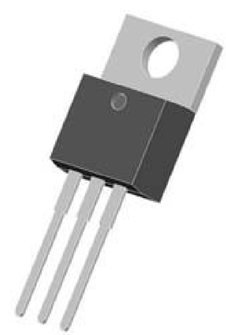
KSM90N10V2/KSMF90N10V2

100V N-Channel MOSFET

TO-220



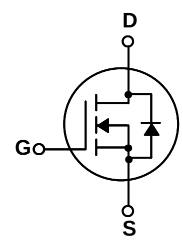
TO-220F

Features

- 90 A, 100V, $R_{DS(on)}$ = 0.01Ω @V_{GS} = 10 V
- Low gate charge (typical 147 nC)
- Low Crss (typical 300 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

General Description

These N-Channel enhancement mode power field effect transistors are produced using Kersemi proprietary, planar stripe, DMOS technology.
This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for DC to DC converters, sychronous rectification, and other applications lowest Rds(on) is required.



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter		KSM90N10V2	KSMF90N10V2	Units
V_{DSS}	Drain-Source Voltage		100		V
I_D	Drain Current - Continuous (T_C = 25°C)		90	90 *	A
	- Continuous (T_C = 100°C)		68	68 *	A
I_{DM}	Drain Current - Pulsed	(Note 1)	360	360 *	A
V_{GSS}	Gate-Source Voltage		± 30		V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	2430		mJ
I_{AR}	Avalanche Current	(Note 1)	90		A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	25		mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5		V/ns
P_D	Power Dissipation (T_C = 25°C)		250	83	W
	- Derate above 25°C		1.67	0.55	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175		°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 Characteristics

Symbol	Parameter	KSM90N10V2	KSMF90N10V2	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.6	1.8	°C/W
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	°C/W

Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	100	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	--	0.1	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 100 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 80 V, T_C = 150°C	--	--	10	μA
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
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 45 A	--	8.5	10	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 45 A (Note 4)	--	72	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	4730	6150	pF
C_{oss}	Output Capacitance		--	1180	1530	pF
C_{rss}	Reverse Transfer Capacitance		--	300	390	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 50 V, I_D = 90 A, R_G = 25 Ω (Note 4, 5)	--	52	114	ns
t_r	Turn-On Rise Time		--	492	994	ns
$t_{d(off)}$	Turn-Off Delay Time		--	304	618	ns
t_f	Turn-Off Fall Time		--	355	720	ns
Q_g	Total Gate Charge	V_{DS} = 80 V, I_D = 90 A, V_{GS} = 10 V (Note 4, 5)	--	147	191	nC
Q_{gs}	Gate-Source Charge		--	28	--	nC
Q_{gd}	Gate-Drain Charge		--	60	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	90	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	360	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 90 A	--	--	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 90 A, dI_F / dt = 100 A/μs (Note 4)	--	114	--	ns
Q_{rr}	Reverse Recovery Charge		--	0.54	--	μC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 0.3mH, I_{AS} = 90A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
3. $I_{SD} \leq$ 90A, di/dt $\leq$ 200A/μs, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25°C
4. Pulse Test : Pulse width $\leq$ 300μs, Duty cycle $\leq$ 2%
5. Essentially independent of operating temperature

Typical Characteristics

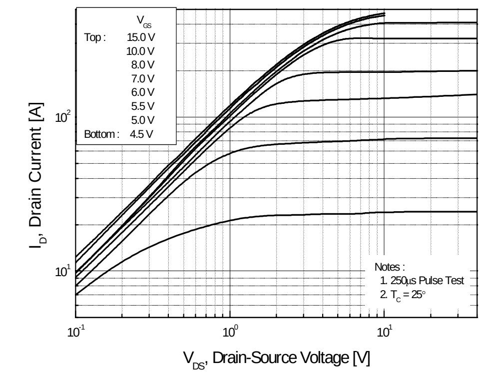


Figure 1. On-Region Characteristics

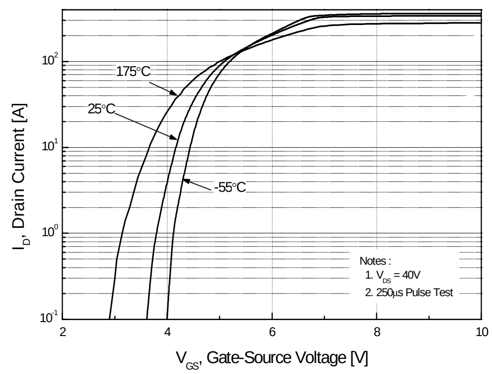


Figure 2. Transfer Characteristics

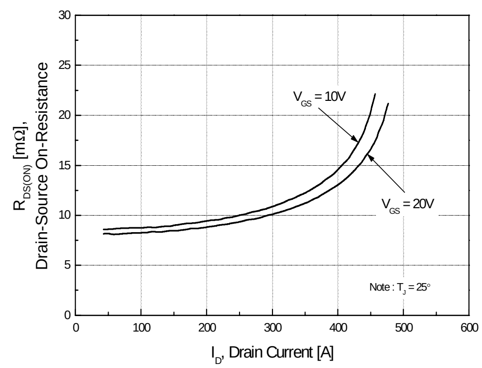


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

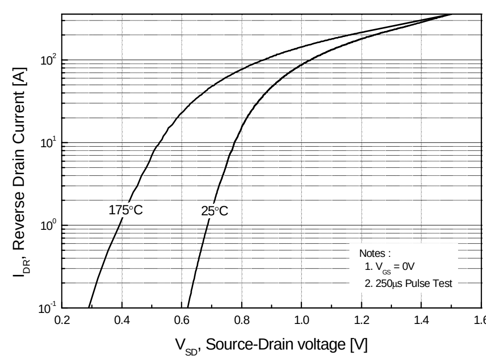


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

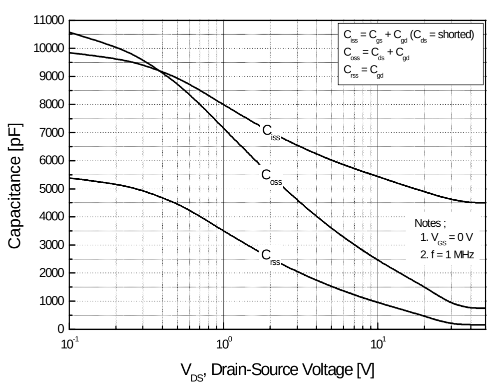


Figure 5. Capacitance Characteristics

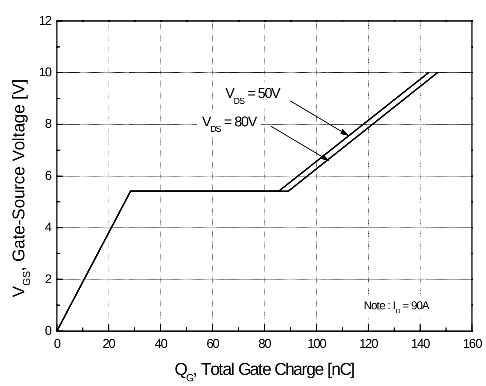


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

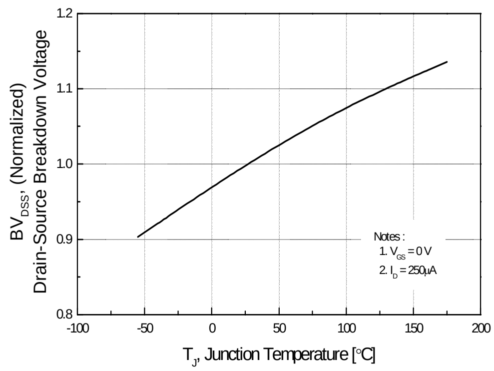


Figure 7. Breakdown Voltage Variation vs Temperature

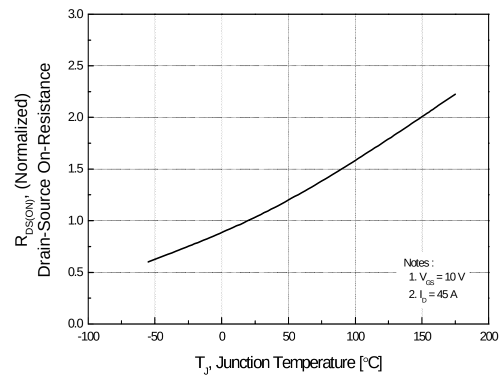


Figure 8. On-Resistance Variation vs Temperature

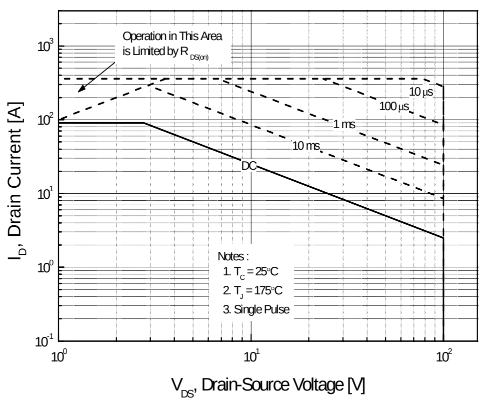


Figure 9-1. Maximum Safe Operating Area for FQP90N10V2

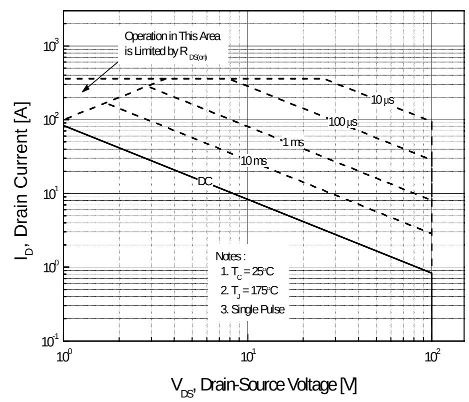


Figure 9-2. Maximum Safe Operating Area for FQPF90N10V2

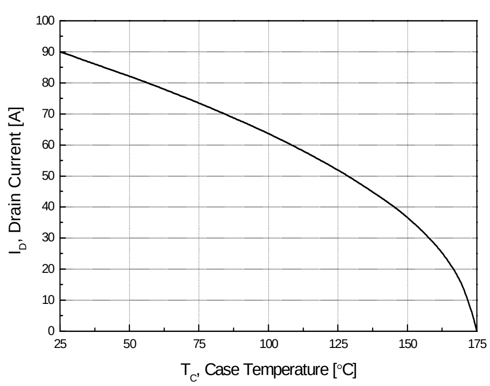


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (Continued)

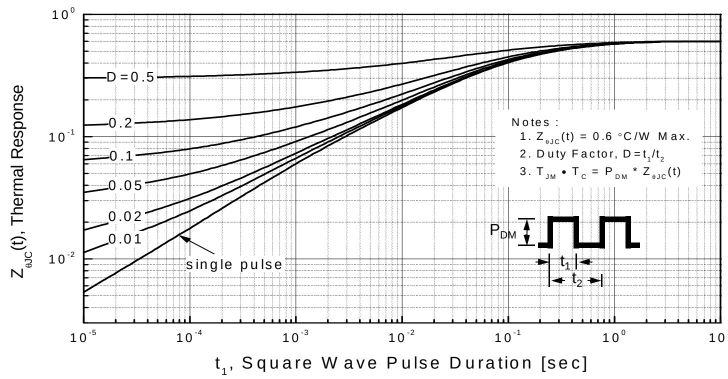


Figure 11-1. Transient Thermal Response Curve for FQP90N10V2

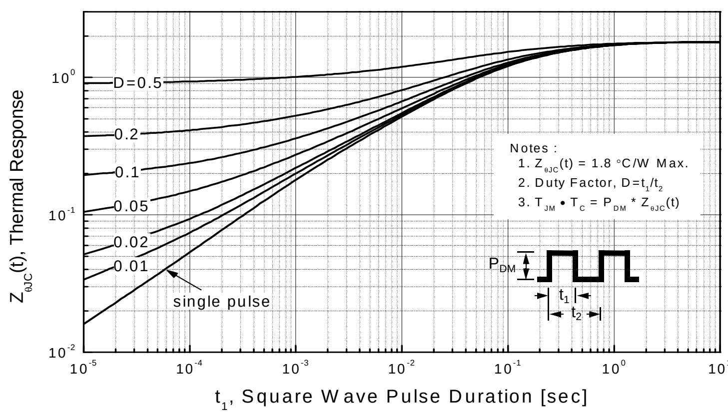
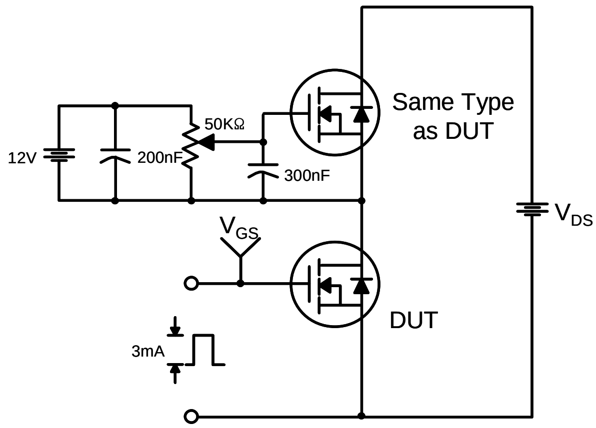
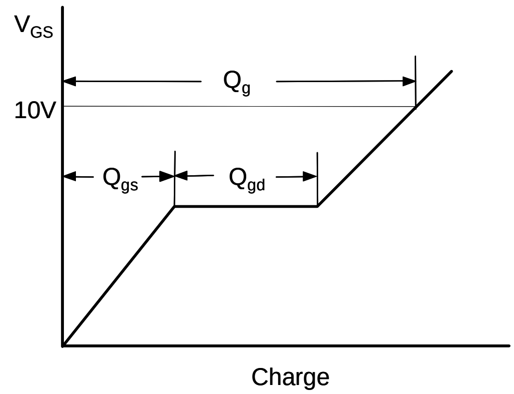


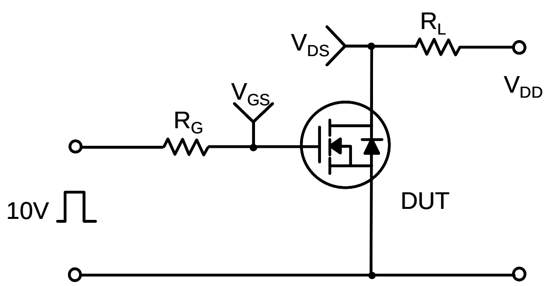
Figure 11-2. Transient Thermal Response Curve for FQPF90N10V2

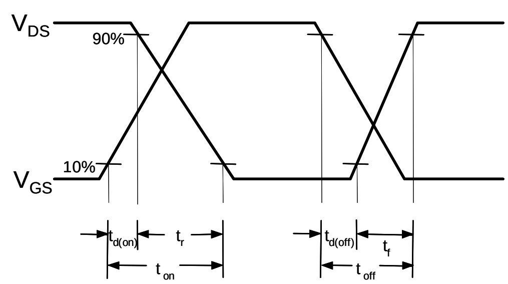
Gate Charge Test Circuit & Waveform



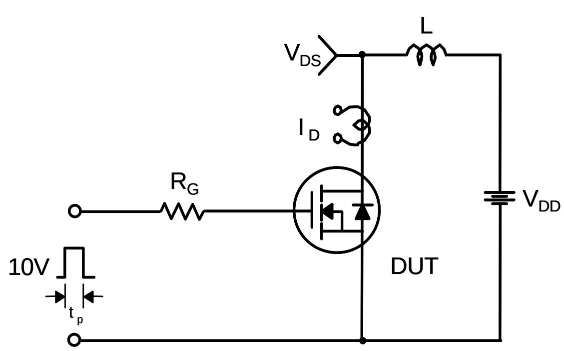


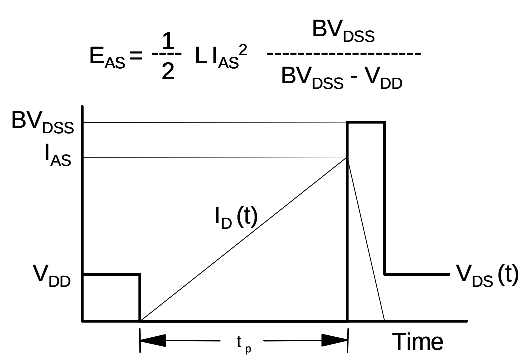
Resistive Switching Test Circuit & Waveforms



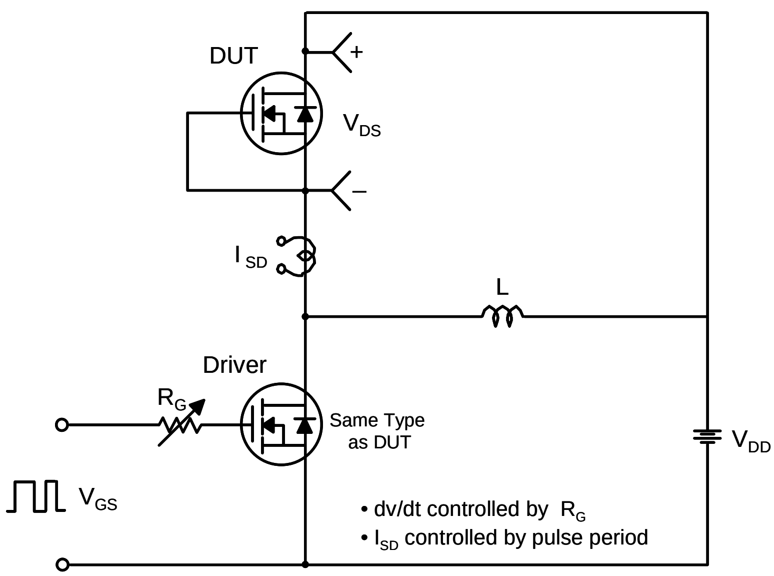


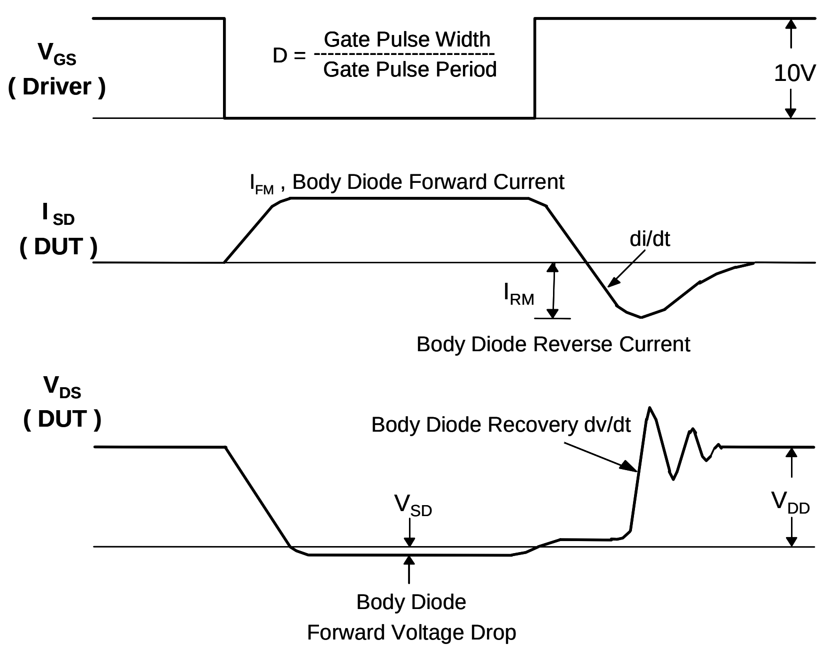
Unclamped Inductive Switching Test Circuit & Waveforms





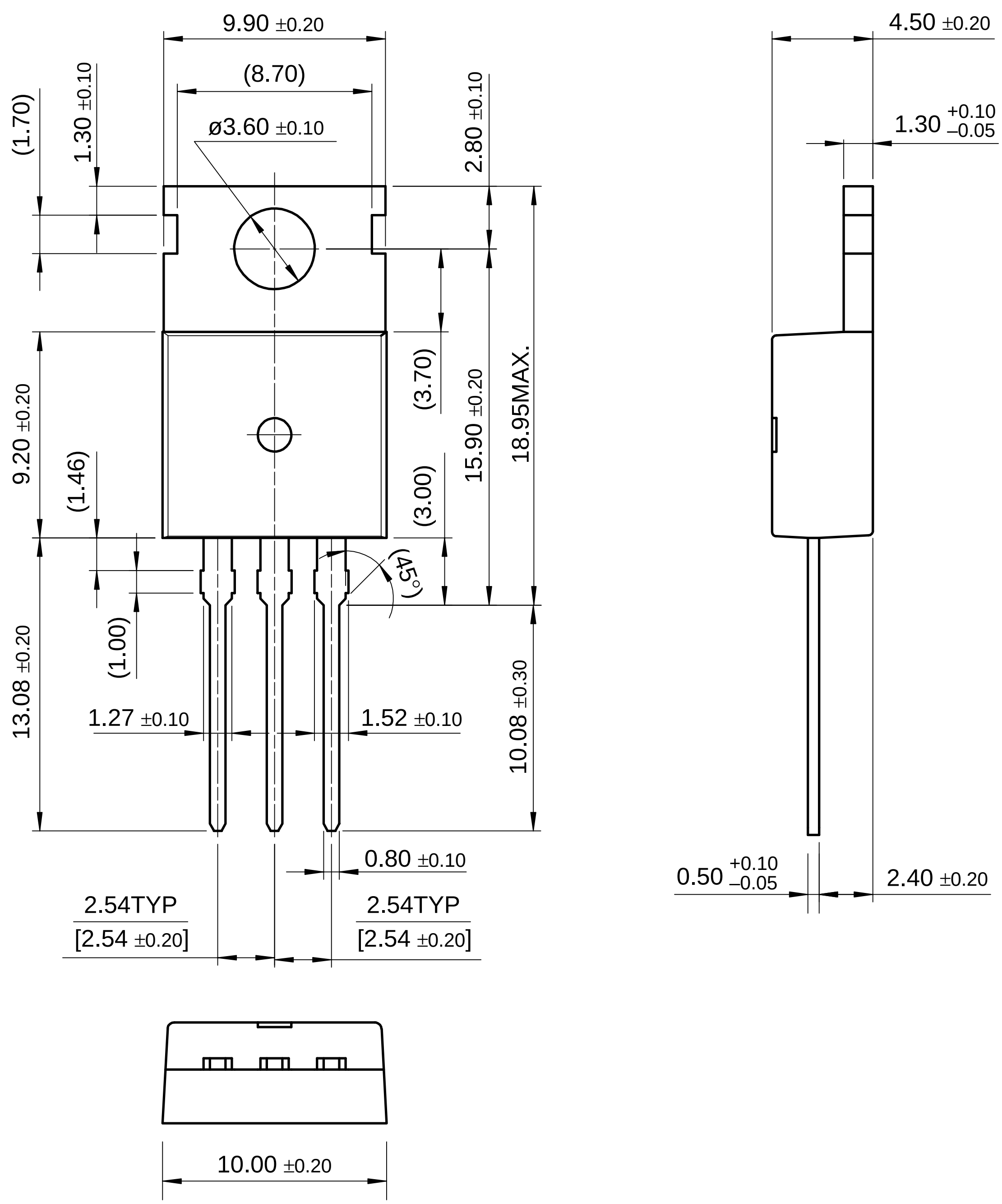
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Package Dimensions

TO-220



Package Dimensions (Continued)

TO-220F