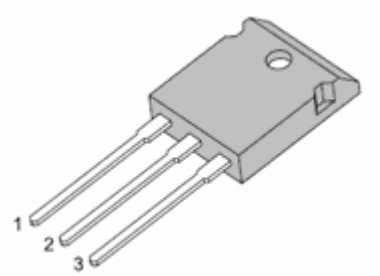
900V/9A Power MOSFET (N-Channel)

General Description

- MSU9N90P is a N-Channel enhancement mode power MOSFET with advanced technology. It is designed to have better characteristics, such as fast switching time, low gate charge, minimized on-state resistance. This device is well suited for use as a load switch or in PWM applications.

- MSU9N90P is available in TO-3P package.



TO-3P

Features

- $R_{DS(ON)}$ =1.4Ω@V_{GS}=10V
- Ultra low gate charge (Typ. 45nC)
- Low Crss (Typ. 14pF)
- Fast switching capability
- Avalanche energy specified
- Improved dv/dt capability, high ruggedness
- RoHS compliance and halogen free

RoHS Compliant

HALOGEN FREE

Application

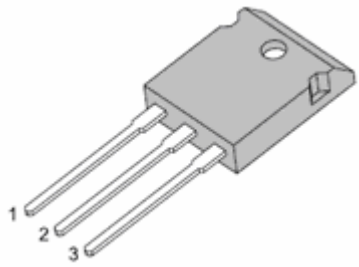
- DC to DC Converter
- Active Power Factor Correction
- SMPS Application.
- Electronic Lamp Ballast

Ordering Information

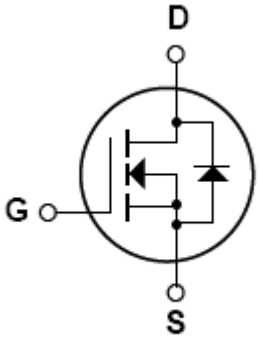
MS U 9 N 90 P - xx - TU

- Packing Code
  - TU: Tube, RoHS
  - UG: Tube, Halogen Free
- Factory Location Code
- Outline Code
  - P: TO-3P
- Voltage Code
  - 90: 900V
- Channel Code
  - N: N-channel
- Ampere Code
  - 9: 9A
- Technology Code
- Taitron Power MOSFET (Standard)

Pin Configuration and Symbol



1: GATE 2: DRAIN 3: SOURCE



Absolute Maximum Ratings *(T_C=25ºC unless otherwise specified)*

Symbol	Description		Ratings	Unit
V_{DSS}	Drain-Source Voltage		900	V
V_{GSS}	Gate-Source Voltage		± 30	V
I_D	Drain Current -Continuous		9.0	A
I_{DM}	Drain Current -Pulsed (note3)		36	A
E_{AS}	Avalanche Energy	Single Pulsed (Note4)	900	mJ
E_{AR}		Repetitive (Note3)	28	
I_{AR}	Avalanche Current (note3)		9.0	A
dv/dt	Peak Diode Recovery dv/dt (note5)		4.0	V/ns
P_D	Power Dissipation @ TC=25ºC		160	W
	Derating above 25ºC		1.28	W/°C
T_J	Junction Temperature		+150	°C
T_{STG}	Storage Temperature		-55 to +150	°C

Note:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.
2. Absolute maximum ratings are stress ratings only and functional device operation is not limited.
3. Repetitive rating: pulse width limited by maximum junction temperature.
4. L=21mH, I_{AS}=9.0A, V_{DD}=50V, R_G=25Ω, starting T_J=25°C.
5. I_{SD}≤9.0A, di/dt≤200A/us, V_{DD}≤BV_{DSS}, starting T_J=25°C.

Thermal Characteristics

Symbol	Description	Ratings	Unit
$R_{\theta JA}$	Thermal Resistance(Junction-to-Ambient)	50	°C/W
$R_{\theta JC}$	Thermal Resistance(Junction-to-Case)	0.78	°C/W

Electrical Characteristics *(T_C=25ºC unless otherwise specified)*

OFF Characteristics

Symbol	Description		Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage		V_{GS}=0V, I_D=250μA	900	-	-	V
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient		I_D=250uA, referenced to 25°C	-	0.99	-	V/°C
I_{DSS}	Drain-Source leakage Current		V_{DS}=900V, V_{GS}=0V	-	-	10	μA
I_{GSS}	Gate-Source Leakage Current	Forward	V_{GS}=30V, V_{DS}=0V	-	-	100	nA
		Reverse	V_{GS}=-30V, V_{DS}=0V	-	-	-100	nA

ON Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Unit
$R_{DS(ON)}$	Static Drain-Source On-State Resistance	V_{GS}=10.0V, I_D=4.5A	-	1.12	1.4	Ω
$V_{GS(th)}$	Gate-Source Threshold Voltage	V_{DS}=V_{GS}, I_D=250uA	3.0	-	5.0	V

Dynamic Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Unit
C_{ISS}	Input Capacitance	V_{DS}=25V, V_{GS}=0V, f=1.0MHz	-	2100	2730	pF
C_{OSS}	Output Capacitance		-	175	230	pF
C_{RSS}	Reverse Transfer Capacitance		-	14	18	pF

Switching Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Unit
$t_{D(on)}$	Turn-On Delay Time	V_{DD}=450V, I_D=11A R_G=25Ω (Note 1, 2)	-	50	110	ns
t_R	Turn-On Rise Time		-	120	250	ns
$t_{D(off)}$	Turn-Off Delay Time		-	100	210	ns
t_F	Turn-Off Fall Time		-	75	160	ns
Q_G	Total Gate Charge	V_{DS}=720V, I_D=11A V_{GS}=10V (Note 1, 2)	-	45	58	nC
Q_{GS}	Gate-Source Charge		-	13	-	nC
Q_{GD}	Gate-Drain Charge		-	18	-	nC

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Description	Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Drain-Source Diode Forward Voltage	V_G =0V, Is=9A	-	-	1.4	V
Is	Maximum Continuous Drain-Source Diode Forward Current	-	-	-	9	A
I_{SM}	Maximum Pulse Drain-Source Diode Forward Current	-	-	-	36	A
t_{RR}	Reverse Recovery Time	V_{GS}=0V, Is=9A D_{IF}/dt=100A/us (Note1)	-	550	-	ns
Q_{RR}	Reverse Recovery Charge		-	6.5	-	uC

Note 1. Pulse test: pulse width ≤300us, duty cycle≤2%.

2. Essentially independent of operating temperature.

Typical Characteristics Curves

Fig.1- Drain Current vs. Source-Drain Voltage

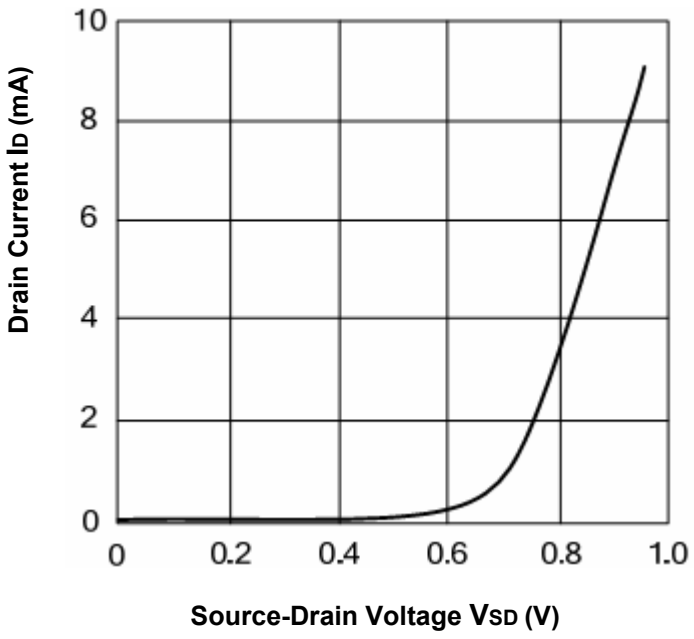


Fig.2- Drain-Source On-State Resistance Characteristics

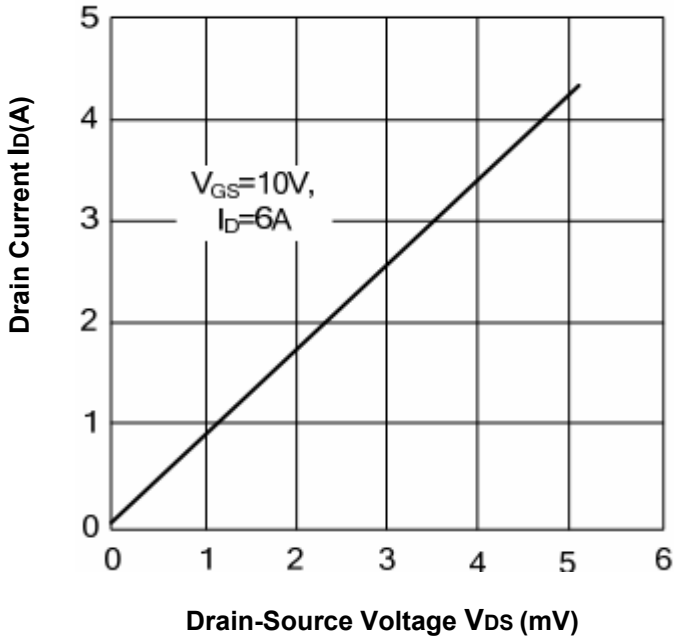


Fig.3- Drain Current vs. Gate Threshold Voltage

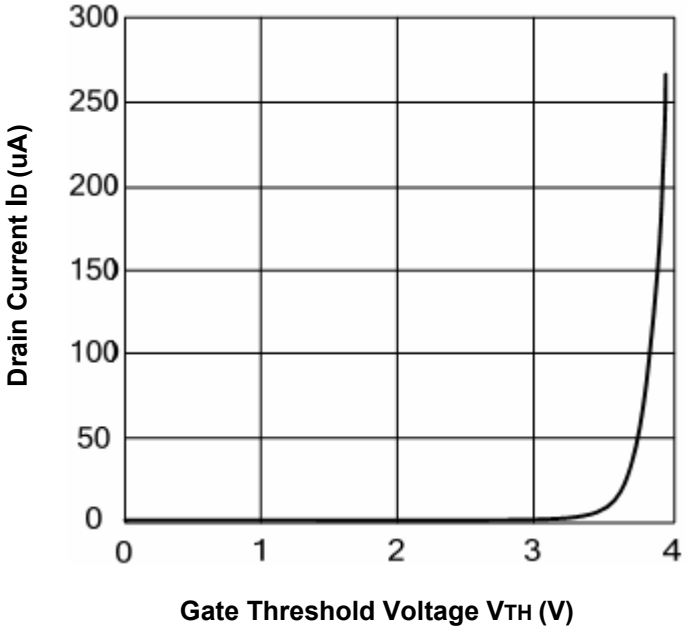
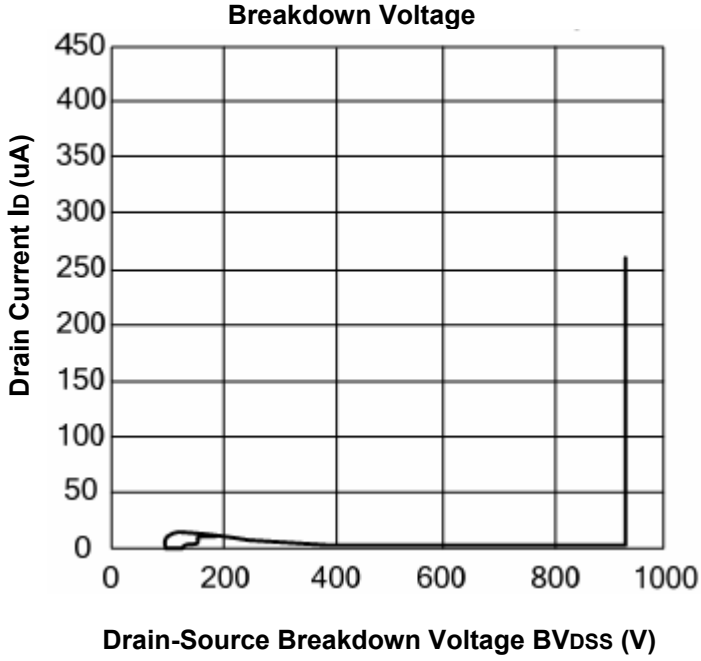


Fig.4- Drain Current vs. Drain-Source Breakdown Voltage



Test Circuit

Fig.5- Switching Test Circuit

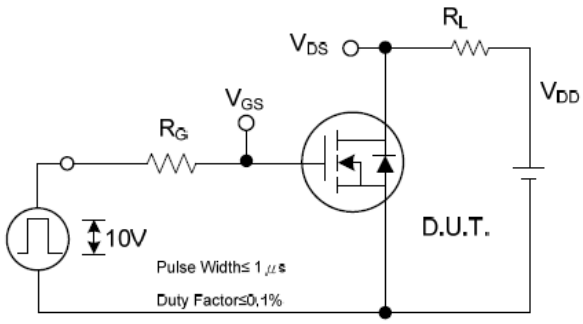


Fig.6- Switching Waveform

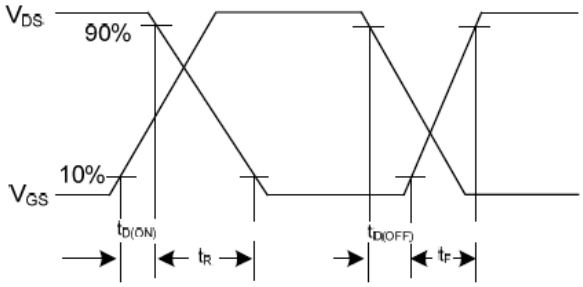


Fig.7- Gate Charge Test Circuit

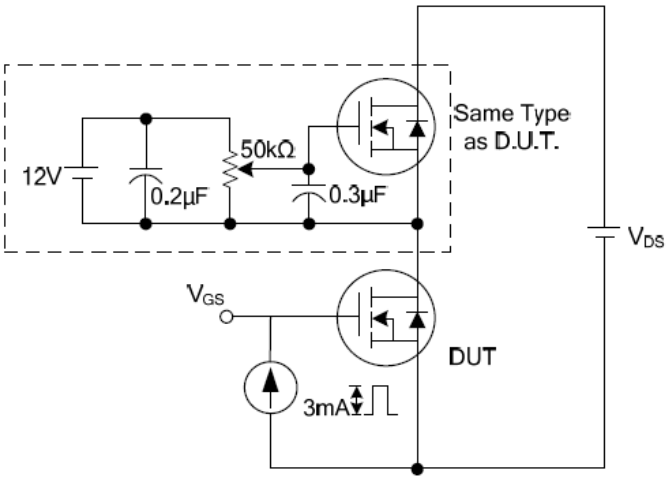


Fig.8- Gate Charge Waveform

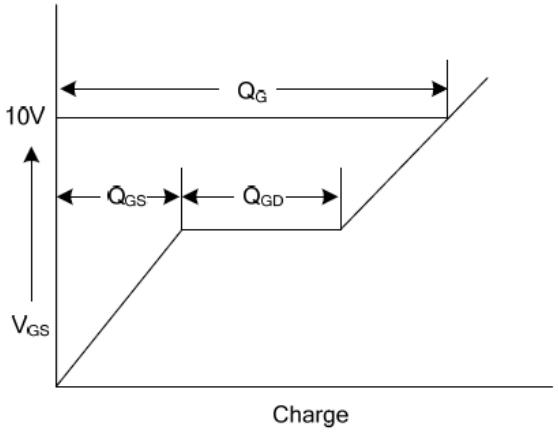


Fig.9- Unclamped Inductive Switching Test Circuit

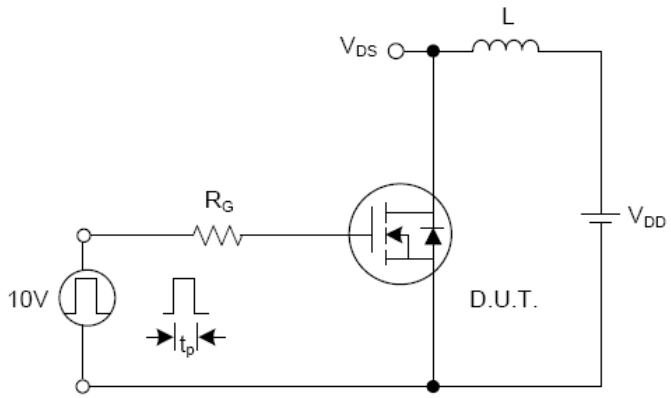


Fig.10- Unclamped Inductive Switching Waveform

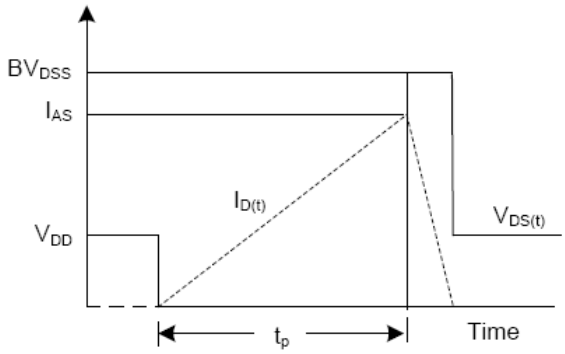


Fig.11- Peak Diode Recovery dv/dt Test Circuit

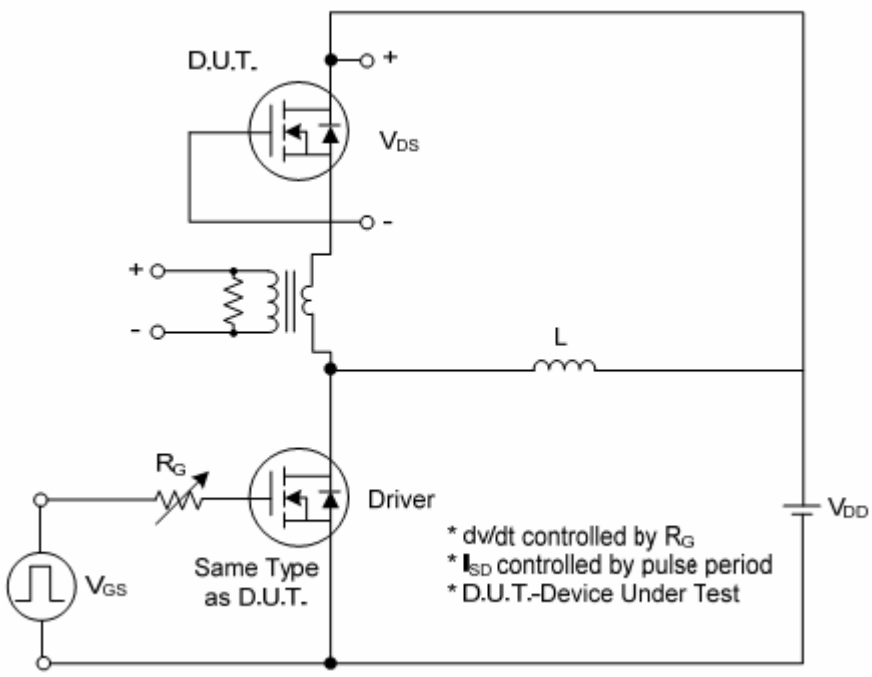
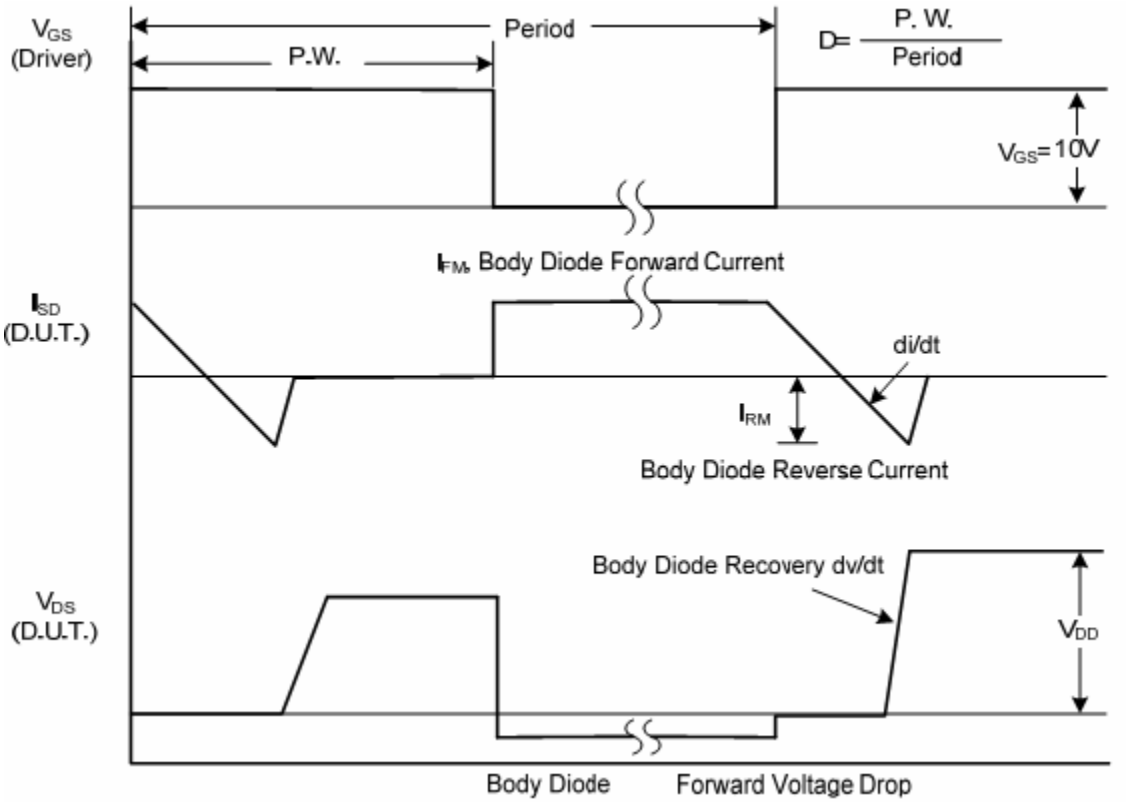
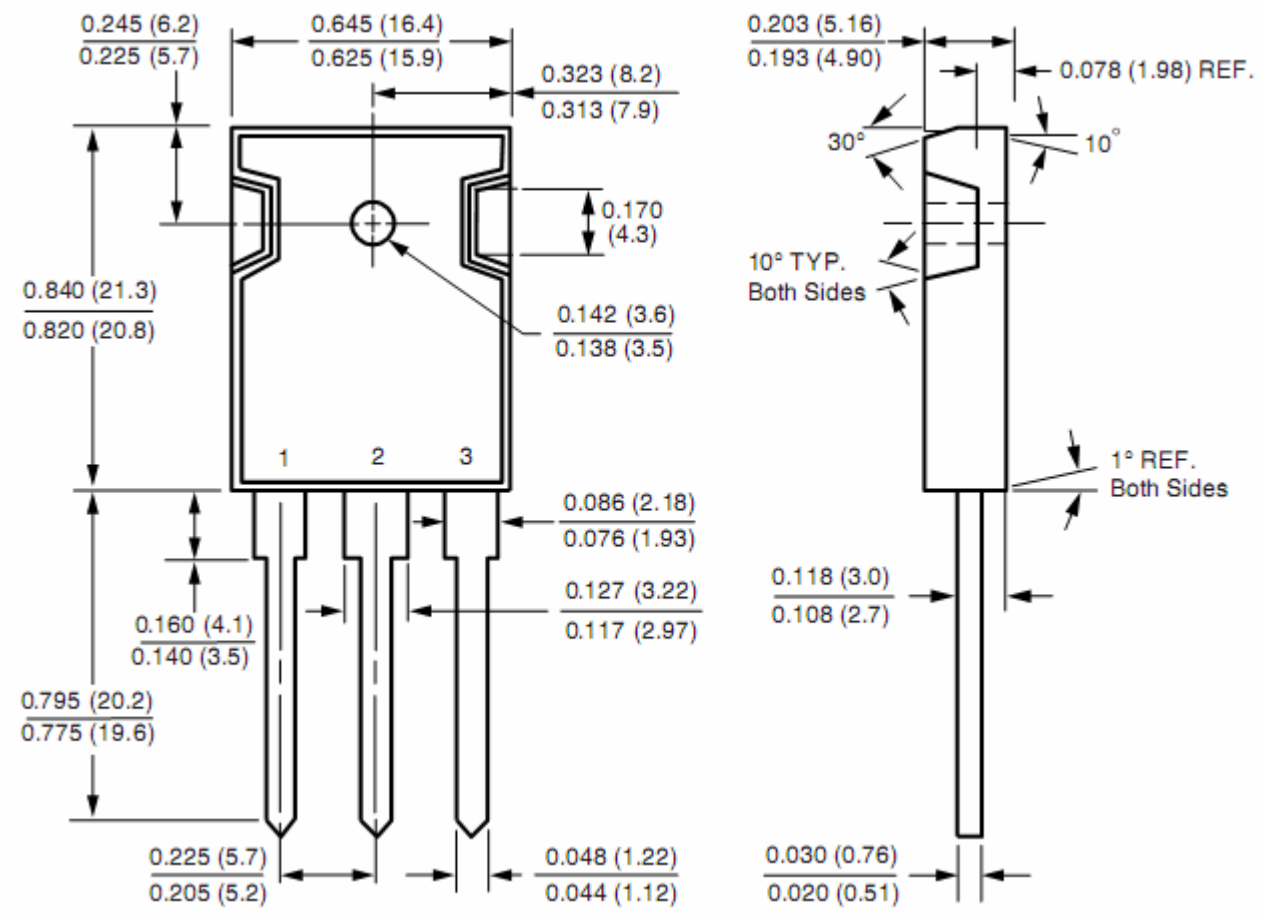


Fig.12- Peak Diode Recovery dv/dt Test Waveform



Dimensions in inch(mm)



TO-3P

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