



PFZ20N50E/PFW20N50E 500V N-Channel MOSFET

FEATURES

- ❑ Originative New Design
- ❑ 100% EAS Test
- ❑ Rugged Gate Oxide Technology
- ❑ Extremely Low Intrinsic Capacitances
- ❑ Remarkable Switching Characteristics
- ❑ Unequalled Gate Charge : 48.5 nC (Typ.)
- ❑ Extended Safe Operating Area
- ❑ Lower $R_{DS(ON)}$: 0.26 Ω (Typ.) @ $V_{GS}=10V$

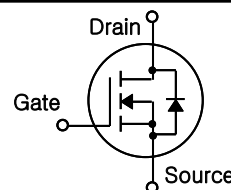
APPLICATION

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

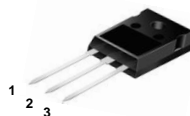
$$BV_{DSS} = 500 \text{ V}$$

$$R_{DS(on) \text{ typ}} = 0.26 \Omega$$

$$I_D = 18 \text{ A}$$

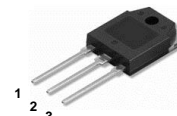


TO-247



1.Gate 2. Drain 3. Source

TO-3P



1.Gate 2. Drain 3. Source

Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	PFZ20N50E	PFW20N50E	Units
V_{DSS}	Drain-Source Voltage	500		V
I_D	Drain Current – Continuous ($T_C = 25^\circ\text{C}$)	18.0	18.0*	A
	Drain Current – Continuous ($T_C = 100^\circ\text{C}$)	11.5	11.5*	A
I_{DM}	Drain Current – Pulsed (Note 1)	72	72*	A
V_{GS}	Gate-Source Voltage	± 30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	950		mJ
I_{AR}	Avalanche Current (Note 1)	18		A
E_{AR}	Repetitive Avalanche Energy (Note 1)	24		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5		V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) – Derate above 25°C	230		W
		1.84		W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300		$^\circ\text{C}$

* Drain current limited by maximum junction temperature

Thermal Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	0.54	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink	0.24	--	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	

Electrical Characteristics $T_C=25\text{ }^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
On Characteristics						
V_{GS}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0	--	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\ \text{V}, I_D = 9.0\ \text{A}$	--	0.26	0.32	Ω

Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\ \text{V}, I_D = 250\ \mu\text{A}$	500	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to $25\text{ }^\circ\text{C}$	--	0.5	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 500\ \text{V}, V_{GS} = 0\ \text{V}$	--	--	10	μA
		$V_{DS} = 400\ \text{V}, T_C = 125\text{ }^\circ\text{C}$	--	--	100	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30\ \text{V}, V_{DS} = 0\ \text{V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\ \text{V}, V_{DS} = 0\ \text{V}$	--	--	-100	nA

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\ \text{V}, V_{GS} = 0\ \text{V},$ $f = 1.0\ \text{MHz}$	--	2015	2620	pF
C_{oss}	Output Capacitance		--	250	325	pF
C_{rss}	Reverse Transfer Capacitance		--	26	35	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Time	$V_{DS} = 250\ \text{V}, I_D = 18.0\ \text{A},$ $R_G = 25\ \Omega$	--	30	60	ns	
t_r	Turn-On Rise Time		--	45	90	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4,5)	--	110	200	ns
t_f	Turn-Off Fall Time			--	45	90	ns
Q_g	Total Gate Charge	$V_{DS} = 400\ \text{V}, I_D = 18.0\ \text{A},$ $V_{GS} = 10\ \text{V}$	--	49	65	nC	
Q_{gs}	Gate-Source Charge		(Note 4,5)	--	10.5	--	nC
Q_{gd}	Gate-Drain Charge			--	20	--	nC

Source-Drain Diode Maximum Ratings and Characteristics

I_S	Continuous Source-Drain Diode Forward Current	--	--	18	A	
I_{SM}	Pulsed Source-Drain Diode Forward Current	--	--	72		
V_{SD}	Source-Drain Diode Forward Voltage	$I_S = 18\ \text{A}, V_{GS} = 0\ \text{V}$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$I_S = 18\ \text{A}, V_{GS} = 0\ \text{V}$ $di_f/dt = 100\ \text{A}/\mu\text{s}$ (Note 4)	--	490	--	ns
Q_{rr}	Reverse Recovery Charge		--	5.8	--	μC

Notes ;

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $I_{AS}=18\text{A}, V_{DD}=50\text{V}, R_G=25\Omega$, Starting $T_J=25\text{ }^\circ\text{C}$
3. $I_{SD}\leq 18\text{A}, di/dt\leq 300\text{A}/\mu\text{s}, V_{DD}\leq BV_{DSS}$, Starting $T_J=25\text{ }^\circ\text{C}$
4. Pulse Test : Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
5. Essentially Independent of Operating Temperature

Typical Characteristics

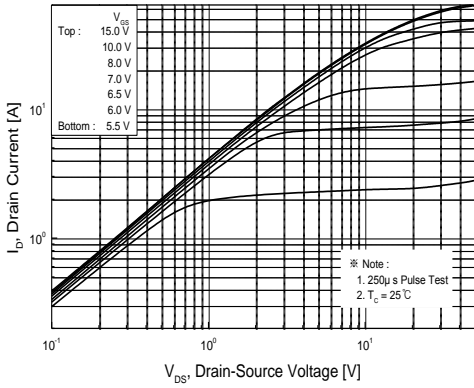


Figure 1. On Region Characteristics

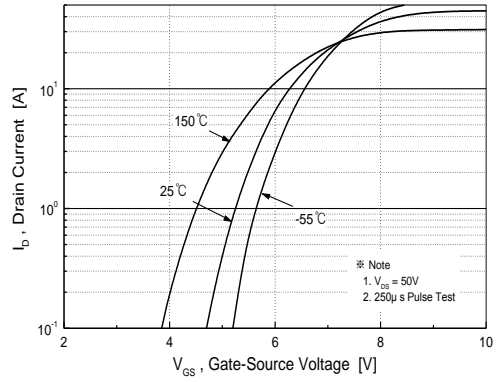


Figure 2. Transfer Characteristics

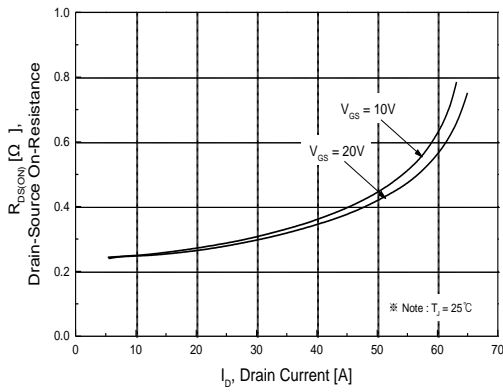


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

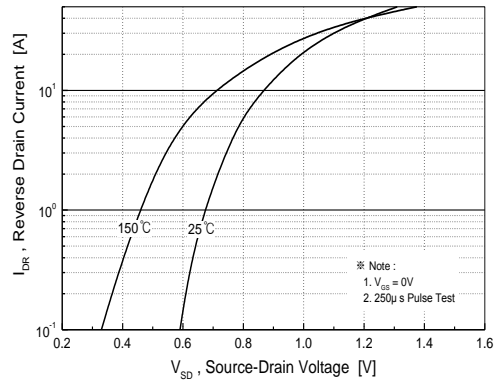


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

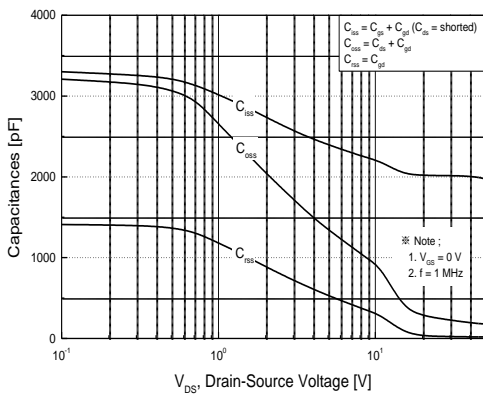


Figure 5. Capacitance Characteristics

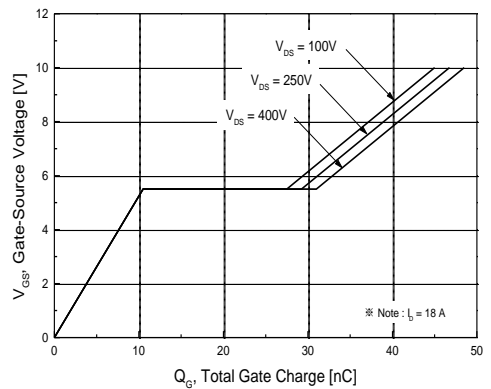


Figure 6. Gate Charge Characteristics

Typical Characteristics (continued)

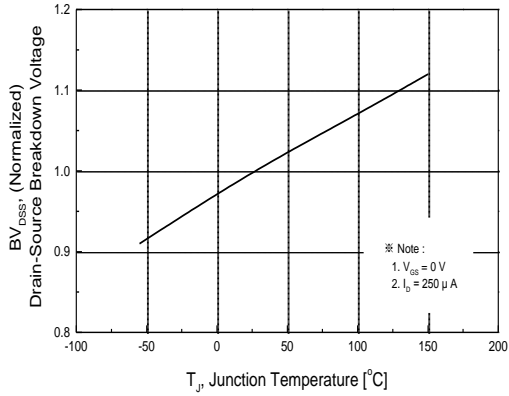


Figure 7. Breakdown Voltage Variation vs Temperature

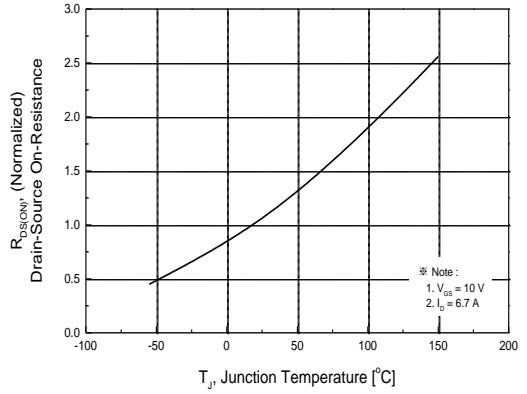


Figure 8. On-Resistance Variation vs Temperature

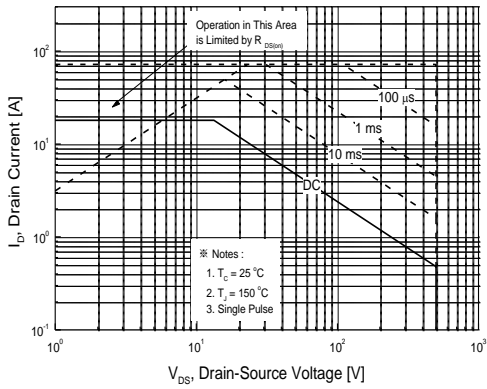


Figure 9. Maximum Safe Operating Area

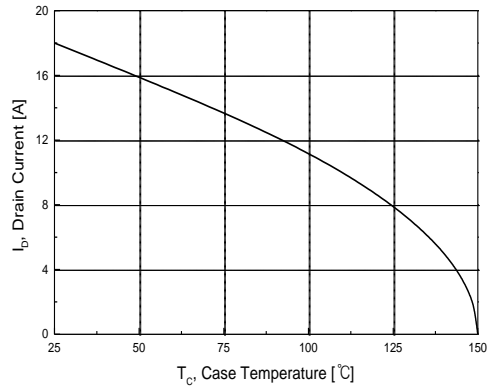


Figure 10. Maximum Drain Current vs Case Temperature

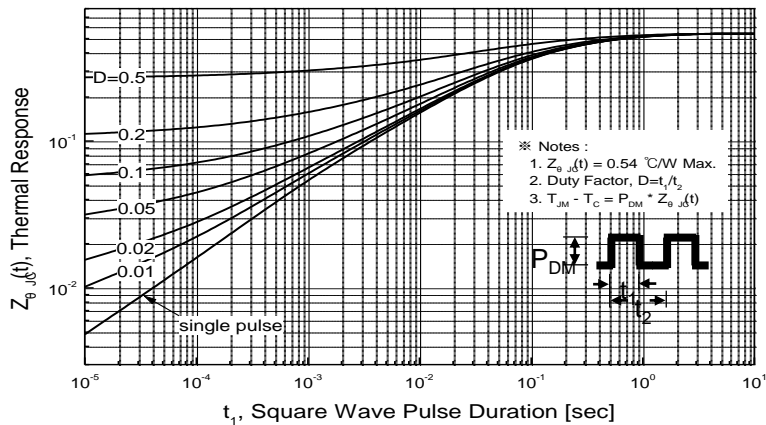


Figure 11. Transient Thermal Response Curve

Characteristics Test Circuit & Waveform

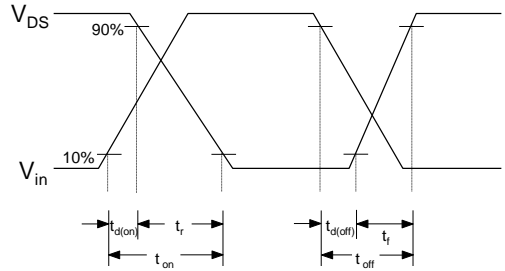
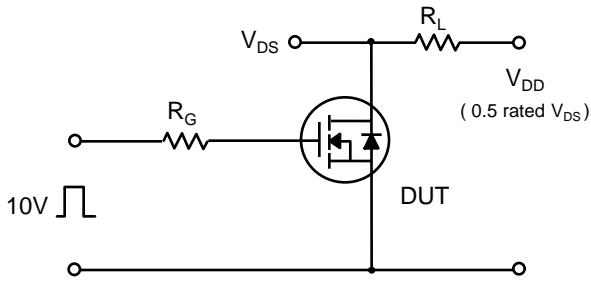


Fig 14. Resistive Switching Test Circuit & Waveforms

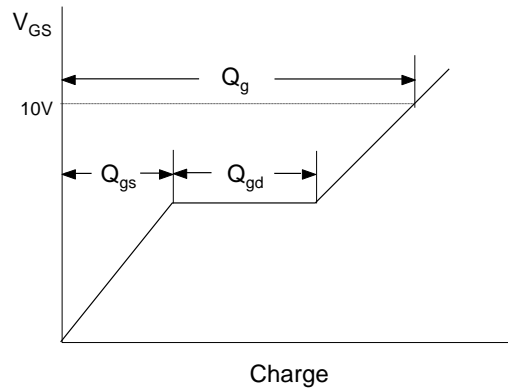
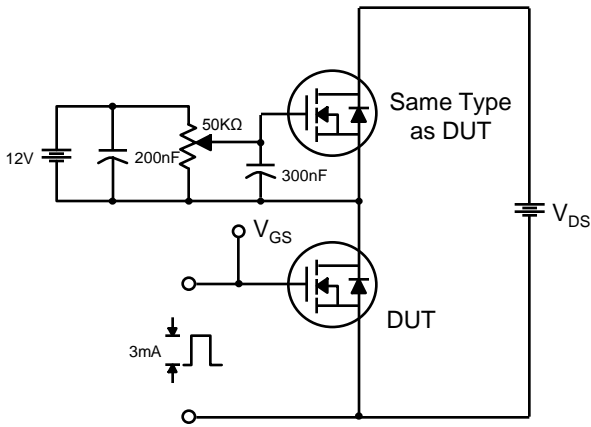


Fig 15. Gate Charge Test Circuit & Waveform

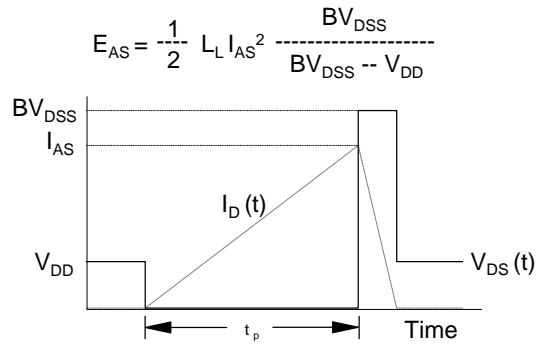
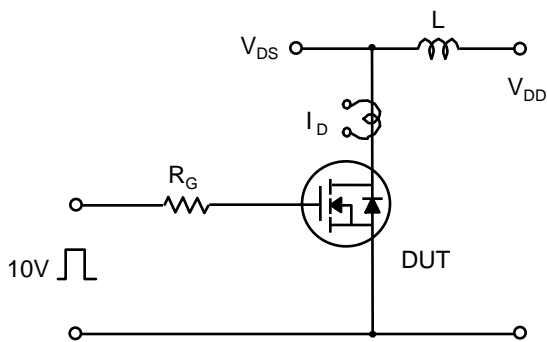


Fig 16. Unclamped Inductive Switching Test Circuit & Waveforms

Characteristics Test Circuit & Waveform (continued)

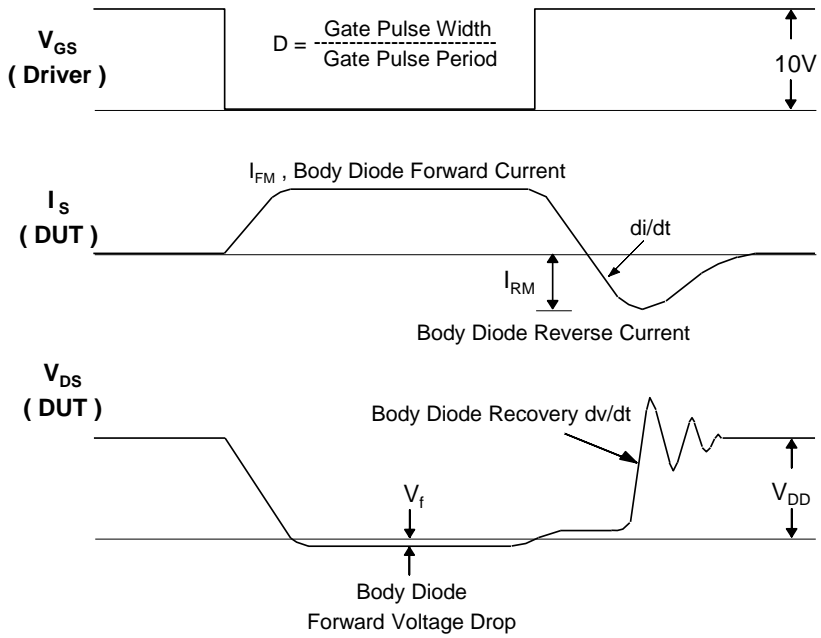
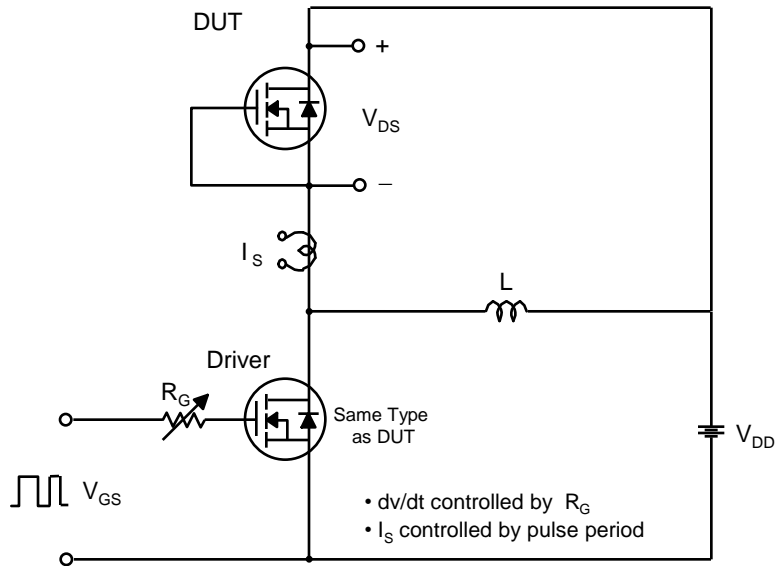
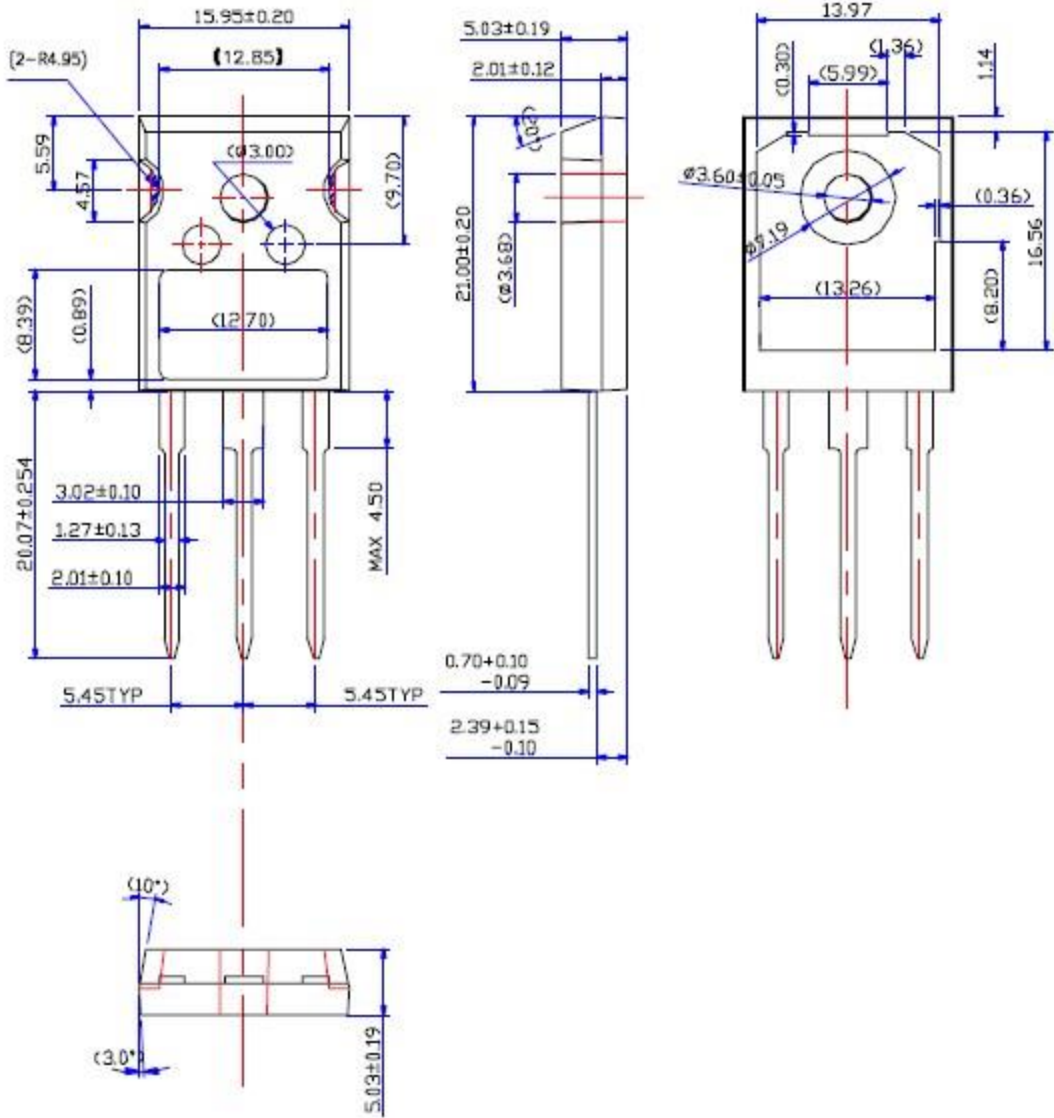


Fig 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Package Dimension

TO-247



Package Dimension

TO-3P

