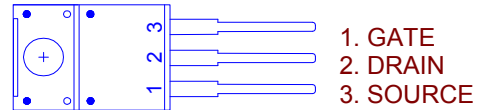
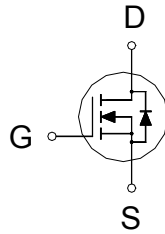


**NIKO-SEM****N-Channel Enhancement Mode  
Field Effect Transistor****P1060ATF:TO-220F****P1060ATFS:TO-220FS****Halogen-Free & Lead-Free****PRODUCT SUMMARY**

$V_{(BR)DSS}$	$R_{DS(ON)}$	$I_D$
600V	0.75Ω	10A



1. GATE
2. DRAIN
3. SOURCE

**100% UIS tested****ABSOLUTE MAXIMUM RATINGS ( $T_C = 25\text{ °C}$  Unless Otherwise Noted)**

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS	UNITS
Drain-Source Voltage		$V_{DS}$	600	V
Gate-Source Voltage		$V_{GS}$	±30	
Continuous Drain Current <sup>2</sup>	$T_C = 25\text{ °C}$	$I_D$	10	A
	$T_C = 100\text{ °C}$		6	
Pulsed Drain Current <sup>1, 2</sup>		$I_{DM}$	40	
Avalanche Current <sup>3</sup>		$I_{AS}$	6.8	
Avalanche Energy <sup>3</sup>	L = 10mH	$E_{AS}$	236	mJ
Power Dissipation	$T_C = 25\text{ °C}$	$P_D$	44	W
	$T_C = 100\text{ °C}$		17	
Operating Junction & Storage Temperature Range		$T_J, T_{stg}$	-55 to 150	°C
Lead Temperature ( <sup>1</sup> / <sub>16</sub> " from case for 10 sec.)		$T_L$	275	

**THERMAL RESISTANCE RATINGS**

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNITS
Junction-to-Case	$R_{\theta JC}$		2.8	°C / W
Junction-to-Ambient	$R_{\theta JA}$		62.5	

<sup>1</sup>Pulse width limited by maximum junction temperature.<sup>2</sup>Limited only by maximum temperature allowed<sup>3</sup> $V_{DD} = 60V$ , starting  $T_J = 25\text{ °C}$ **ELECTRICAL CHARACTERISTICS ( $T_C = 25\text{ °C}$ , Unless Otherwise Noted)**

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
<b>STATIC</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	600			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.5		4.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0V, V_{GS} = \pm 30V$			±250	nA

REV 1.0

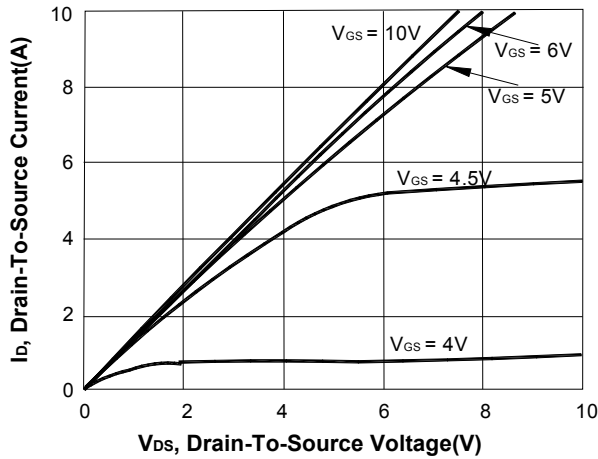
Apr-16-2010

**NIKO-SEM****N-Channel Enhancement Mode  
Field Effect Transistor****P1060ATF:TO-220F  
P1060ATFS:TO-220FS****Halogen-Free & Lead-Free**

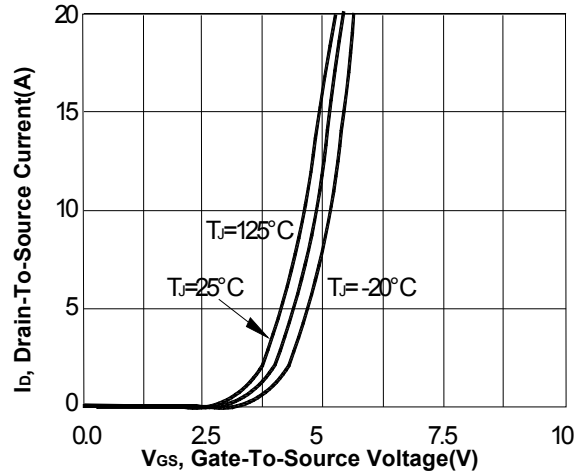
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 600V, V_{GS} = 0V, T_C = 25\text{ }^\circ\text{C}$			25	$\mu\text{A}$
		$V_{DS} = 600V, V_{GS} = 0V, T_C = 100\text{ }^\circ\text{C}$			250	
On-State Drain Current <sup>1</sup>	$I_{D(ON)}$	$V_{DS} = 10V, V_{GS} = 10V$	40			A
Drain-Source On-State Resistance <sup>1</sup>	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 5A$		0.6	0.75	$\Omega$
Forward Transconductance <sup>1</sup>	$g_{fs}$	$V_{DS} = 10V, I_D = 5A$		9.4		S
<b>DYNAMIC</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0V, V_{DS} = 25V, f = 1\text{MHz}$		2120		pF
Output Capacitance	$C_{oss}$			240		
Reverse Transfer Capacitance	$C_{rss}$			38		
Total Gate Charge <sup>2</sup>	$Q_g$	$V_{DD} = 300V, I_D = 6A, V_{GS} = 10V$		37		nC
Gate-Source Charge <sup>2</sup>	$Q_{gs}$			10		
Gate-Drain Charge <sup>2</sup>	$Q_{gd}$			11.7		
Turn-On Delay Time <sup>2</sup>	$t_{d(on)}$	$V_{DD} = 300V, I_D = 6A, R_G = 25\Omega$		55		nS
Rise Time <sup>2</sup>	$t_r$			30		
Turn-Off Delay Time <sup>2</sup>	$t_{d(off)}$			210		
Fall Time <sup>2</sup>	$t_f$			40		
<b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (<math>T_C = 25\text{ }^\circ\text{C}</math>)</b>						
Continuous Current <sup>3</sup>	$I_S$				10	A
Forward Voltage <sup>1</sup>	$V_{SD}$	$I_F = 10A, V_{GS} = 0V$			1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 10A, di_F/dt = 100A / \mu\text{S}$		490		nS
Reverse Recovery Charge	$Q_{rr}$	$V_{GS} = 0V$		4.2		nC

<sup>1</sup>Pulse test : Pulse Width  $\leq 300\text{ }\mu\text{sec}$ , Duty Cycle  $\leq 2\%$ .<sup>2</sup>Independent of operating temperature.<sup>3</sup>Pulse width limited by maximum junction temperature.**REMARK: THE PRODUCT MARKED WITH "P1060ATF(S)", DATE CODE or LOT #**

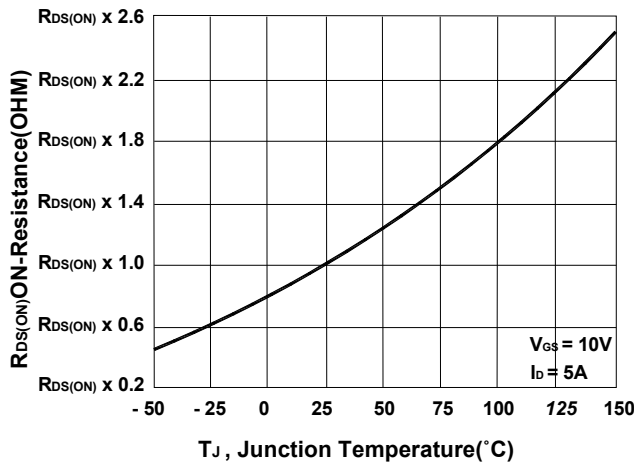
**Output Characteristics**



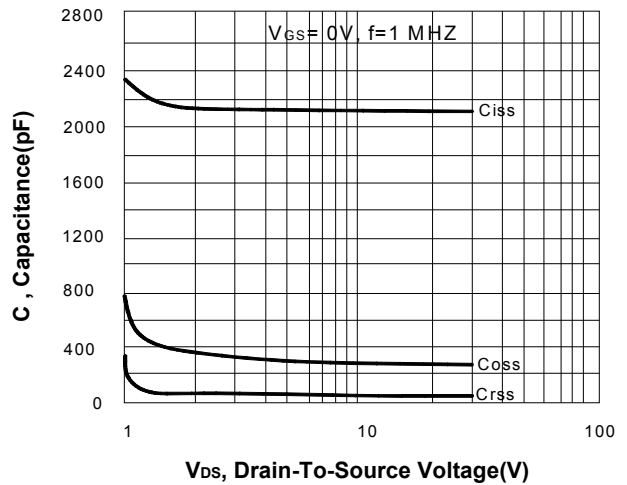
**Transfer Characteristics**



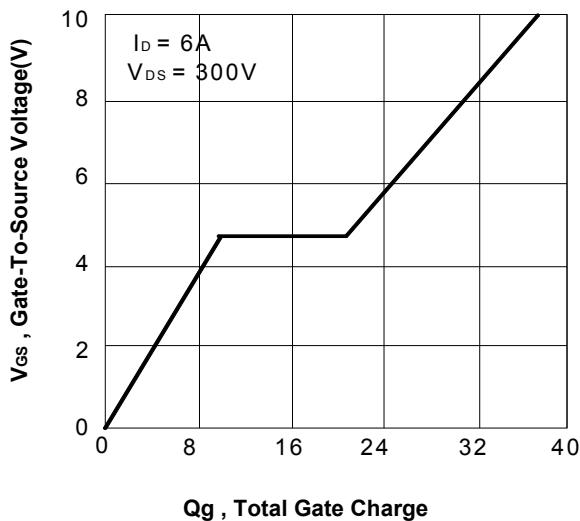
**On-Resistance VS Temperature**



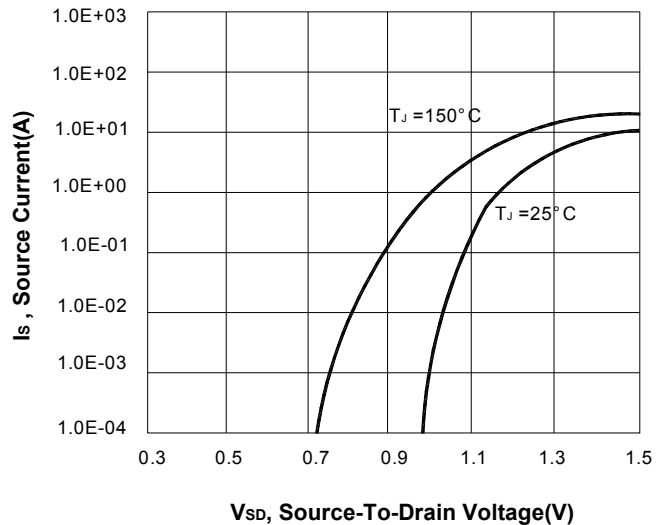
**Capacitance Characteristic**



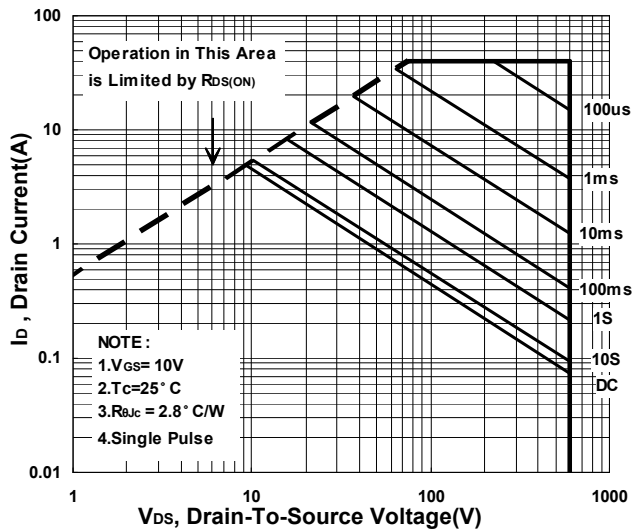
**Gate charge Characteristics**



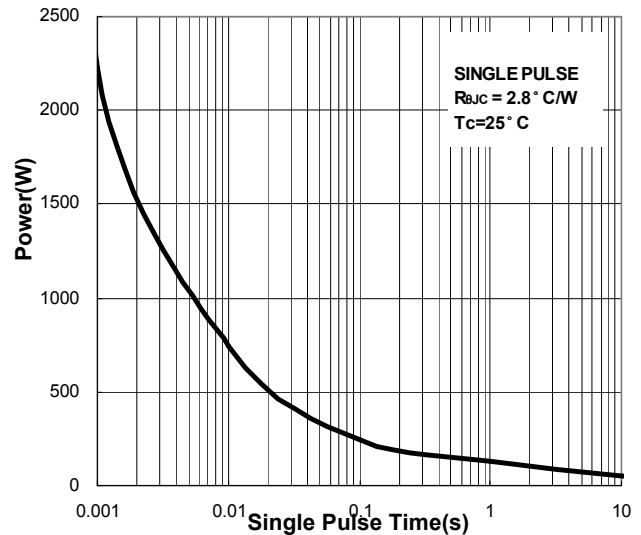
**Source-Drain Diode Forward Voltage**



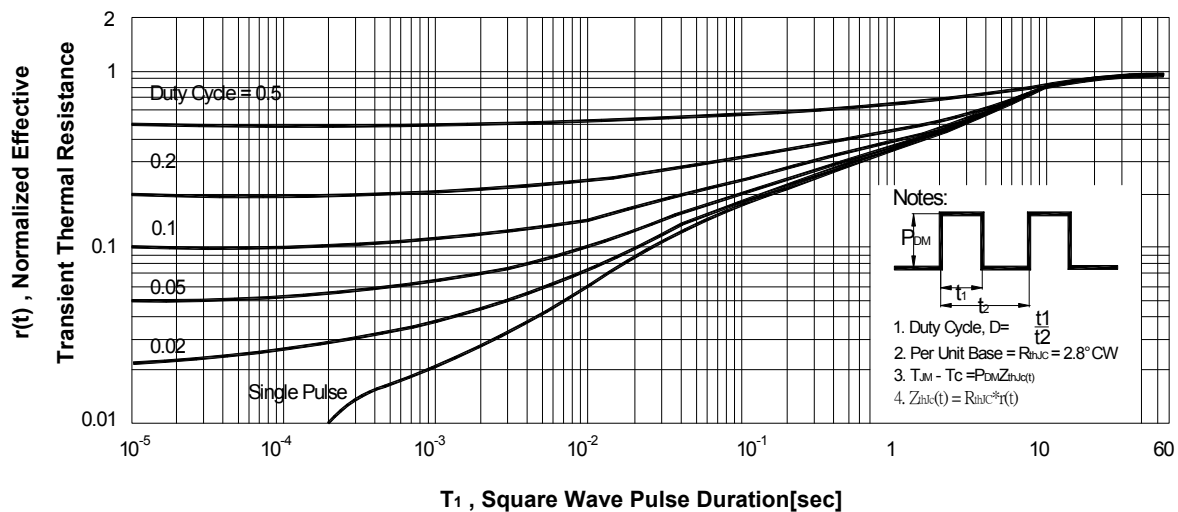
**Safe Operating Area**



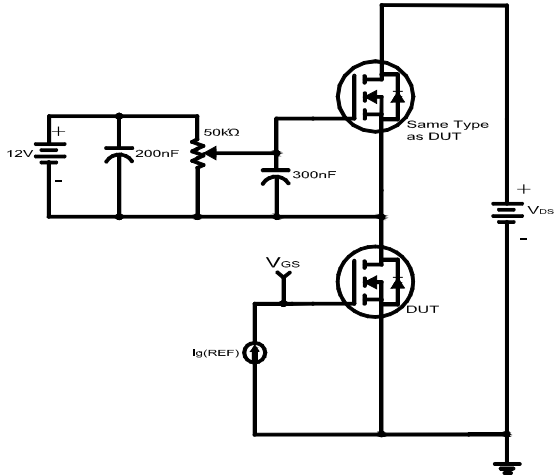
**Single Pulse Maximum Power Dissipation**



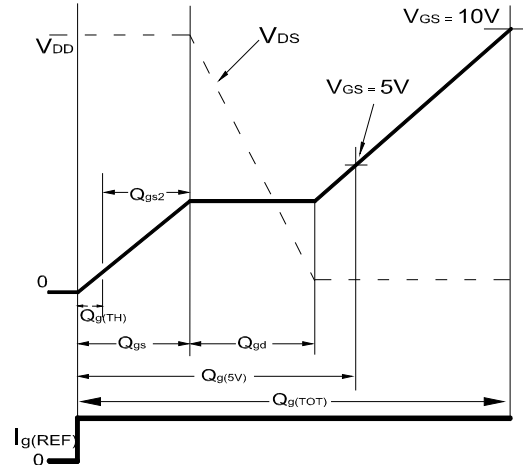
**Transient Thermal Response Curve**



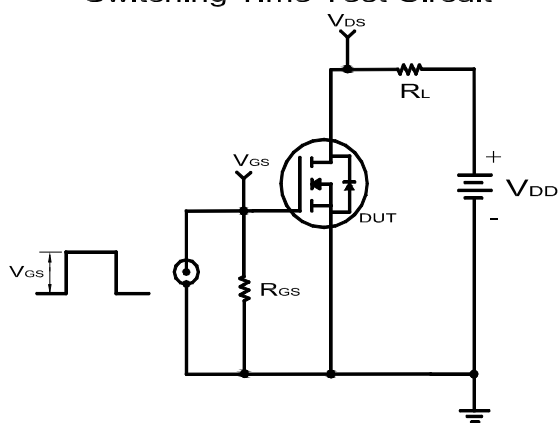
**Figure 1**  
Gate Charge Test Circuit



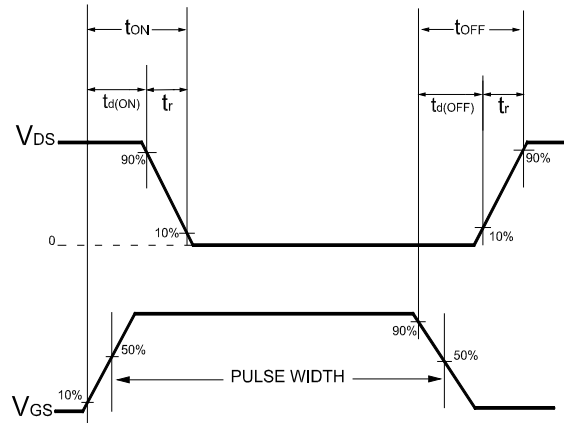
**Figure 2**  
Gate Charge Waveforms



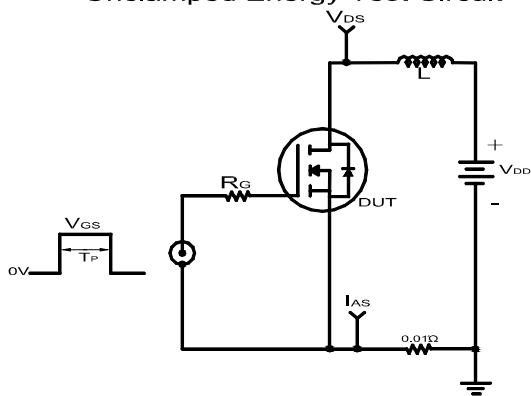
**Figure 3**  
Switching Time Test Circuit



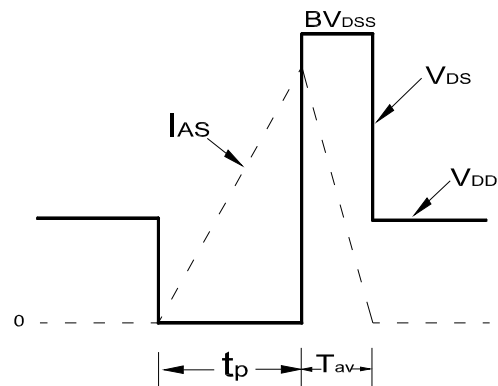
**Figure 4**  
Switching Time Waveforms



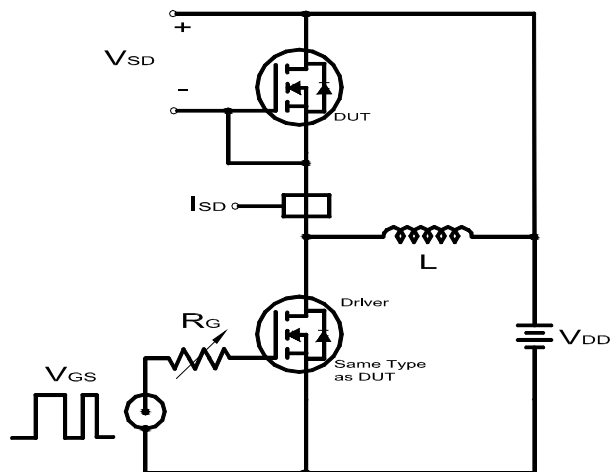
**Figure 5**  
Unclamped Energy Test Circuit



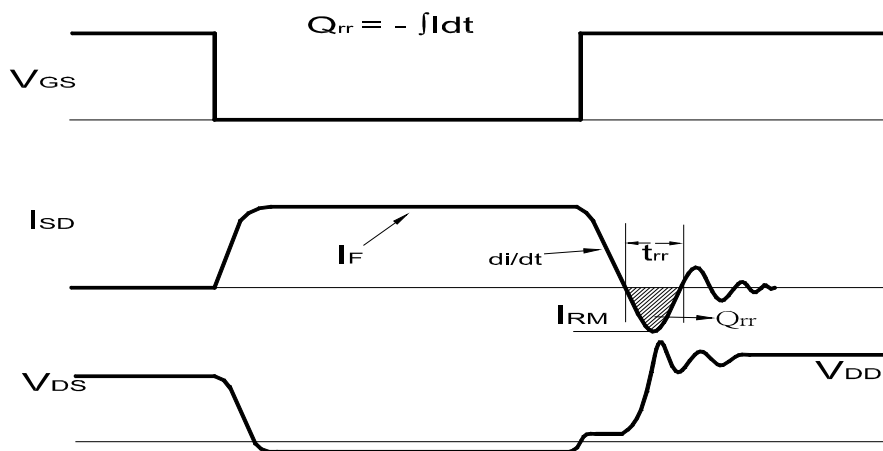
**Figure 6**  
Unclamped Energy Waveforms



**Figure 7**  
**Diode Recovery Test Circuit**

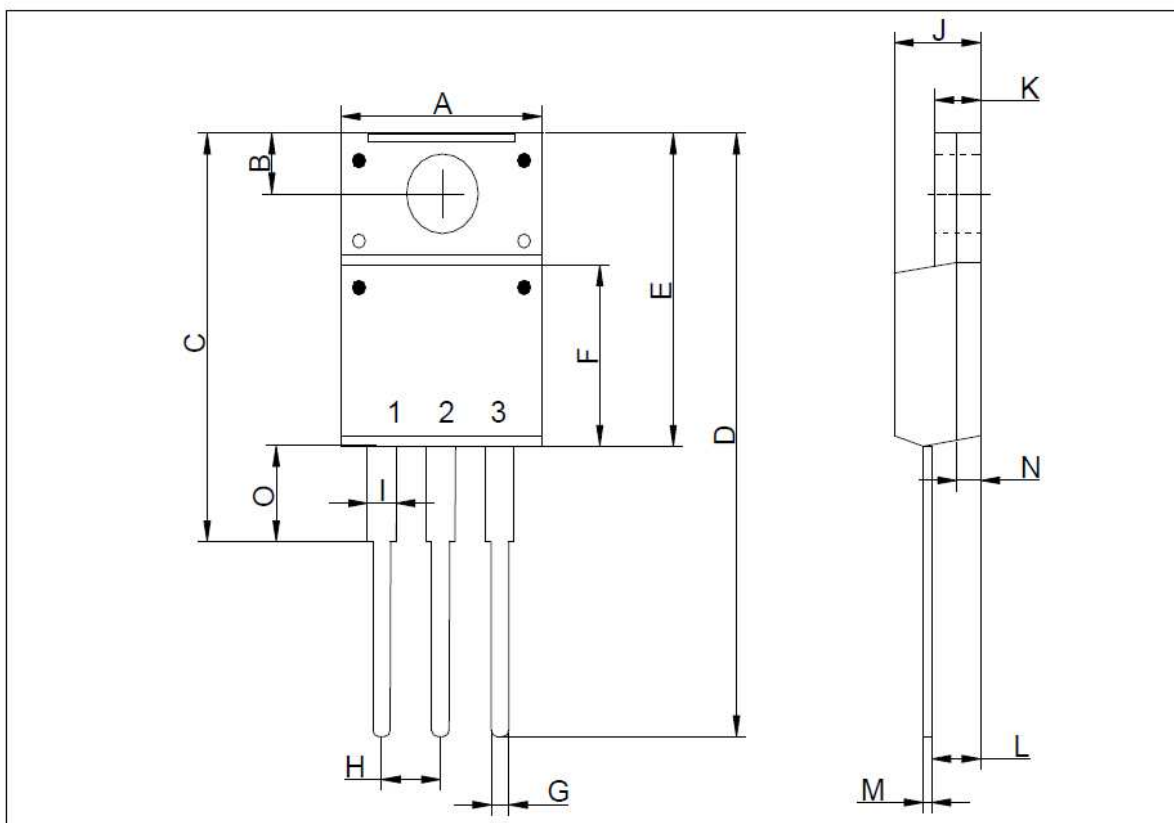


**Figure 8**  
**Diode Recovery Test Waveforms**



**TO-220F (3-Lead) MECHANICAL DATA**

Dimension	mm			Dimension	mm		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	9.96	10.0	10.6	I	0.95	1.2	1.39
B	2.4	3.0	3.38	J	4.3	4.5	4.93
C	18.1	19.1	19.7	K	2.34		2.74
D	27.3	28.4	30	L	2.56		2.96
E	15.67		16.1	M	0.45		0.6
F	8.8	9.17	9.8	N		0.7	
G	0.5	0.75	0.91	O	2.8		3.4
H	2.3		2.74				



**TO-220FS (3-Lead) MECHANICAL DATA**

Dimension	mm			Dimension	mm		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	9.96		10.36	I	1.15		1.39
B	3.1		3.5	J	4.53		4.93
C	17.55		18.95	K	2.34		2.74
D	28.04		28.84	L	2.56		2.96
E	15.67		16.07	M	0.45		0.60
F		9.17		N		0.7	
G	0.71		0.91	O	2.23		2.63
H		2.54					

