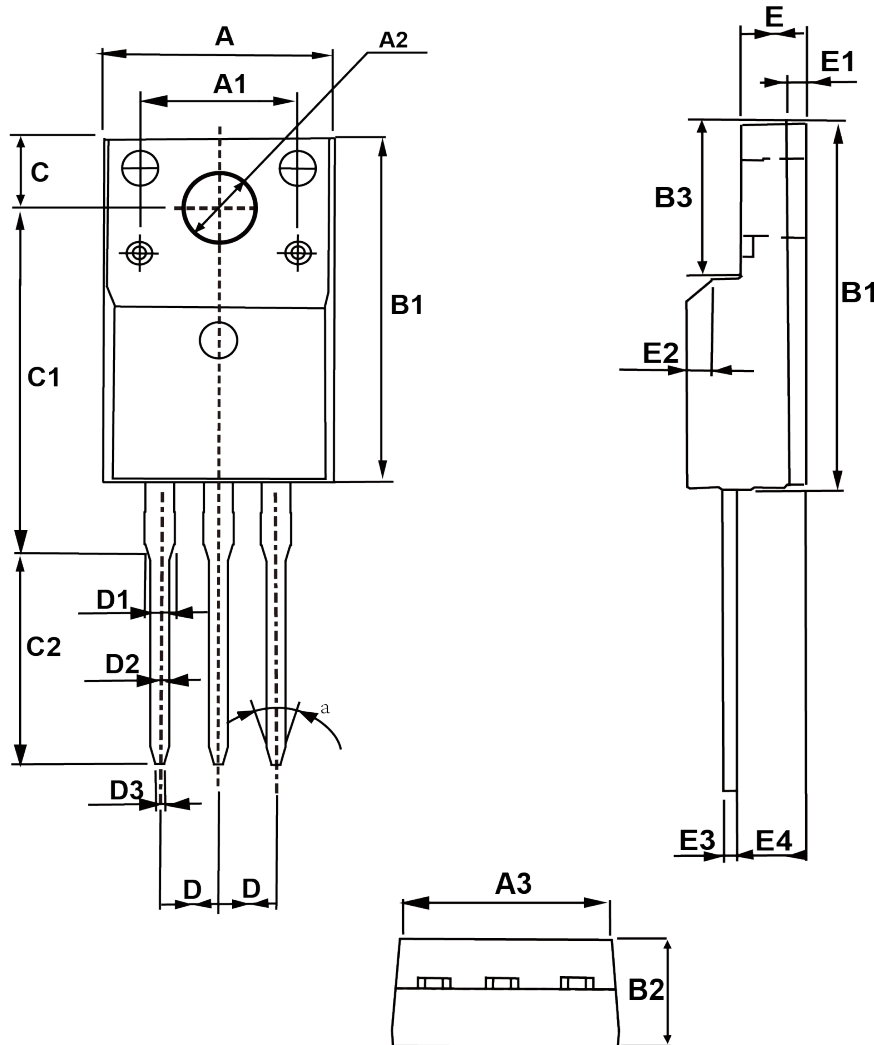
Unclamped Inductive Switching Waveforms

Peak Diode Recovery dv/dt Test Circuit & Waveform



Package Dimension of TO-220F

Unit: mm



Symbol	Min	Max	Symbol	Min	Max
A	9.96	10.36	D	2.54	
A1	7.00		D1	1.15	1.35
A2	3.08	3.28	D2	0.70	0.90
A3	9.25	9.65	D3	0.28	0.48
B1	15.70	16.10	E	2.34	2.74
B2	4.50	4.90	E1	0.70	
B3	6.20	6.80	E2	1.0×45°	
C	3.20	3.40	E3	0.36	0.65
C1	15.20	16.00	E4	2.55	2.95
C2	9.75	10.15	a (angle)	30°	