N-Channel Enhancement Mode Power MOSFET

MTN12N65FP

BV_{DSS} : 650V
$R_{DS(ON)}$: 0.6Ω (typ.)
I_D : 12A

Description

The MTN12N65FP is a N-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness.
The TO-220FP package is universally preferred for all commercial-industrial applications

Features

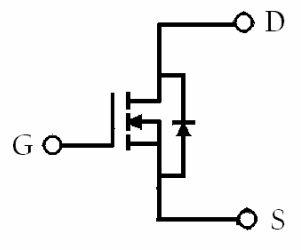
- Low On Resistance
- Simple Drive Requirement
- Fast Switching Characteristic
- Insulating package, front/back side insulating voltage=2500V(AC)
- RoHS compliant package

Applications

- Adapter
- Switching Mode Power Supply

Symbol

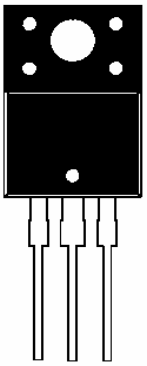
MTN12N65FP



G：Gate
D：Drain
S：Source

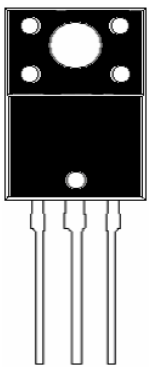
Outline

TO-220FP
(C forming)



G D S

TO-220FP
(S forming)



G D S

Absolute Maximum Ratings (T_C=25°C)

Parameter		Symbol	Limits	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current		I_D	12*	A
Continuous Drain Current @T_C=100°C		I_D	7.2*	A
Pulsed Drain Current @ V_{GS}=10V	(Note 1)	I_{DM}	48*	A
Single Pulse Avalanche Energy	(Note 2)	E_{AS}	624	mJ
Avalanche Current	(Note 1)	I_{AR}	12	A
Repetitive Avalanche Energy	(Note 1)	E_{AR}	5.1	mJ
Peak Diode Recovery dv/dt	(Note 3)	dv/dt	4.5	V/ns
Maximum Temperature for Soldering @ Lead at 0.125 in(0.318mm) from case for 10 seconds		T_L	300	°C
Total Power Dissipation (T_C=25℃)			51	W
Linear Derating Factor			0.41	W/°C
Operating Junction and Storage Temperature		Tj, Tstg	-55~+150	°C

*Drain current limited by maximum junction temperature

Note : 1.Repetitive rating; pulse width limited by maximum junction temperature.
2. I_{AS}=12A, V_{DD}=50V, L=8mH, R_G=25Ω, starting T_J=+25℃.
3. I_{SD}≤12A, dI/dt≤100A/μs, V_{DD}≤BV_{DSS}, starting T_J=+25℃.

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j\text{-}c}$	2.43	°C/W
Thermal Resistance, Junction-to-ambient, max	$R_{th,j\text{-}a}$	62.5	°C/W

Characteristics (Tj=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	650	-	-	V	V_{GS}=0, I_D=250μA, Tj=25℃
$\Delta BV_{DSS}/\Delta Tj$	-	0.5	-	V/°C	Reference to 25°C, I_D=250μA
$V_{GS(th)}$	2.0	-	4.0	V	V_{DS} = V_{GS}, I_D=250μA
*G_{FS}	-	5	-	S	V_{DS} =15V, I_D=7A
I_{GSS}	-	-	±100	nA	V_{GS}=±30
I_{DSS}	-	-	1	μA	V_{DS} =650V, V_{GS} =0
	-	-	10		V_{DS} =520V, V_{GS} =0, Tj=125°C
*$R_{DS(ON)}$	-	0.6	0.65	Ω	V_{GS} =10V, I_D=6A
Dynamic					
*Qg	-	38	49	nC	I_D=12A, V_{DS}=520V, V_{GS}=10V
*Qgs	-	8.2	-		
*Qgd	-	13.7	-		
*$t_{d(ON)}$	-	30	70	ns	V_{DS}=325V, I_D=12A, V_{GS}=10V, R_G=25Ω
*tr	-	85	180		
*$t_{d(OFF)}$	-	140	280		
*t_f	-	90	190		
Ciss	-	1835	2385	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Coss	-	185	240		
Crss	-	16	21		
Source-Drain Diode					
*I_S	-	-	12	A	
*I_{SM}	-	-	48		
*V_{SD}	-	-	1.5	V	I_S=12A, V_{GS}=0V
*trr	-	420	-	ns	V_{GS}=0, I_F=12A, dI/dt=100A/μs
*Qrr	-	4.9	-	μC	

*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

Ordering Information

Device	Package	Shipping
MTN12N65FP	TO-220FP(C forming) (RoHS compliant)	50 pcs/tube, 20 tubes/box, 4 boxes / carton
MTN12N65FPS	TO-220FP(S forming) (RoHS compliant)	50 pcs/tube, 20 tubes/box, 4 boxes / carton

Typical Characteristics

Figure 1. On-Region Characteristics

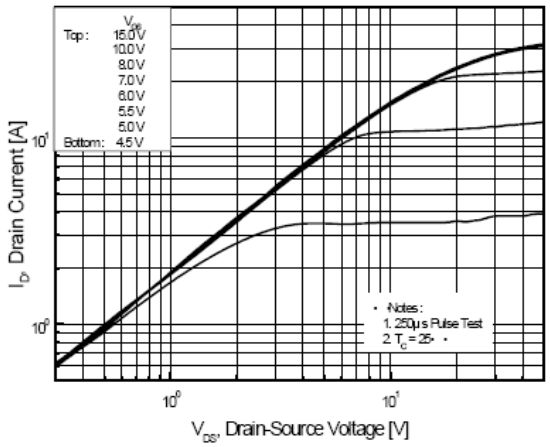


Figure 2. Transfer Characteristics

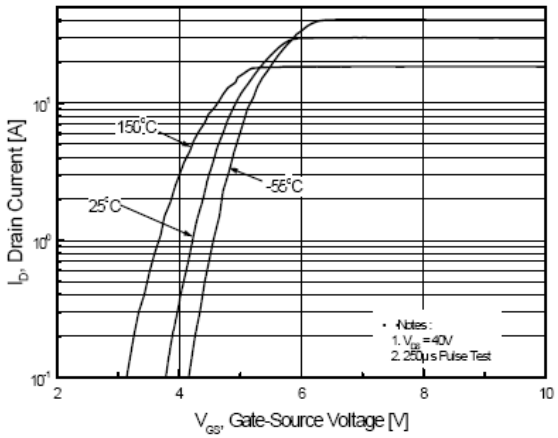


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

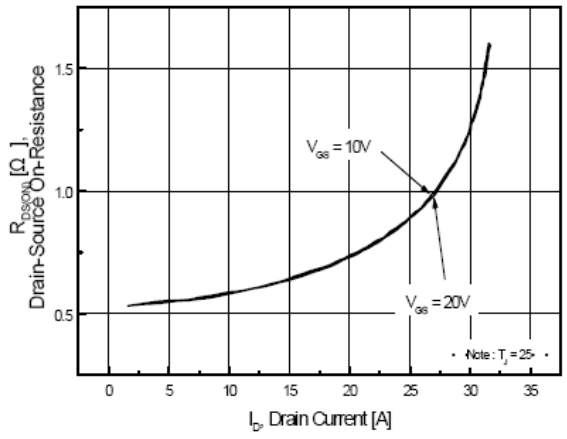


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

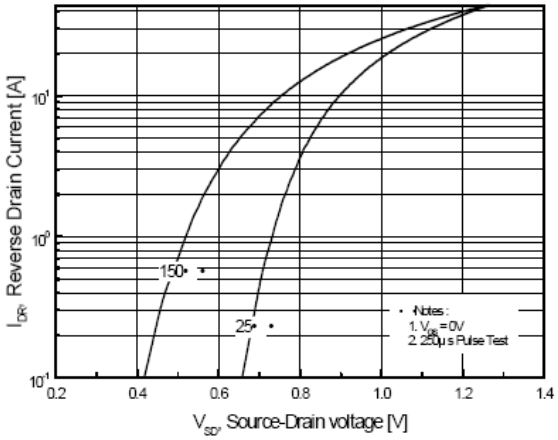


Figure 5. Capacitance Characteristics

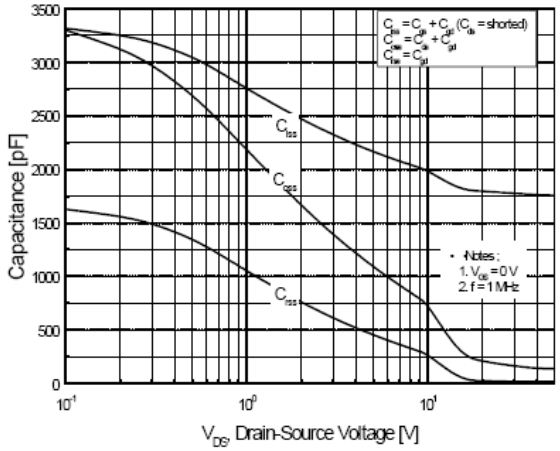
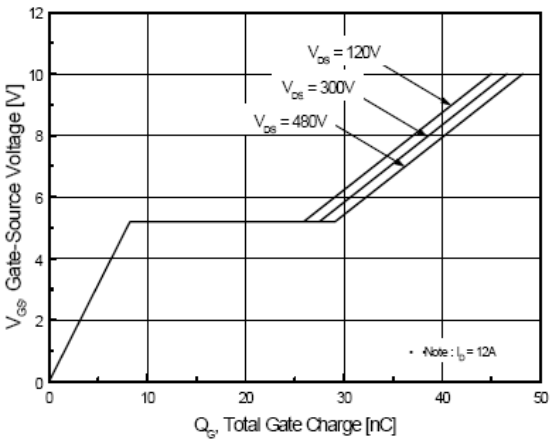


Figure 6. Gate Charge Characteristics



Typical Characteristics(Cont.)

Figure 7. Breakdown Voltage Variation vs. Temperature

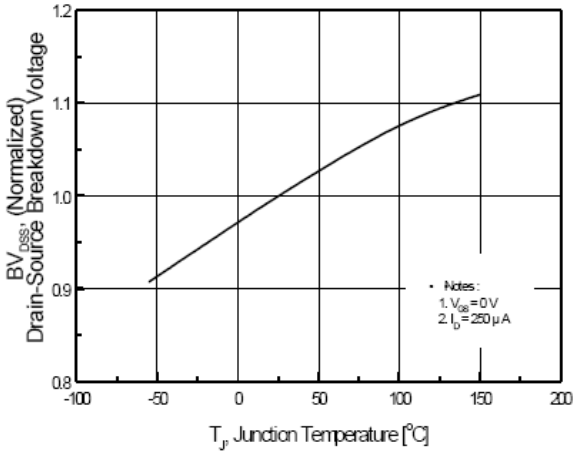


Figure 8. On-Resistance Variation vs. Temperature

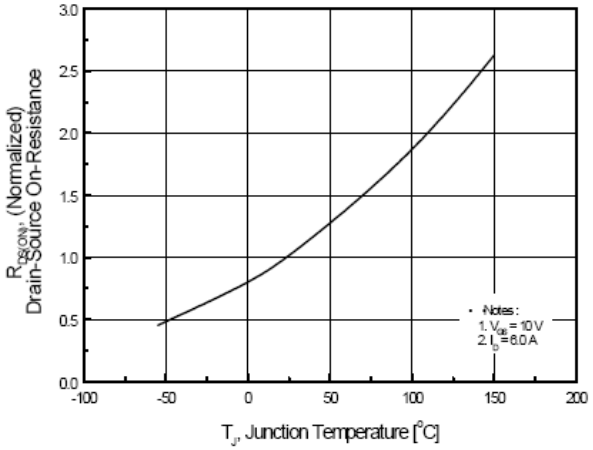


Figure 9. Maximum Safe Operating Area

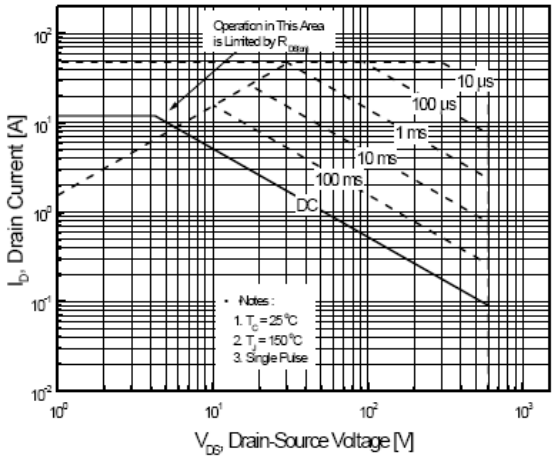


Figure 10. Maximum Drain Current vs. Case Temperature

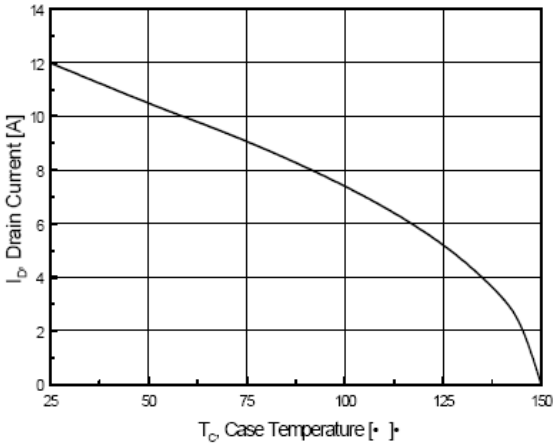
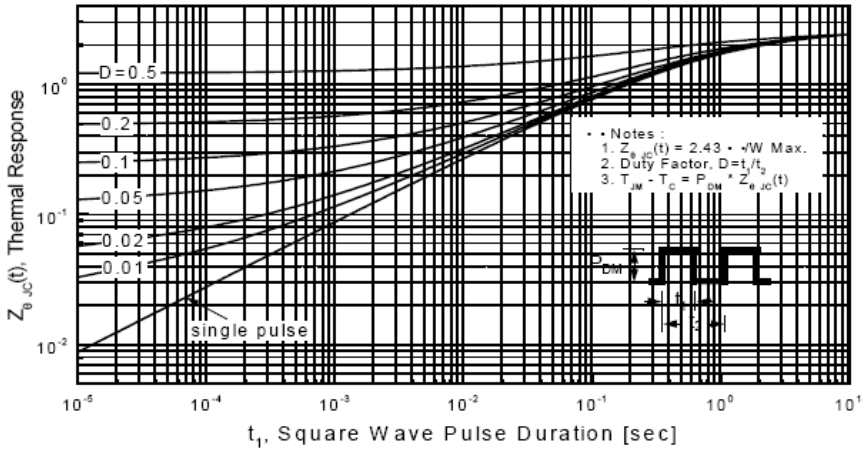


Figure 11. Transient Thermal Response Curve



Test Circuit and Waveforms

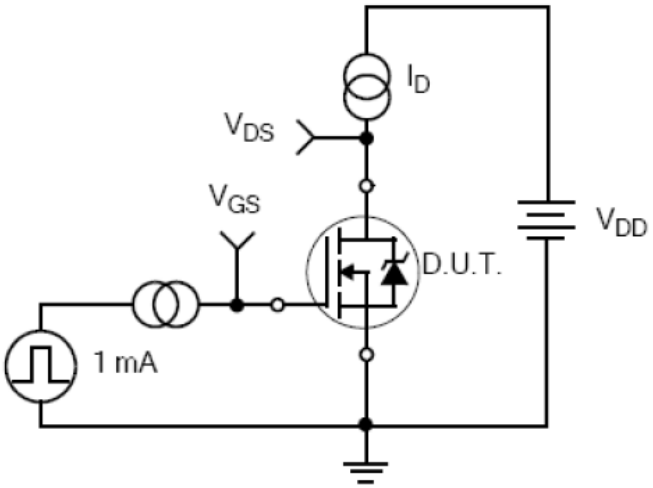


Figure 12. Gate Charge Test Circuit

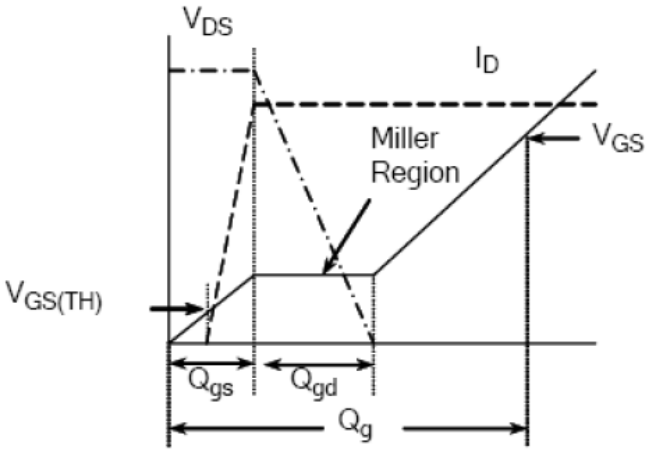


Figure 13. Gate Charge Waveform

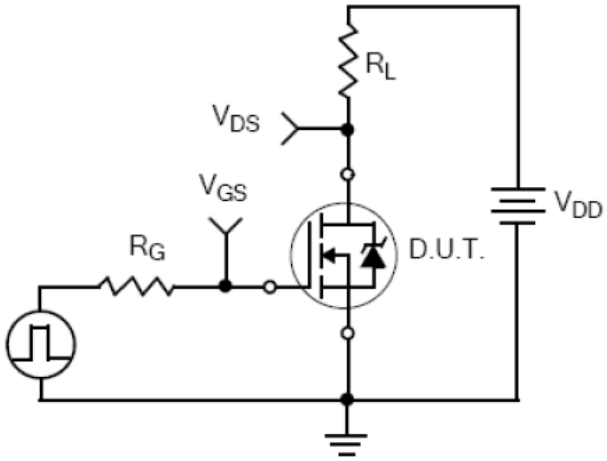


Figure 14. Resistive Switching Test Circuit

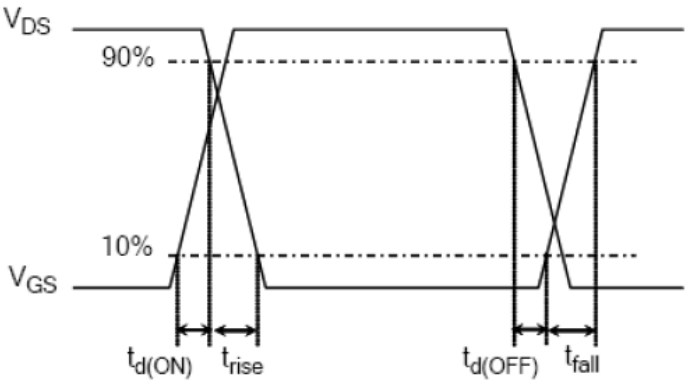


Figure 15. Resistive Switching Waveforms

Test Circuit and Waveforms(Cont.)

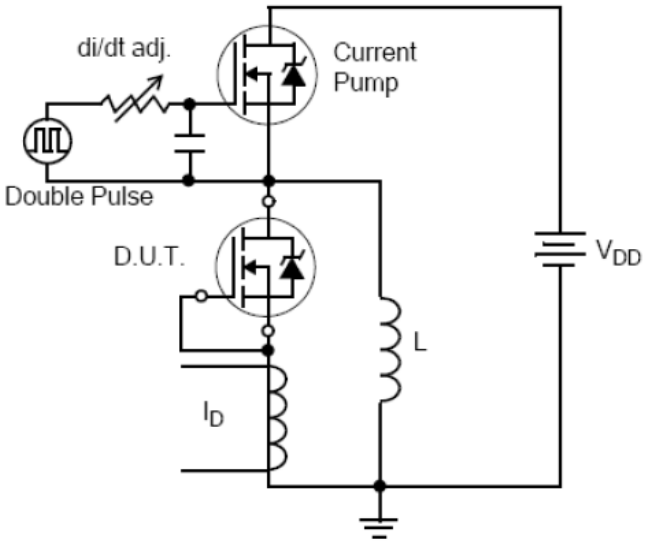


Figure 16. Diode Reverse Recovery Test Circuit

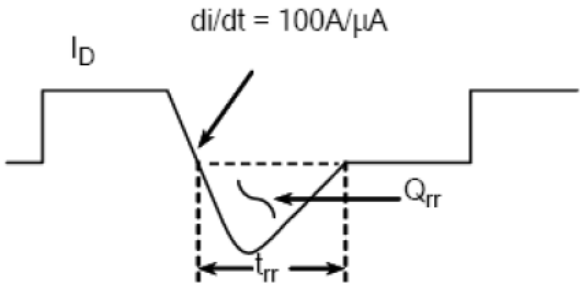


Figure 17. Diode Reverse Recovery Waveform

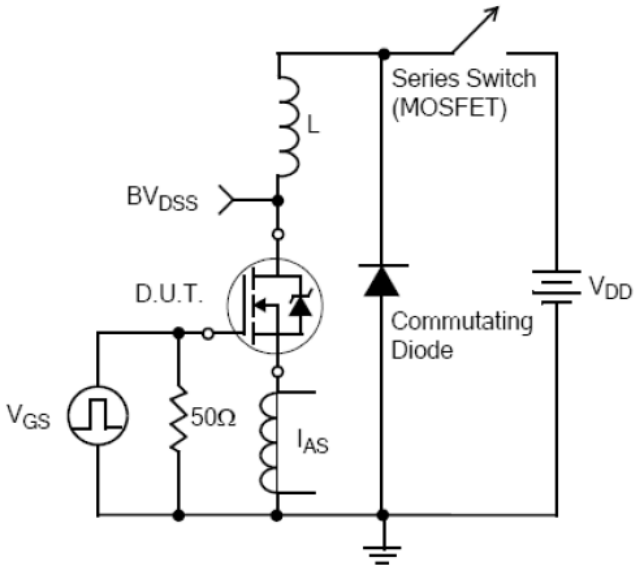


Figure 18. Unclamped Inductive Switching Test Circuit

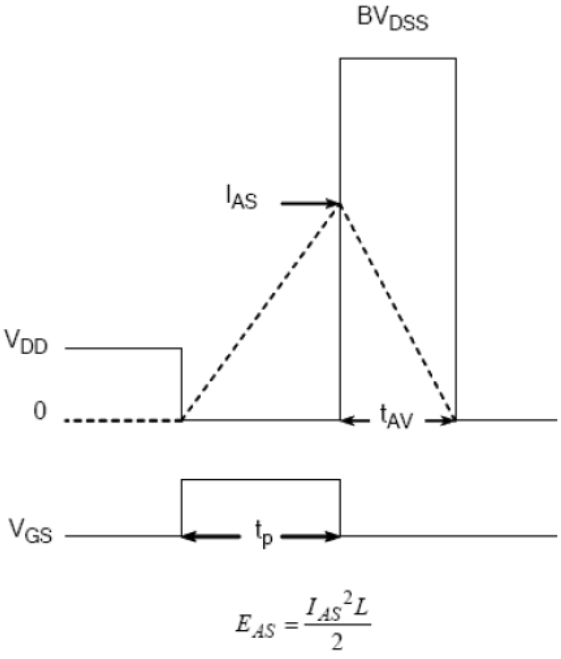
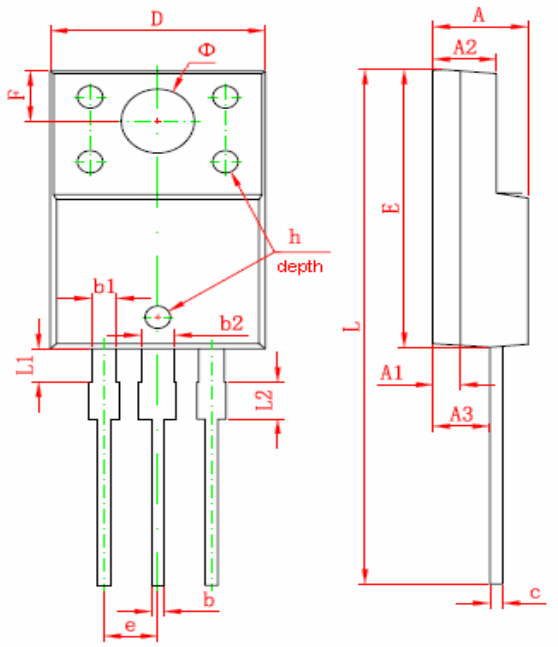
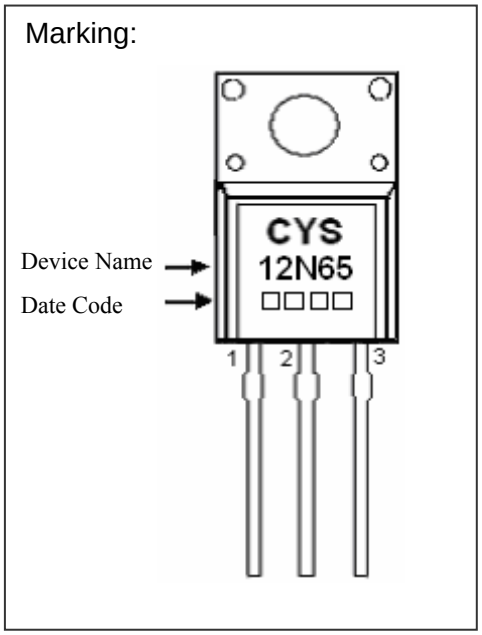


Figure 19. Unclamped Inductive Switching Waveforms

TO-220FP (C Forming) Dimension



3-Lead TO-220FP Plastic Package
CYStek Package Code: FP



Style: Pin 1.Gate 2.Drain 3.Source

*Typical

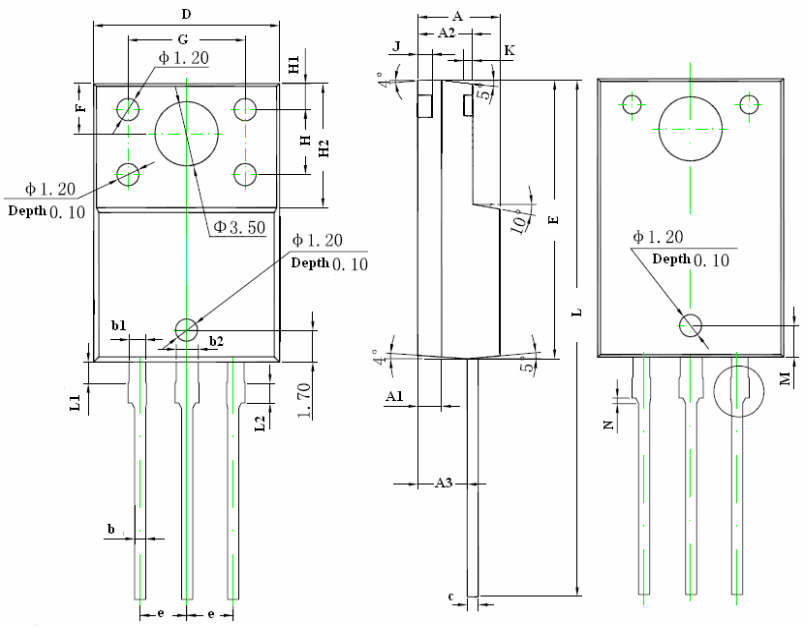
DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.169	0.185	4.300	4.700	E	0.583	0.598	14.800	15.200
A1	0.051 REF		1.300 REF		e	0.100*		2.540*	
A2	0.110	0.126	2.800	3.200	F	0.106 REF		2.700 REF	
A3	0.098	0.114	2.500	2.900	Φ	0.138 REF		3.500 REF	
b	0.020	0.030	0.500	0.750	h	0.000	0.012	0.000	0.300
b1	0.043	0.053	1.100	1.350	L	1.102	1.118	28.000	28.400
b2	0.059	0.069	1.500	1.750	L1	0.067	0.075	1.700	1.900
c	0.020	0.030	0.500	0.750	L2	0.075	0.083	1.900	2.100
D	0.392	0.408	9.960	10.360					

Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

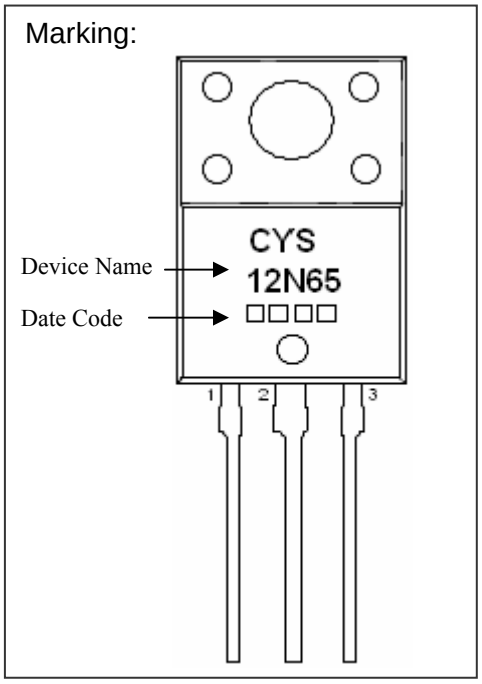
Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

TO-220FP (S Forming) Dimension



3-Lead TO-220FP Plastic Package
CYStek Package Code: FP



Style: Pin 1.Gate 2.Drain 3.Source

*Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.171	0.183	4.35	4.65	G	0.246	0.258	6.25	6.55
A1	0.051 REF		1.300 REF		H	0.138 REF		3.50 REF	
A2	0.112	0.124	2.85	3.15	H1	0.055 REF		1.40 REF	
A3	0.102	0.110	2.60	2.80	H2	0.256	0.272	6.50	6.90
b	0.020	0.030	0.50	0.75	J	0.031 REF		0.80 REF	
b1	0.031	0.041	0.80	1.05	K	0.020		0.50 REF	
b2	0.047 REF		1.20 REF		L	1.102	1.118	28.00	28.40
c	0.020	0.030	0.500	0.750	L1	0.043	0.051	1.10	1.30
D	0.396	0.404	10.06	10.26	L2	0.036	0.043	0.92	1.08
E	0.583	0.598	14.80	15.20	M	0.067 REF		1.70 REF	
e	0.100 *		2.54*		N	0.012 REF		0.30 REF	
F	0.106 REF		2.70 REF						

Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.