

N-Channel Enhancement Mode Power MOSFET

MTN12N60FP

BV_{DSS} : 600V
$R_{DS(ON)}$: 0.6 Ω typ.
I_D : 12A

Description

The MTN12N60FP 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

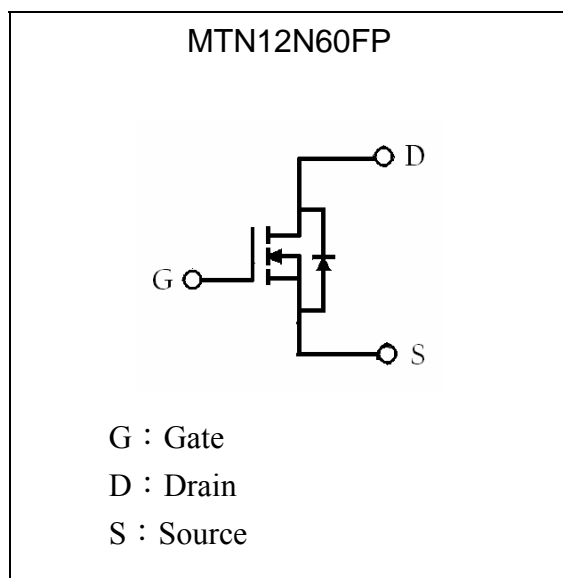
Features

- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant package

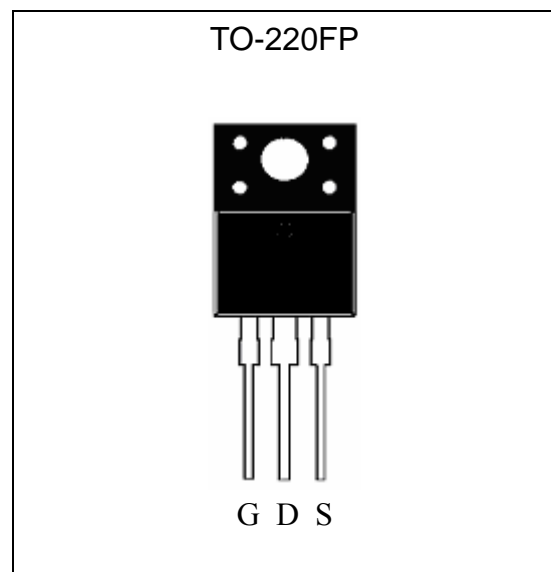
Applications

- Ballast
- Inverter

Symbol



Outline



**Absolute Maximum Ratings** ($T_C=25^{\circ}\text{C}$)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage (Note 1)	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current	I_D	12*	A
Continuous Drain Current @ $T_C=100^{\circ}\text{C}$	I_D	7.4*	A
Pulsed Drain Current @ $V_{GS}=10\text{V}$ (Note 2)	I_{DM}	48*	A
Single Pulse Avalanche Energy (Note 3)	E_{AS}	870	mJ
Avalanche Current (Note 2)	I_{AR}	12	A
Repetitive Avalanche Energy (Note 2)	E_{AR}	22.5	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	3.5	V/ns
Maximum Temperature for Soldering @ Lead at 0.125 in(3.175mm) from case for 10 seconds	T_L	300	$^{\circ}\text{C}$
Total Power Dissipation ($T_C=25^{\circ}\text{C}$)	P_D	51	W
Linear Derating Factor above 25°C		0.41	W/ $^{\circ}\text{C}$
Operating Junction and Storage Temperature	T_J, T_{stg}	-55~+150	$^{\circ}\text{C}$

* Drain current limited by maximum junction temperature.

- Note : 1. $T_J=+25^{\circ}\text{C}$ to $+150^{\circ}\text{C}$.
2. Repetitive rating; pulse width limited by maximum junction temperature.
3. $I_{SD}=12\text{A}$, $dI/dt<100\text{A}/\mu\text{s}$, $V_{DD}<BV_{DSS}$, $T_J=+150^{\circ}\text{C}$.
4. $I_{AS}=12\text{A}$, $V_{DD}=50\text{V}$, $L=11\text{mH}$, $R_G=25\Omega$, starting $T_J=+25^{\circ}\text{C}$.

Thermal Data

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



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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	600	-	-	V	V _{GS} =0, I _D =250μA
ΔBV _{DSS} /ΔT _j	-	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 =6A
I _{GSS}	-	-	±100	nA	V _{GS} =±30
I _{DSS}	-	-	1	μA	V _{DS} =600V, V _{GS} =0
	-	-	25		V _{DS} =480V, V _{GS} =0, T _j =125°C
*R _{DS(ON)}	-	0.6	0.65	Ω	V _{GS} =10V, I _D =6A
Dynamic					
*Q _g	-	48	63	nC	I _D =12A, V _{DD} =400V, V _{GS} =10V
*Q _{gs}	-	8.5	-		
*Q _{gd}	-	21	-		
*t _{d(ON)}	-	30	70	ns	V _{DD} =300V, I _D =12A, V _{GS} =10V, R _G =25 Ω
*t _r	-	85	180		
*t _{d(OFF)}	-	140	280		
*t _f	-	90	190		
C _{iss}	-	1760	2290	pF	V _{GS} =0V, V _{DS} =25V, f=1MHz
C _{oss}	-	182	235		
C _{rss}	-	21	28		
Source-Drain Diode					
*I _S	-	-	12	A	
*I _{SM}	-	-	48		
*V _{SD}	-	-	1.5	V	I _S =12A, V _{GS} =0V
*t _{rr}	-	460	-	ns	V _{GS} =0, I _F =12A, dI/dt=100A/μs
*Q _{rr}	-	4.9	-	μC	

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

Ordering Information

Device	Package	Shipping	Marking
MTN12N60FP	TO-220FP (RoHS compliant)	50 pcs/tube, 20 tubes/box, 4 boxes / carton	12N60

Characteristic Curves

Figure 1. On-Region Characteristics

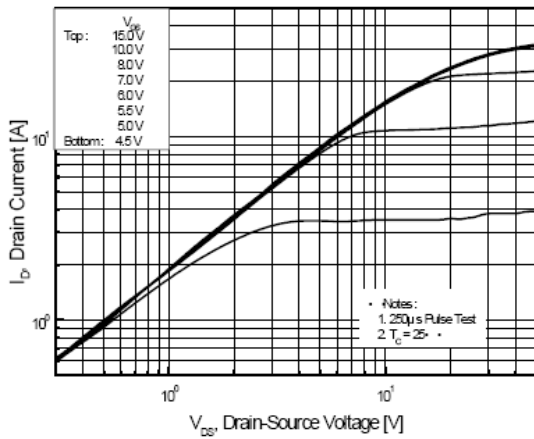


Figure 2. Transfer Characteristics

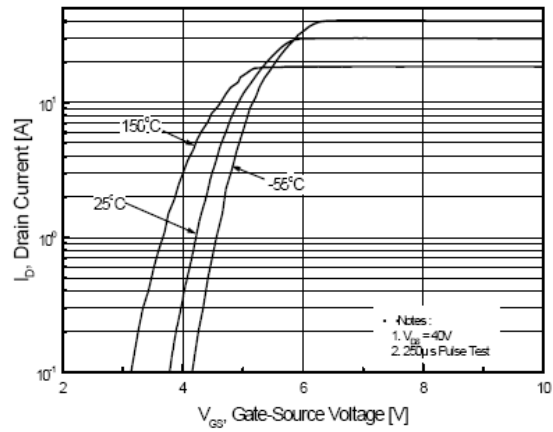


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

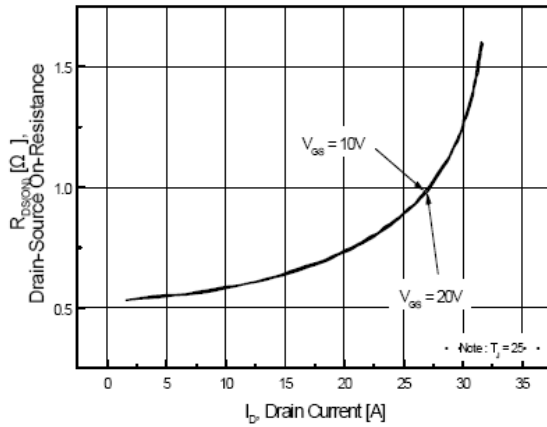


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

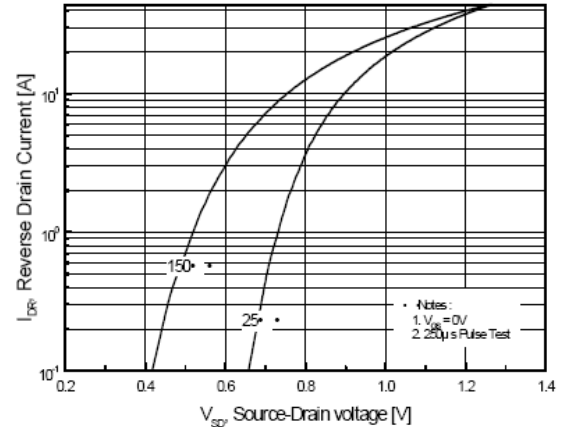


Figure 5. Capacitance Characteristics

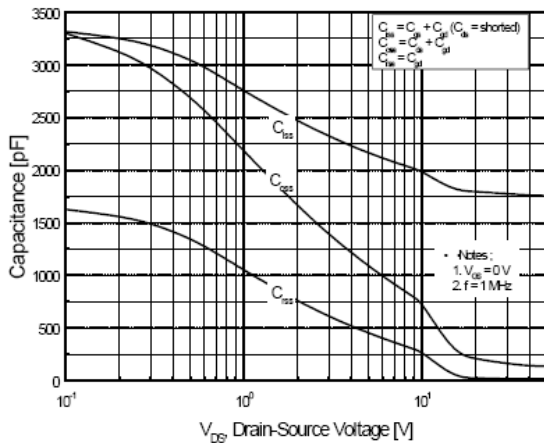
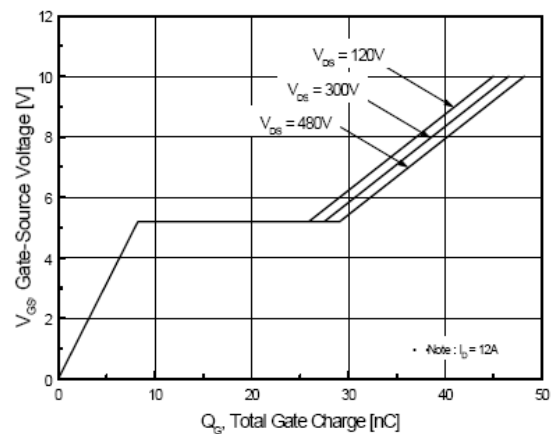


Figure 6. Gate Charge Characteristics



Characteristic Curves(Cont.)

Figure 7. Breakdown Voltage Variation vs. Temperature

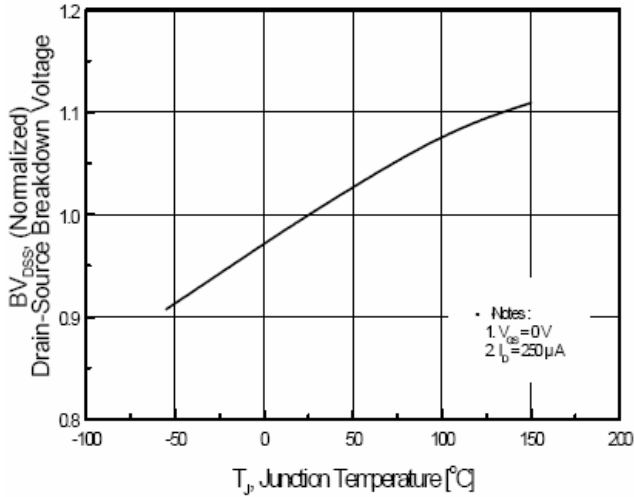


Figure 8. On-Resistance Variation vs. Temperature

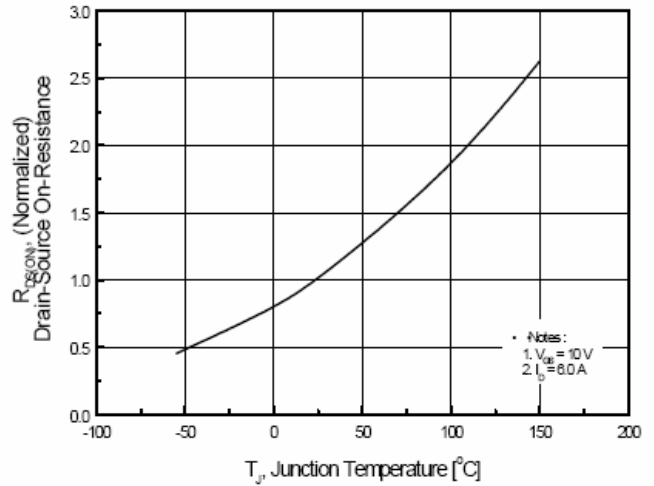


Figure 9. Maximum Safe Operating Area

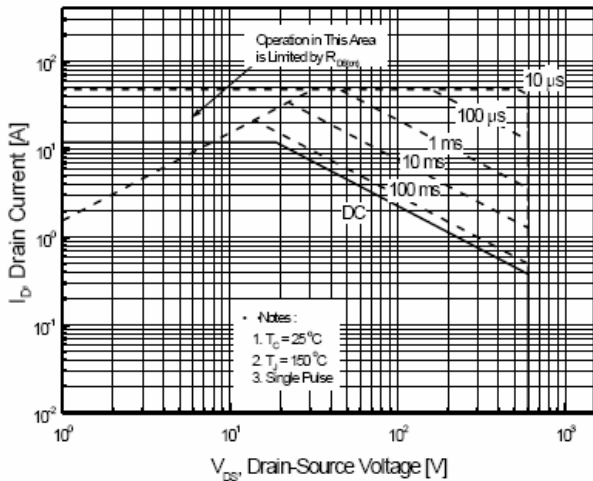


Figure 10. Maximum Drain Current vs. Case Temperature

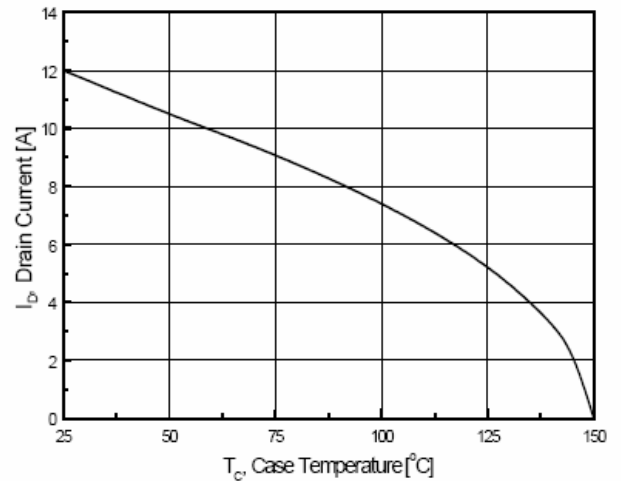
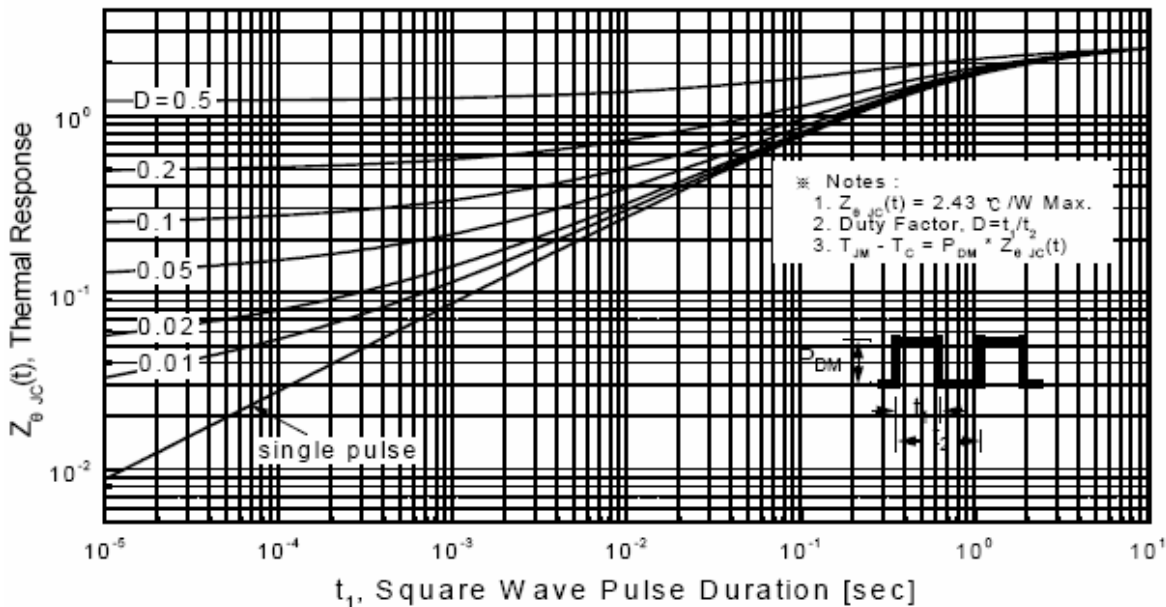
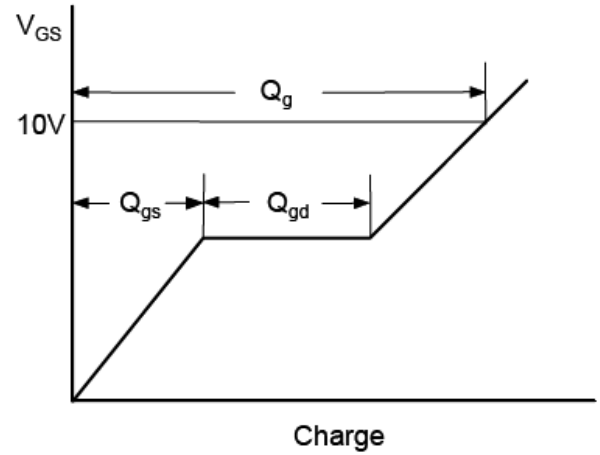
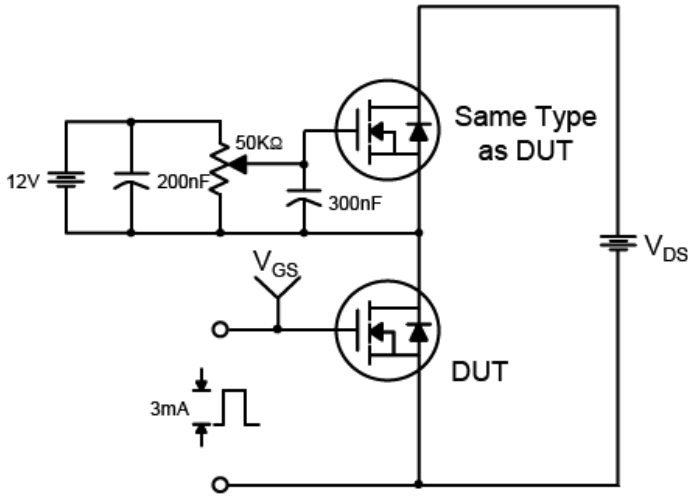


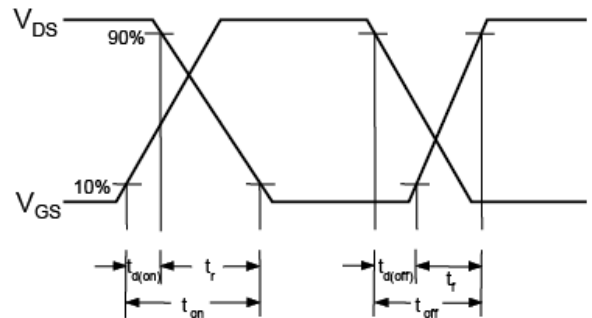
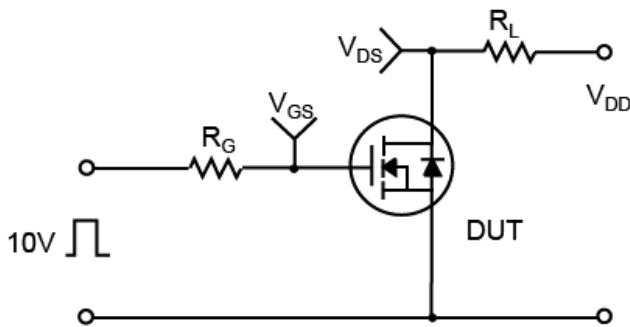
Figure 11. Transient Thermal Response Curve



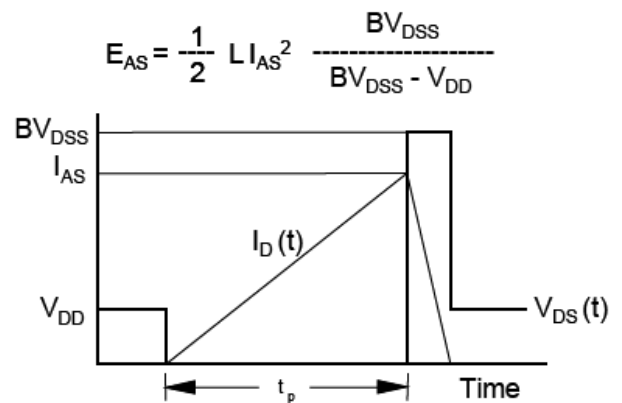
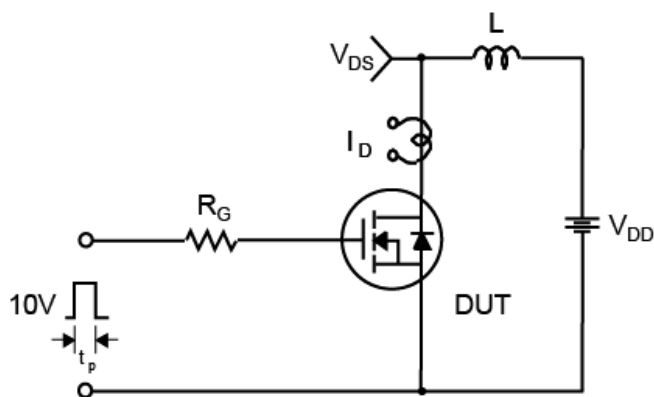
Test Circuit and Waveforms



Resistive Switching Test Circuit & Waveforms

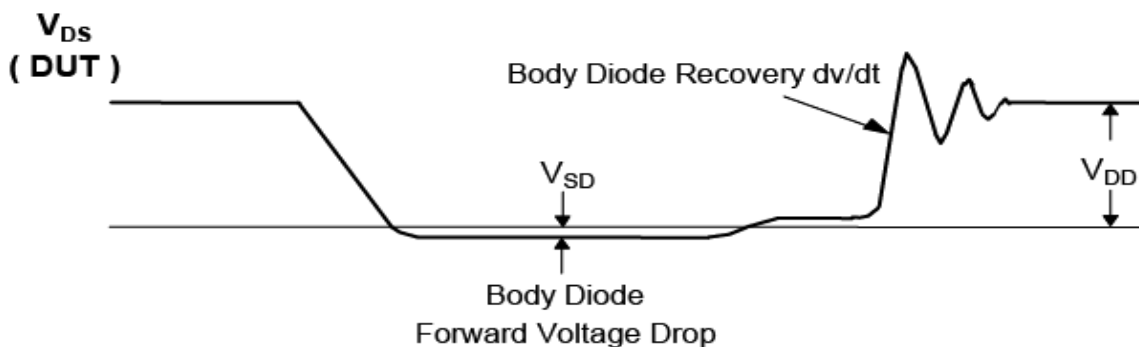
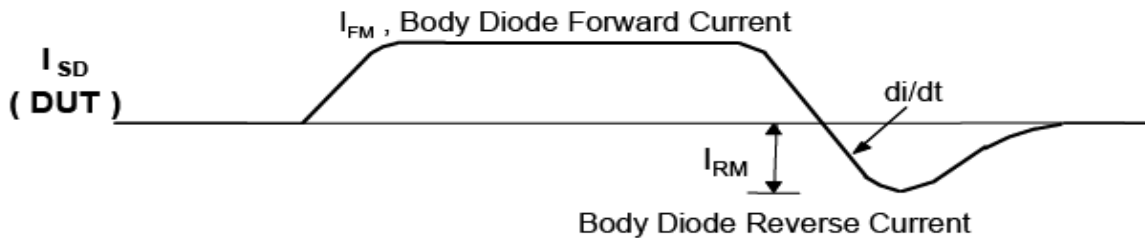
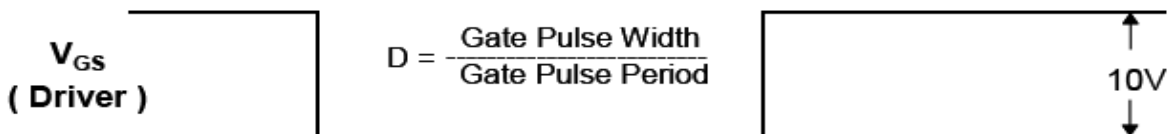
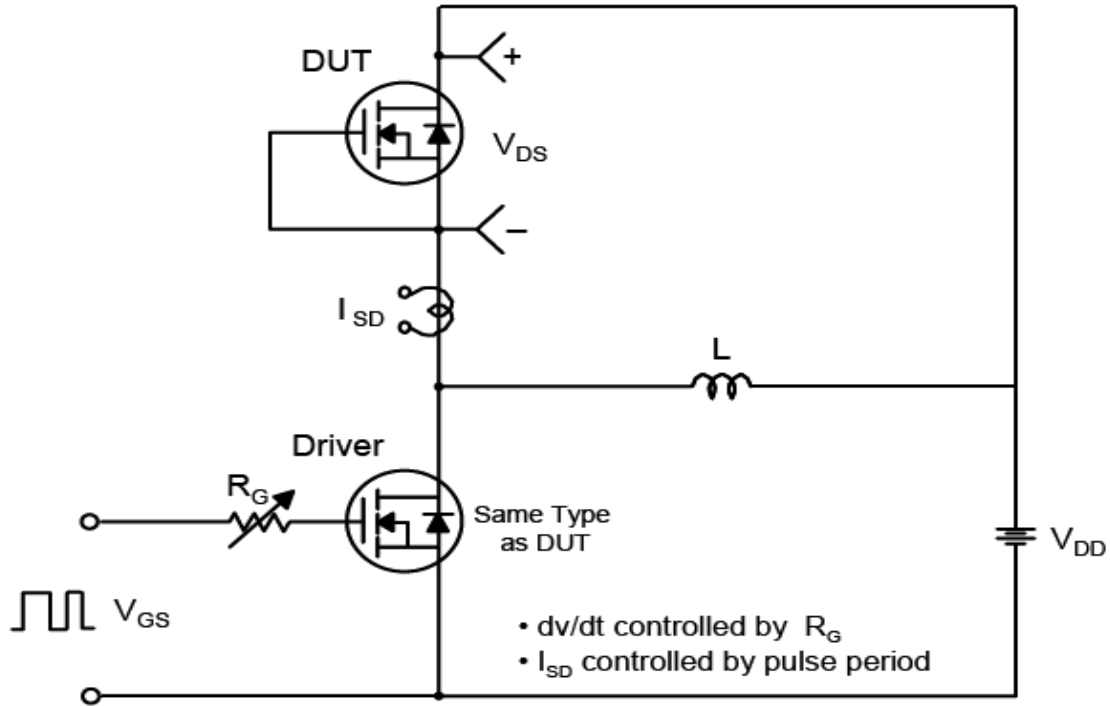


Unclamped Inductive Switching Test Circuit & Waveforms



Test Circuit and Waveforms(Cont.)

Peak Diode Recovery dv/dt Test Circuit & 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

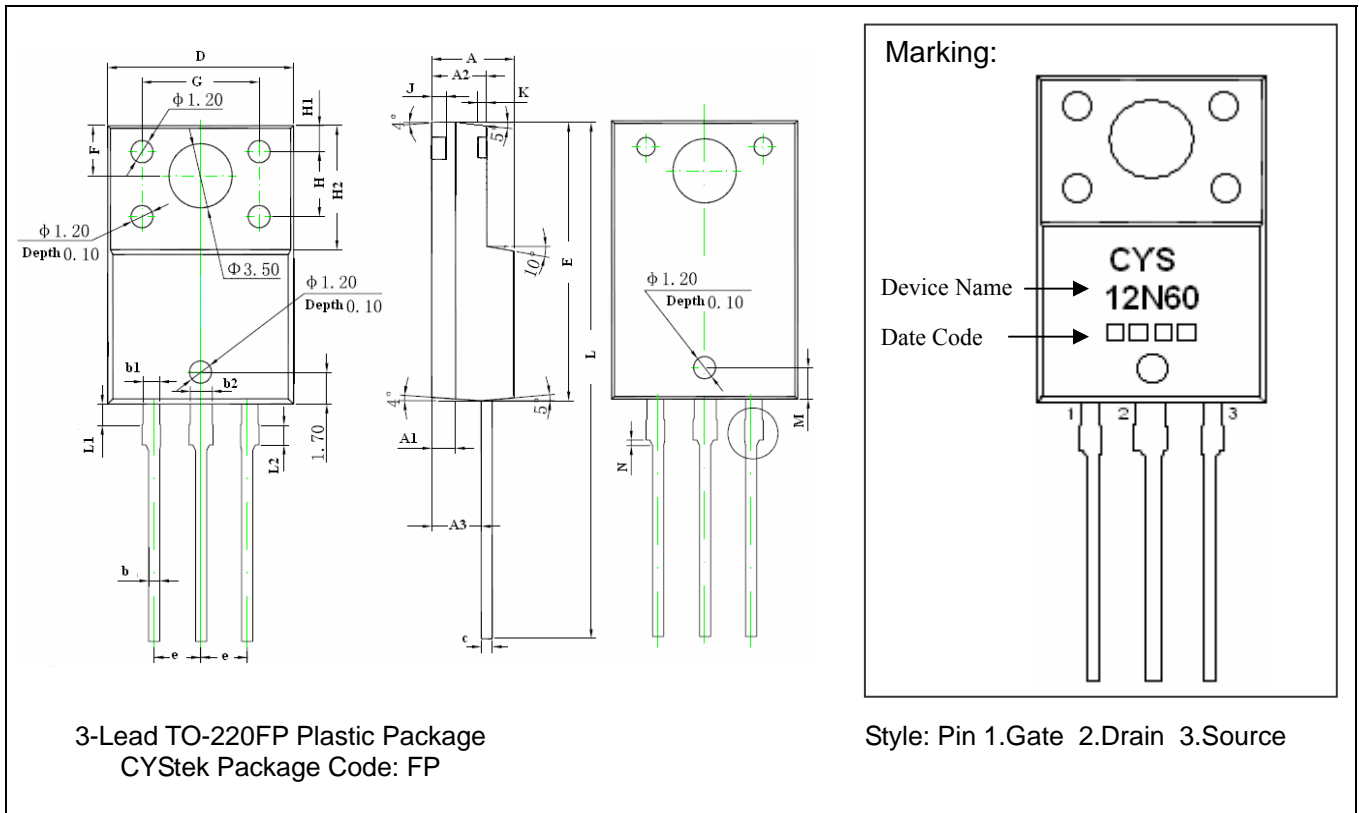
DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.169	0.185	4.300	4.700	E	0.583	0.598	14.800	15.200
A1	0.051 REF		1.300 REF		e	0.100*		2.540*	
A2	0.110	0.126	2.800	3.200	F	0.106 REF		2.700 REF	
A3	0.098	0.114	2.500	2.900	Φ	0.138 REF		3.500 REF	
b	0.020	0.030	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

Marking:
 Device Name → **CYS 12N60**
 Date Code → □□□□

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.
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Material:

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

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