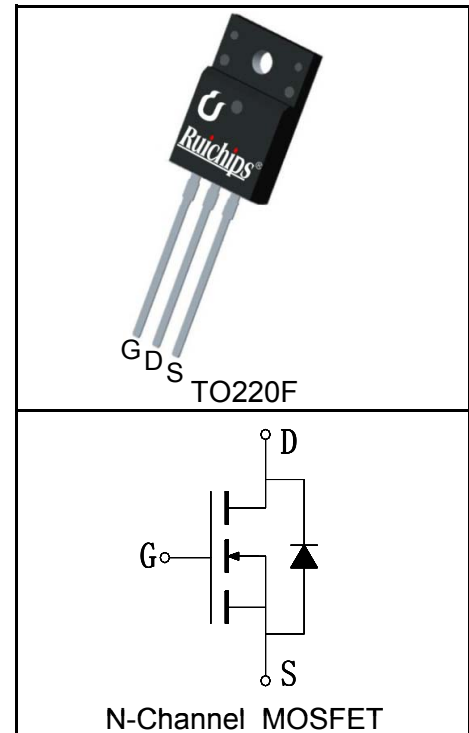


### Features

- 650V/4A,  
 $R_{DS(ON)} = 2200m\Omega(Typ.)@V_{GS}=10V$
- Low Reverse Transfer
- Ultra Low Gate Charge
- 100% avalanche tested
- Lead Free and Green Devices Available (RoHS Compliant)



### Pin Description



### Applications

- AC/DC Power Conversion in Switched Mode Power Supplies (SMPS)
- Adapter
- PWM Motor Controls

### Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
<b>Common Ratings</b> ( $T_C=25^\circ C$ Unless Otherwise Noted)			
$V_{DSS}$	Drain-Source Voltage	650	V
$V_{GSS}$	Gate-Source Voltage	$\pm 30$	
$T_J$	Maximum Junction Temperature	150	$^\circ C$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$I_S$	Diode Continuous Forward Current	$T_C=25^\circ C$ 4	A
<b>Mounted on Large Heat Sink</b>			
$I_{DP}^{①}$	300 $\mu s$ Pulse Drain Current Tested	$T_C=25^\circ C$ 16	A
$I_D^{②}$	Continuous Drain Current( $V_{GS}=10V$ )	$T_C=25^\circ C$ 4	A
		$T_C=100^\circ C$ 2.5	
$P_D$	Maximum Power Dissipation	$T_C=25^\circ C$ 30	W
		$T_C=100^\circ C$ 12	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	4.2	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	62.5	$^\circ C/W$
<b>Drain-Source Avalanche Ratings</b>			
$E_{AS}^{③}$	Avalanche Energy, Single Pulsed	100	mJ

**Electrical Characteristics** ( $T_C=25^\circ\text{C}$  Unless Otherwise Noted)

Symbol	Parameter	Test Condition	RU4N65P			Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	650			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=650V, V_{GS}=0V$			1	$\mu A$
		$T_J=125^\circ C$			30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	2		4	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 30V, V_{DS}=0V$			$\pm 100$	nA
$R_{DS(ON)}^{(4)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=1A$		2200	2600	m $\Omega$
<b>Diode Characteristics</b>						
$V_{SD}^{(4)}$	Diode Forward Voltage	$I_{SD}=4A, V_{GS}=0V$			1.2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD}=4A, di_{SD}/dt=100A/\mu s$		250		ns
$Q_{rr}$	Reverse Recovery Charge			1.4		$\mu C$
<b>Dynamic Characteristics</b> <sup>(5)</sup>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$		2.1		$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=300V,$ Frequency=1.0MHz		560		pF
$C_{oss}$	Output Capacitance			70		
$C_{riss}$	Reverse Transfer Capacitance			8		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=300V, R_L=100\Omega,$ $I_{DS}=4A, V_{GEN}=10V,$ $R_G=25\Omega$		19		ns
$t_r$	Turn-on Rise Time			48		
$t_{d(OFF)}$	Turn-off Delay Time			26		
$t_f$	Turn-off Fall Time			43		
<b>Gate Charge Characteristics</b> <sup>(5)</sup>						
$Q_g$	Total Gate Charge	$V_{DS}=520V, V_{GS}=10V,$ $I_{DS}=4A$		17		nC
$Q_{gs}$	Gate-Source Charge			3.5		
$Q_{gd}$	Gate-Drain Charge			7		

- Notes:
- ① Pulse width limited by safe operating area.
  - ② Calculated continuous current based on maximum allowable junction temperature.
  - ③ Limited by  $T_{Jmax}, I_{AS}=4.5A, V_{DD}=100V, R_G=50\Omega$ , Starting  $T_J=25^\circ C$ .
  - ④ Pulse test; Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
  - ⑤ Guaranteed by design, not subject to production testing.

**Ordering and Marking Information**

Device	Marking	Package	Packaging	Quantity	Reel Size	Tape width
RU4N65P	RU4N65P	TO220F	Tube	50	-	-



① The following characters could be different and means:

1<sup>st</sup> line : Ruichips Company Logo

2<sup>nd</sup> line : Part Number ( RU4N65P )

3<sup>rd</sup> line: Date code ( LLL LXYWW )

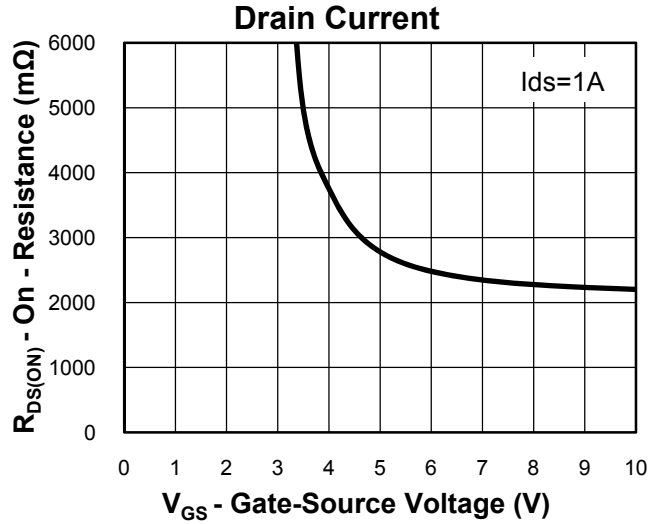
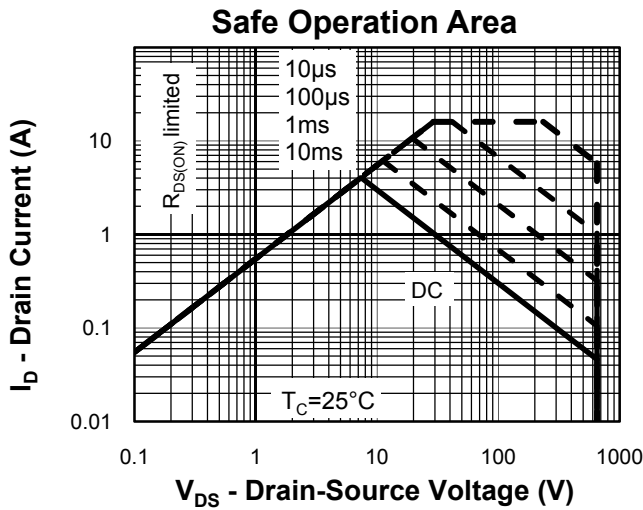
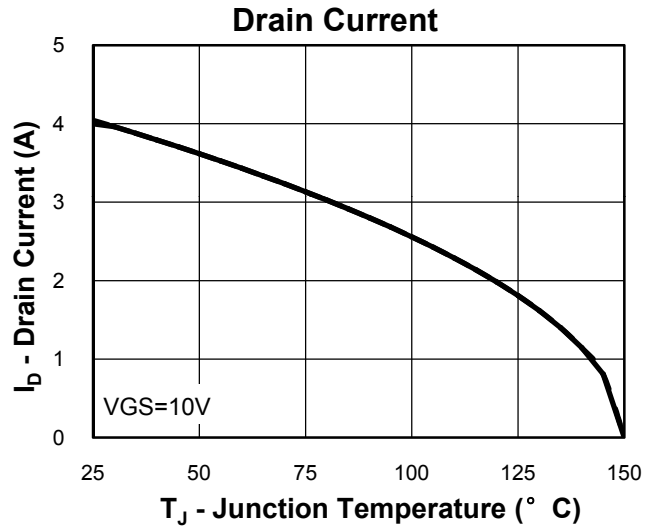
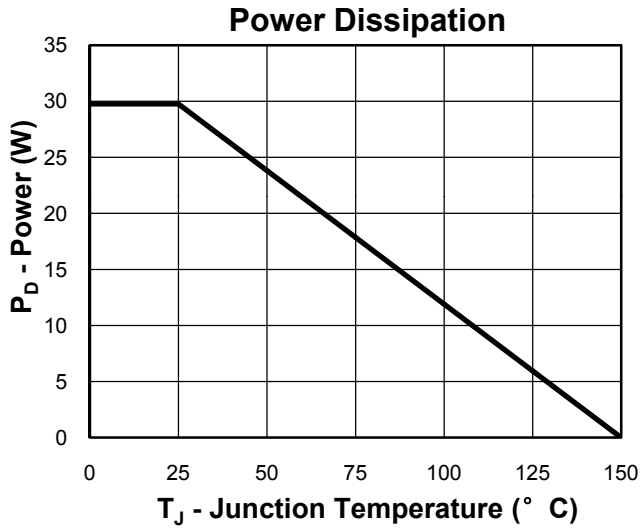
LLL L =Wafer Lot Number

X =Assembly site code

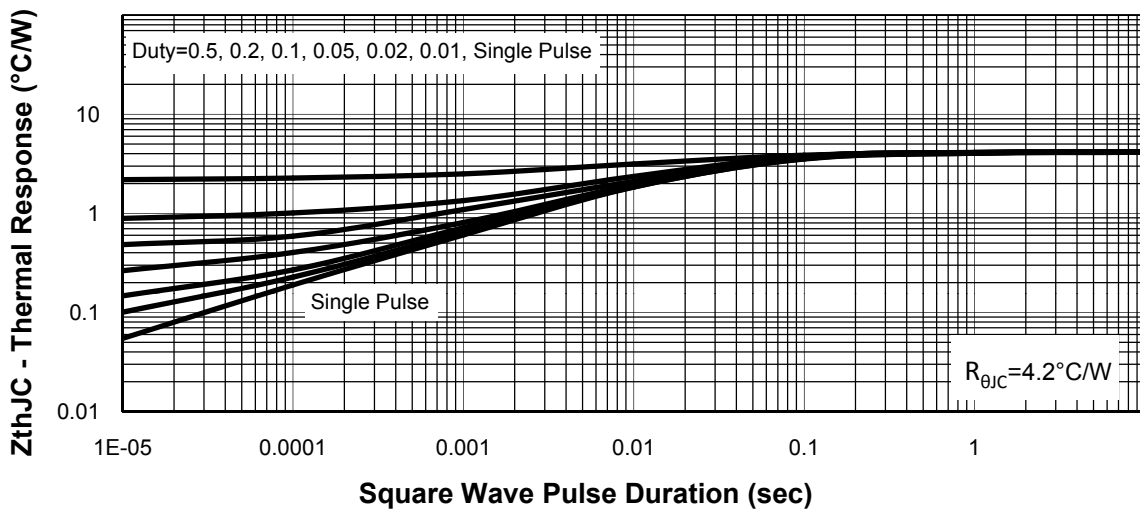
Y =Year

WW =Work Week

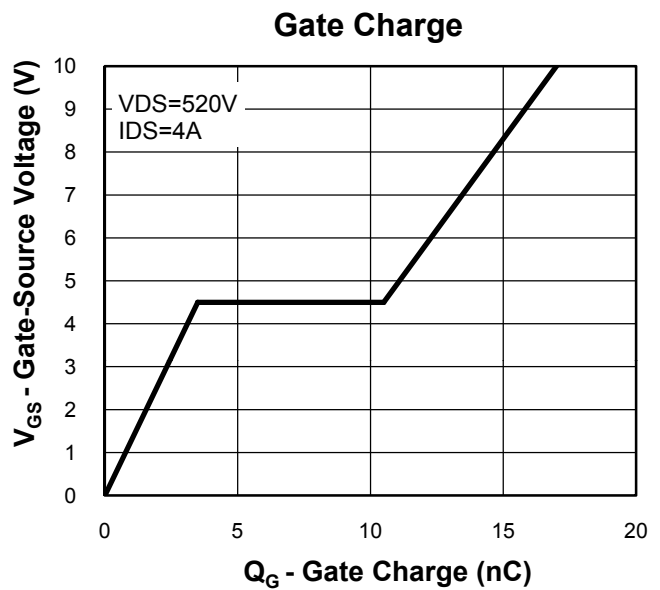
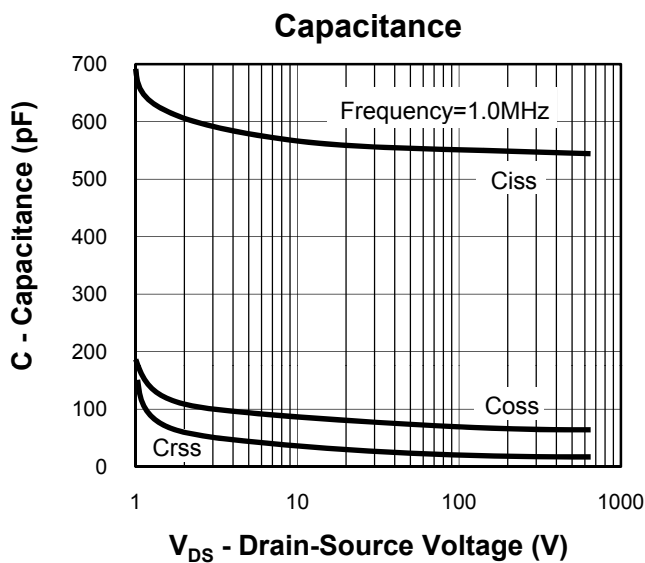
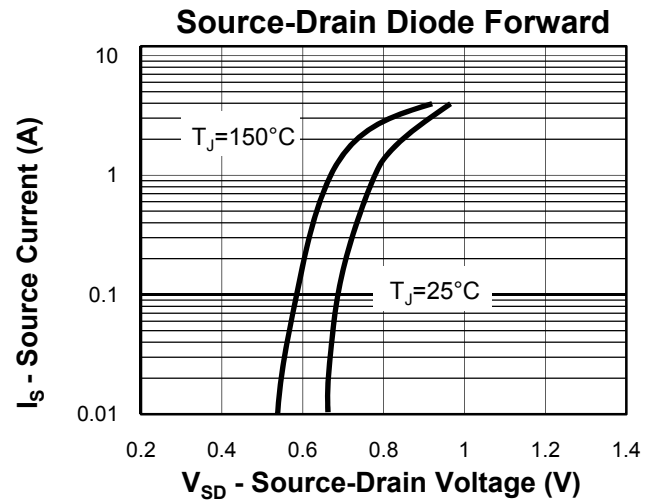
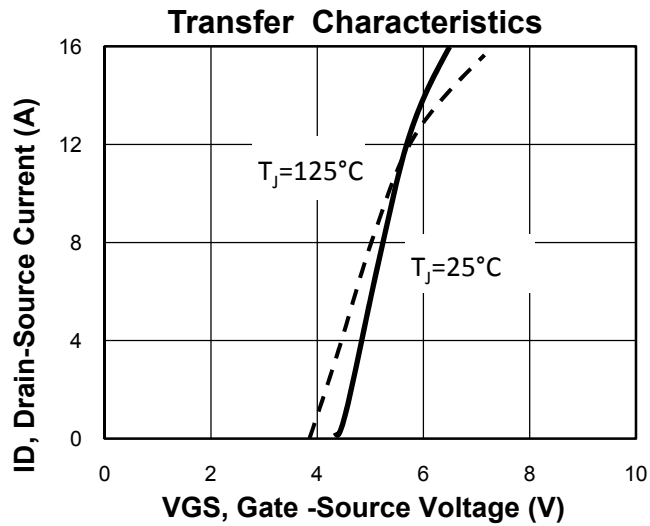
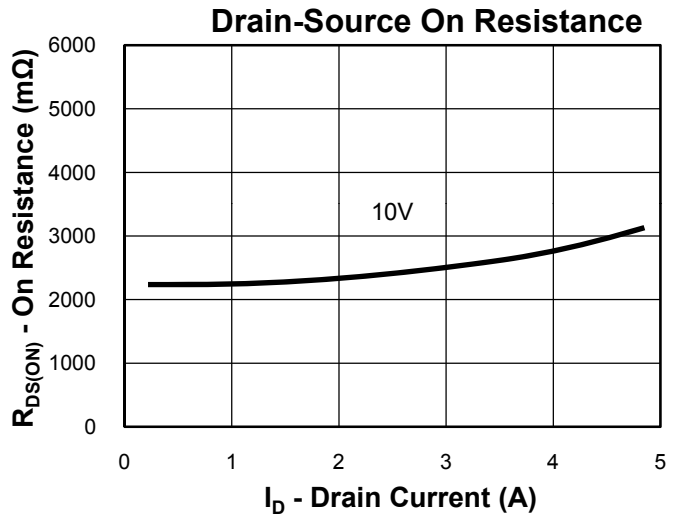
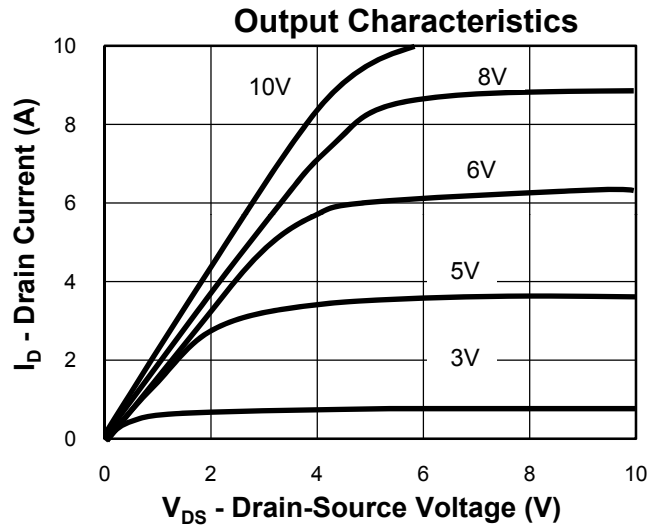
**Typical Characteristics**



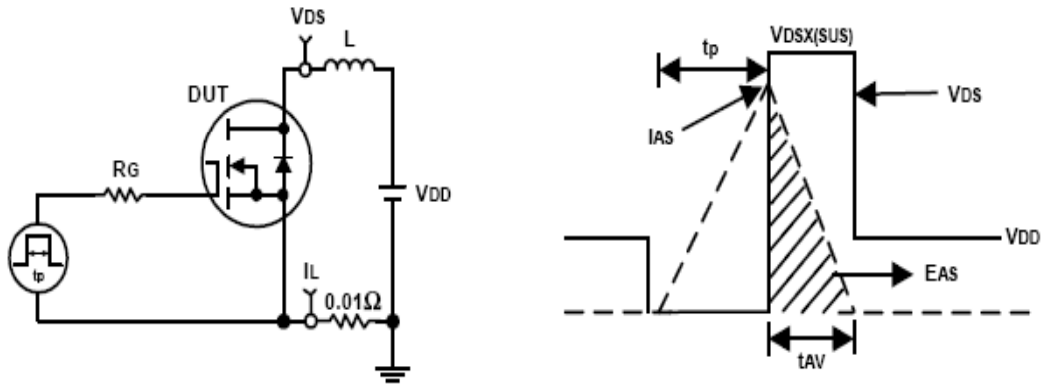
**Thermal Transient Impedance**



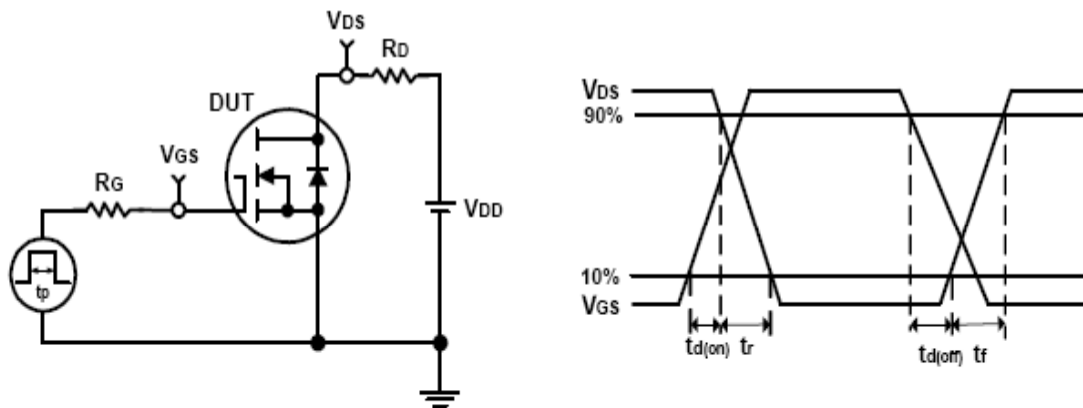
**Typical Characteristics**



**Avalanche Test Circuit and Waveforms**

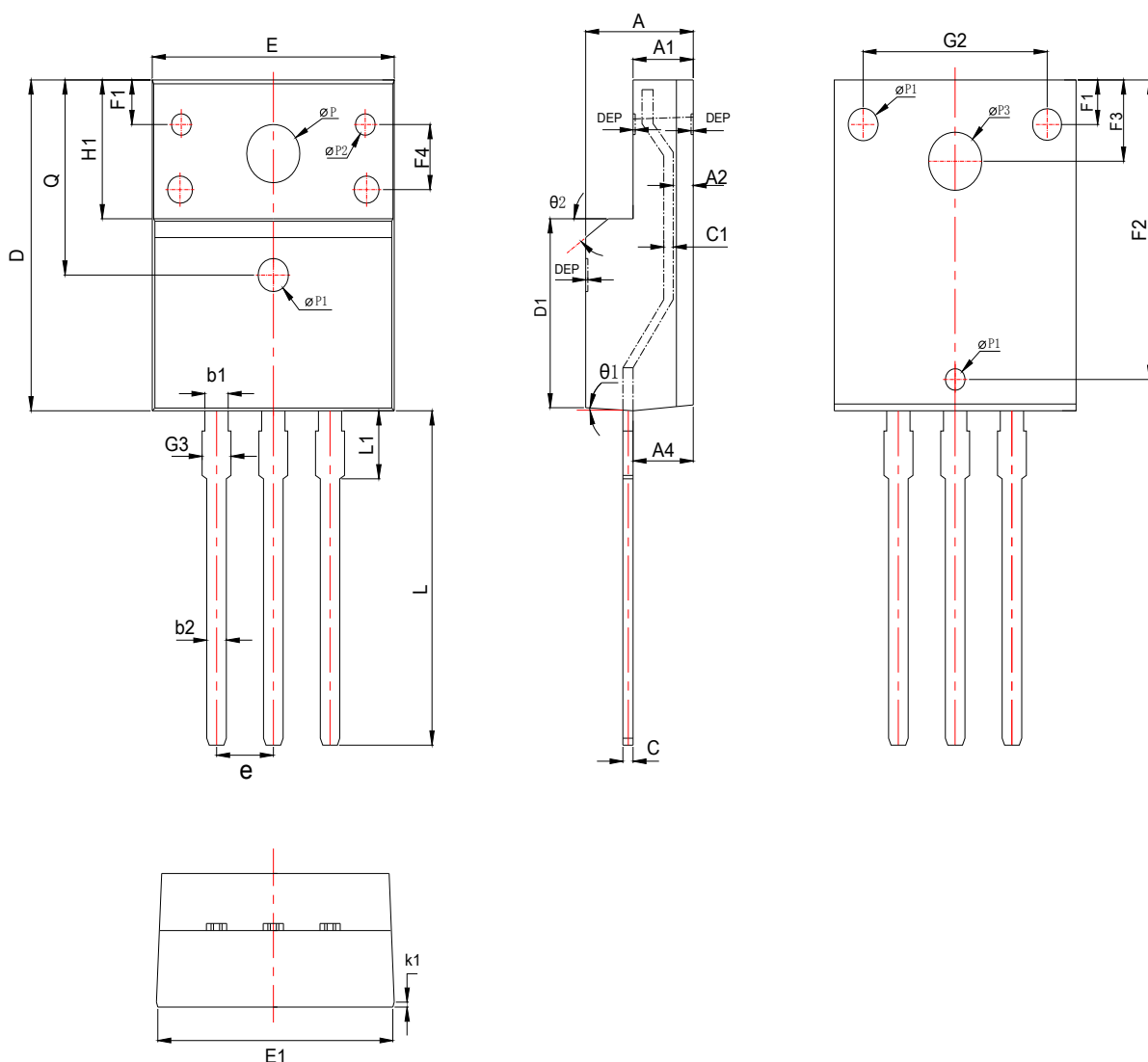


**Switching Time Test Circuit and Waveforms**



**Package Information**

**TO220F**



SYMBOL	MM			INCH			SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX		MIN	NOM	MAX	MIN	NOM	MAX
E	9.96	10.16	10.36	0.392	0.400	0.408	$\Phi p2$	1.15	1.20	1.25	0.045	0.047	0.049
A	4.50	4.70	4.90	0.177	0.185	0.193	$\Phi p3$		3.450			0.136	
A1	2.34	2.54	2.74	0.092	0.100	0.108	$\theta 1$	5°	7°	9°	5°	7°	9°
A2	0.95	1.05	1.15	0.037	0.041	0.045	$\theta 2$		45°			45°	
A4	2.65	2.75	2.85	0.104	0.108	0.112	DEP	0.05	0.10	0.15	0.002	0.004	0.006
c		0.50			0.020		F1	1.90	2.00	2.10	0.075	0.079	0.083
c1		0.50			0.020		F2	13.61	13.81	14.01	0.536	0.544	0.552
D	15.67	15.87	16.07	0.617	0.625	0.633	F3	3.20	3.30	3.40	0.126	0.130	0.134
Q	8.80	9.00	9.20	0.346	0.354	0.362	F4	5.25	5.40	5.55	0.207	0.213	0.219
H1	6.48	6.68	6.88	0.255	0.263	0.271	G2	6.90	7.00	7.10	0.272	0.276	0.280
e		2.54BSC			0.100BSC		G3	1.10	1.30	1.50	0.043	0.051	0.059
$\Phi p$		3.183			0.125		b1	1.17	1.21	1.24	0.046	0.047	0.049
L	12.78	12.98	13.18	0.503	0.511	0.519	b2	0.77	0.80	0.85	0.030	0.032	0.033
L1	3.25	3.45	3.65	0.128	0.136	0.144	E1	9.80	10.00	10.20	0.386	0.394	0.402
D1	8.99	9.19	9.39	0.354	0.362	0.370	K1	0.65	0.70	0.75	0.026	0.028	0.030
$\Phi p1$	1.40	1.50	1.60	0.055	0.059	0.063							