PFP6N90E / PFF6N90E

900V N-Channel MOSFET

FEATURES

- Originative New Design
- 100% EAS Test
- Rugged Gate Oxide Technology
- Extremely Low Intrinsic Capacitances
- Remarkable Switching Characteristics
- Unequalled Gate Charge : 30.5 nC (Typ.)
- Extended Safe Operating Area
- Lower $R_{DS(ON)}$: 1.9Ω (Typ.) @V_{GS}=10V

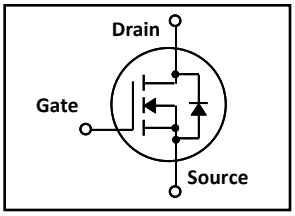
APPLICATION

- High current, High speed switching
- Suitable for power supplies, adaptors and PFC
- SMPS (Switched Mode Power Supplies)

BV_{DSS} = 900 V

$R_{DS(on)}$ = 1.9 Ω

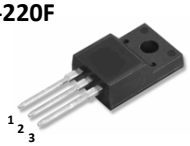
I_D = 5.7 A



TO-220

1.Gate 2. Drain 3. Source

TO-220F



1.Gate 2. Drain 3. Source

Absolute Maximum Ratings

T_C=25°C unless otherwise specified

Symbol	Parameter	PFP6N90E	PFF6N90E	Units
V_{DSS}	Drain-Source Voltage	900		V
I_D	Drain Current – Continuous (T_C = 25°C)	5.7	5.7*	A
	Drain Current – Continuous (T_C = 100°C)	3.6	3.6*	A
I_{DM}	Drain Current – Pulsed (Note 1)	23.0	23.0*	A
V_{GS}	Gate-Source Voltage	±30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	630		mJ
I_{AR}	Avalanche Current (Note 1)	5.7		A
E_{AR}	Repetitive Avalanche Energy (Note 1)	16.7		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5		V/ns
P_D	Power Dissipation (T_C = 25°C)	167	56	W
	- Derate above 25°C	1.3	0.4	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300		°C

* Drain current limited by maximum junction temperature.

Thermal Resistance Characteristics

Symbol	Parameter	PFP6N90E	PFF6N90E	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.75	2.25	°C/W
$R_{\theta JS}$	Thermal Resistance, Junction-to-Sink	0.5	--	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	

Electrical Characteristics T_C=25 °C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
On Characteristics						
V_{GS}	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 uA	2.5	--	4.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 3.0 A	--	1.9	2.3	Ω
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 uA	900	--	--	V
ΔBV_{DSS} /ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 uA, Referenced to25°C	--	0.5	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 900 V, V_{GS} = 0 V	--	--	10	uA
		V_{DS} = 720 V, T_C = 125°C	--	--	100	uA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	1660	2160	pF
C_{oss}	Output Capacitance		--	105	135	pF
C_{rss}	Reverse Transfer Capacitance		--	16	22	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	V_{DS} = 450 V, I_D = 6.0 A, R_G = 25 Ω, R_L = 75 Ω (Note 4,5)	--	28	55	ns
t_r	Turn-On Rise Time		--	22	45	ns
$t_{d(off)}$	Turn-Off Delay Time		--	60	120	ns
t_f	Turn-Off Fall Time		--	24	50	ns
Q_g	Total Gate Charge	V_{DS} = 720 V, I_D = 6.0 A, V_{GS} = 10 V (Note 4,5)	--	30.5	45	nC
Q_{gs}	Gate-Source Charge		--	10	--	nC
Q_{gd}	Gate-Drain Charge		--	7	--	nC
Source-Drain Diode Maximum Ratings and Characteristics						
I_S	Continuous Source-Drain Diode Forward Current		--	--	5.7	A
I_{SM}	Pulsed Source-Drain Diode Forward Current		--	--	23.0	
V_{SD}	Source-Drain Diode Forward Voltage	I_S = 6.0 A, V_{GS} = 0 V	--	--	1.4	V
trr	Reverse Recovery Time	I_S = 6.0 A, V_{GS} = 0 V di_F/dt = 100 A/us (Note 4)	--	505	--	ns
Qrr	Reverse Recovery Charge		--	5.3	--	uC

Notes ;

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=35mH, I_{AS}=6.0A, V_{DD}=50V, R_G=25Ω, Starting T_J =25°C
3. I_{SD}≤6.0A, di/dt≤200A/us, V_{DD}≤BV_{DSS} , Starting T_J =25 °C
4. Pulse Test : Pulse Width ≤ 300us, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature

Typical Characteristics

Fig.1 On Region Characteristics

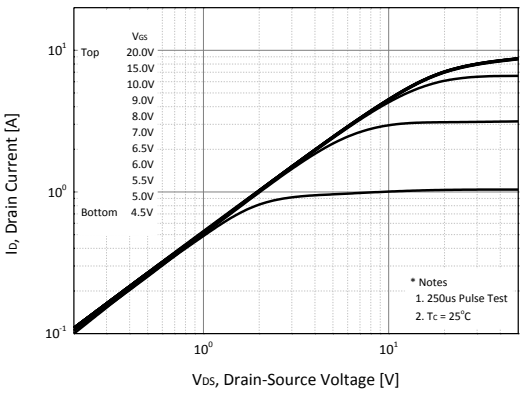


Fig.2 Transfer Characteristics

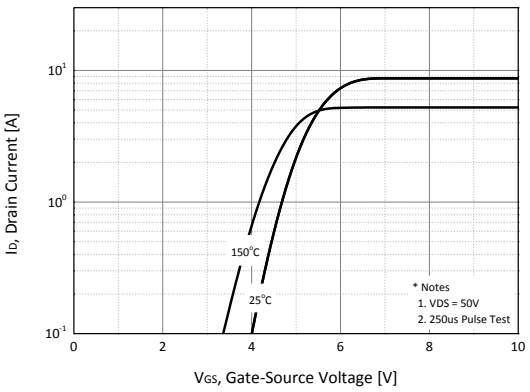


Fig.3 Static Drain-Source On Resistance

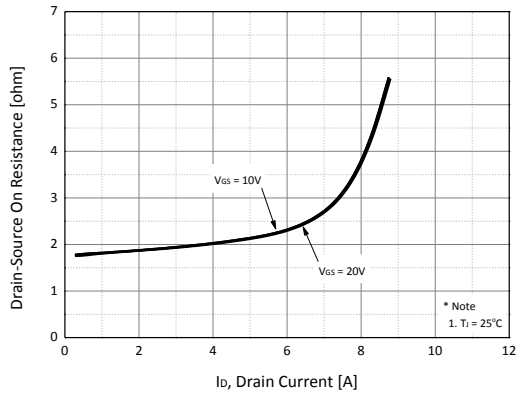


Fig.4 Body Diode Forward Voltage

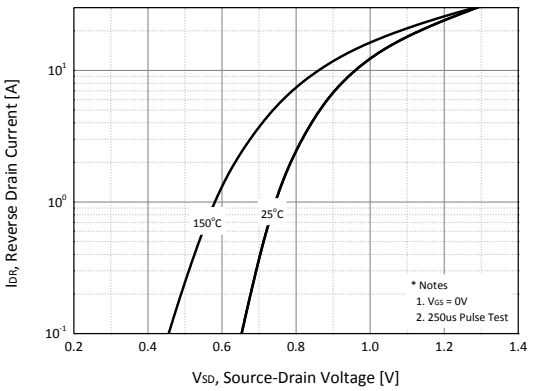


Fig.5 Capacitance Characteristics

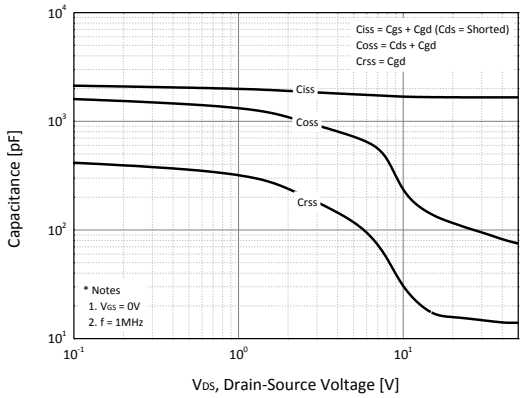
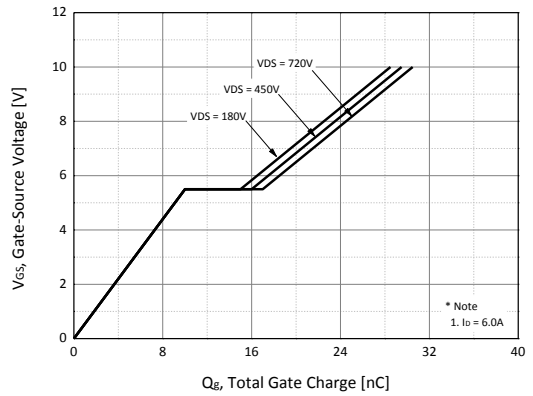


Fig.6 Gate Charge Characteristics



Typical Characteristics

Fig.7 BV_{DSS} Variation vs. Temperature

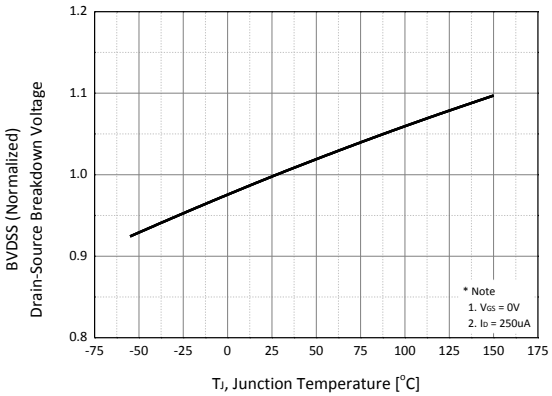


Fig.8 On-Resistance Variation vs. Temperature

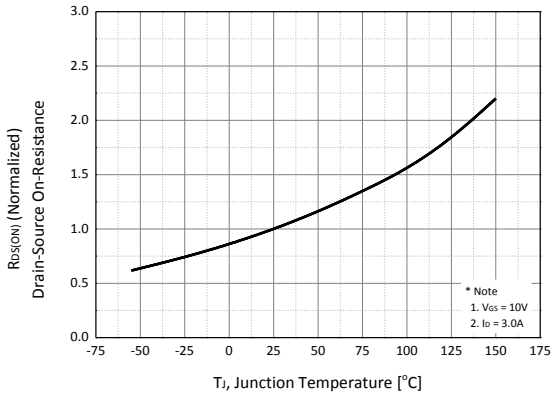


Fig.9-1 Safe Operation Area for TO-220

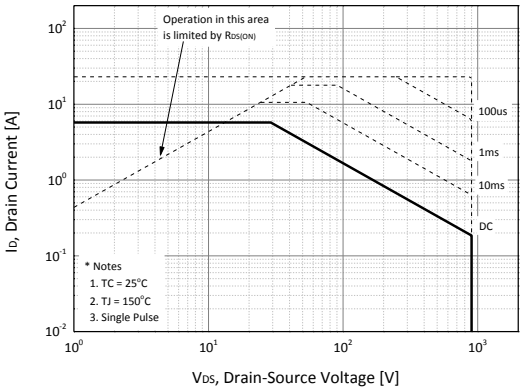


Fig.9-2 Safe Operation Area for TO-220F

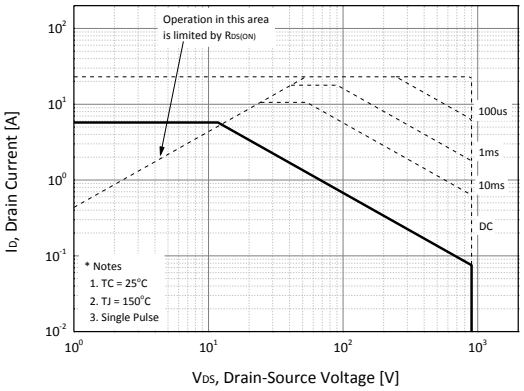
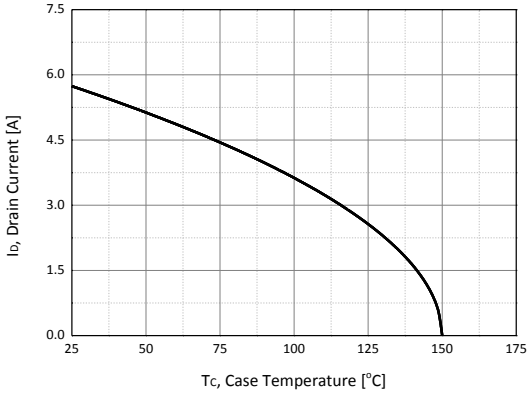


Fig.10 Maximum I_D vs. Case Temperature



Typical Characteristics

Fig.11-1 Transient Thermal Response Curve

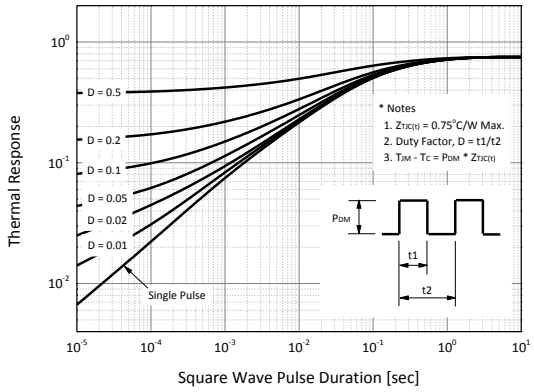
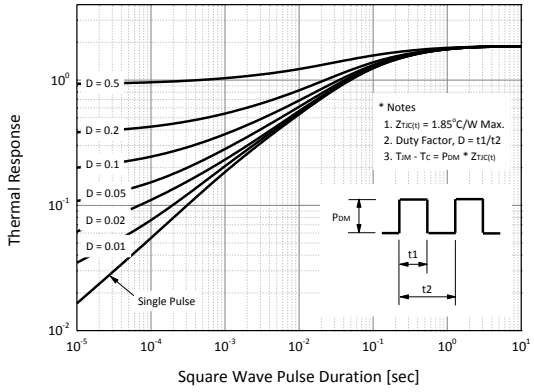


Fig.11-2 Transient Thermal Response Curve



Characteristics Test Circuit & Waveform

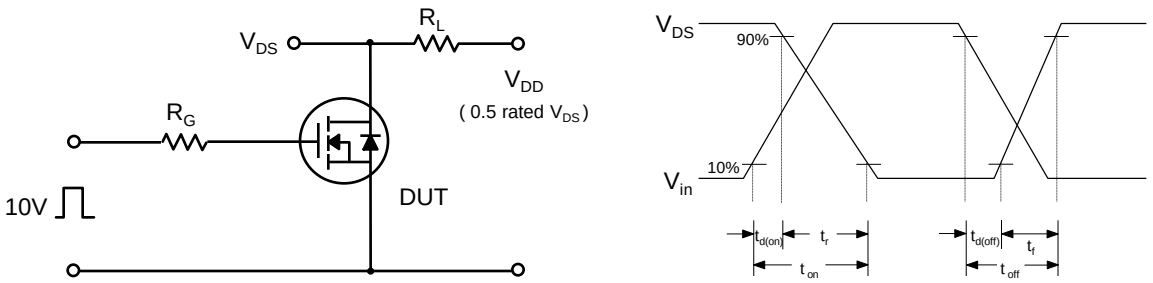


Fig 14. Resistive Switching Test Circuit & Waveforms

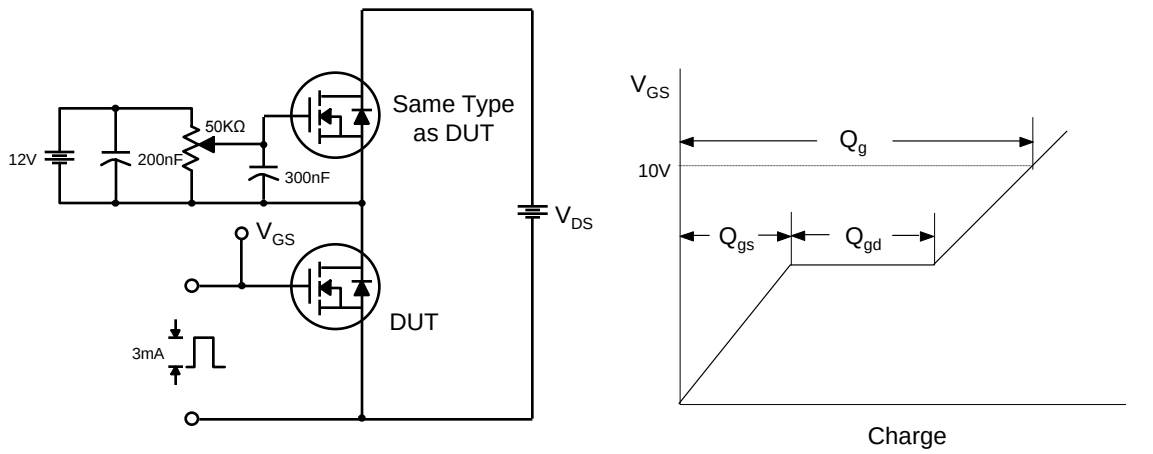


Fig 15. Gate Charge Test Circuit & Waveform

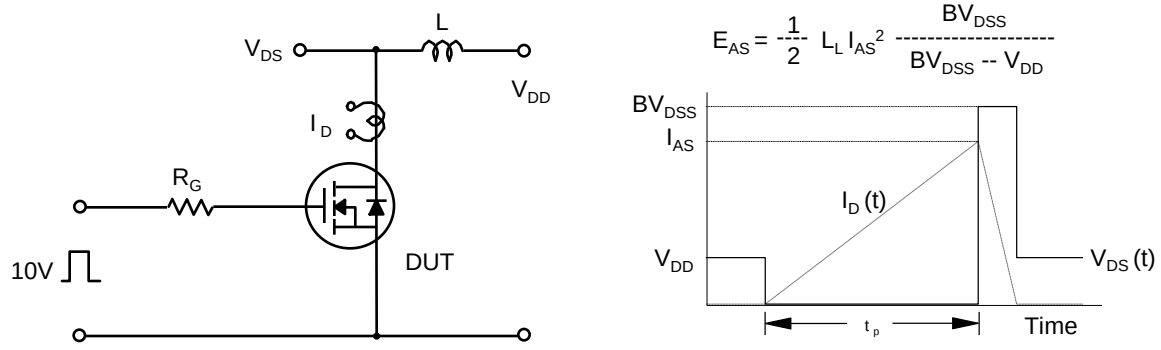
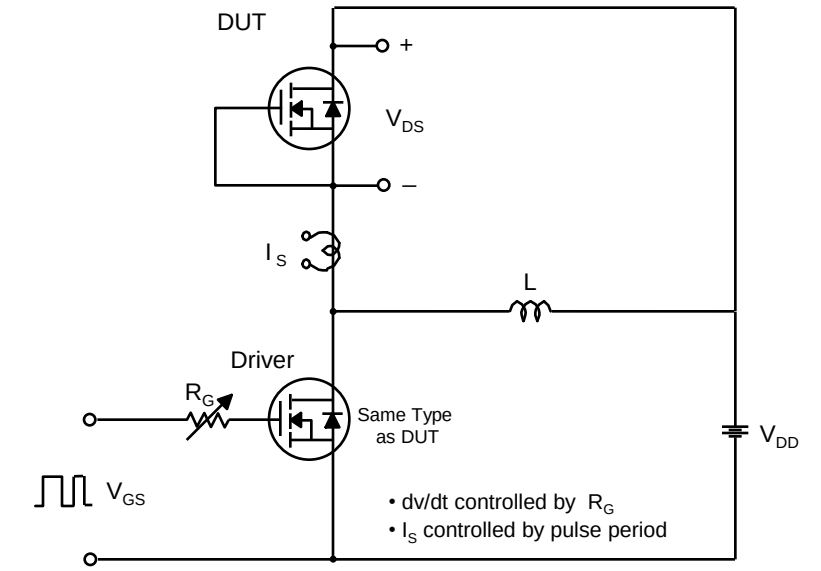


Fig 16. Unclamped Inductive Switching Test Circuit & Waveforms

Characteristics Test Circuit & Waveform (continued)



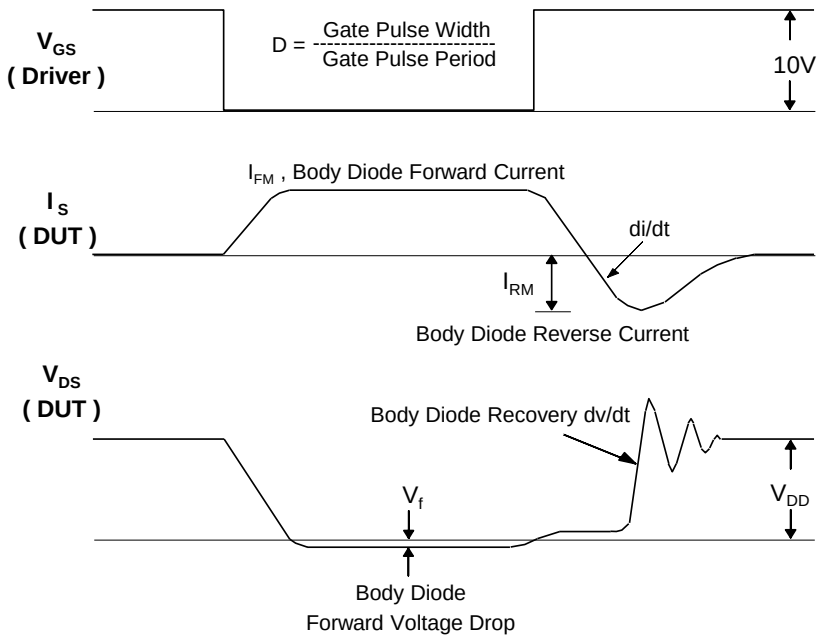
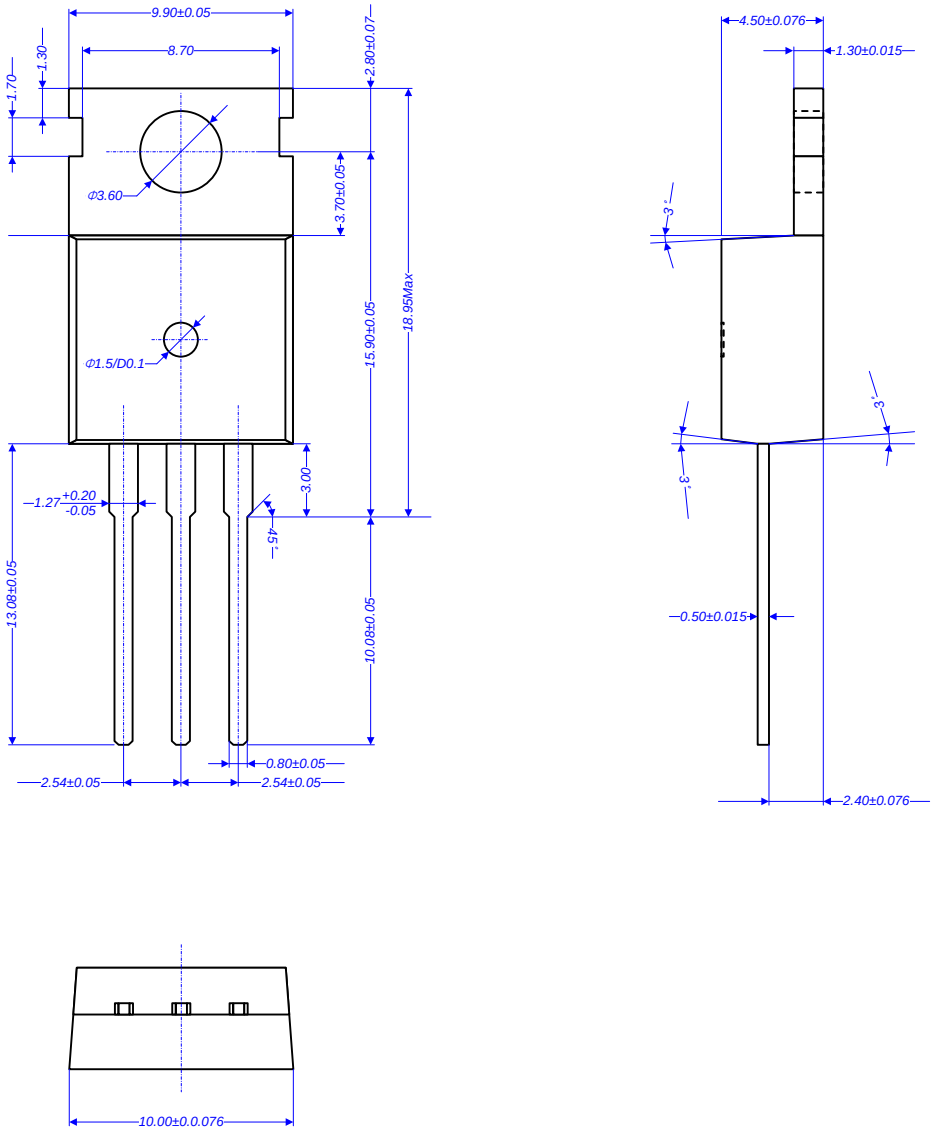


Fig 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Package Dimension

Z

TO-220



Package Dimension

Z

TO-220F