



N-Channel Enhancement Mode Power MOSFET

# MTN12N60DFP

BV <sub>DSS</sub>	600V
I <sub>D</sub> @ V <sub>GS</sub> =10V, T <sub>C</sub> =25°C	12A
R <sub>DS(on)(TYP)</sub> @ V <sub>GS</sub> =10V, I <sub>D</sub> =6A	0.47Ω

## Description

The MTN12N60DFP 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

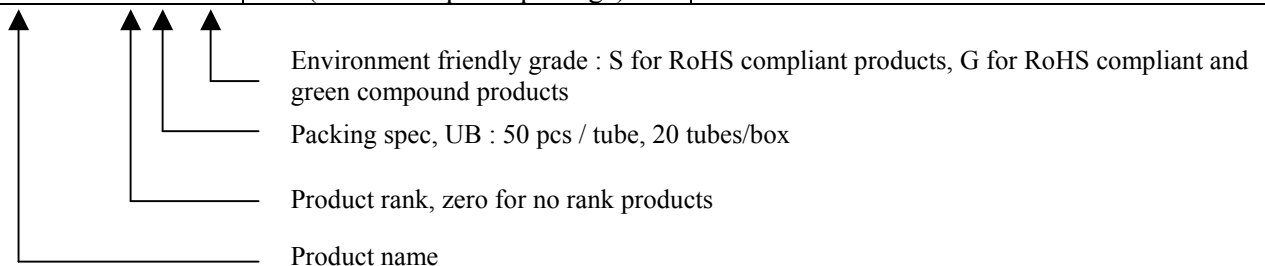
- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant package

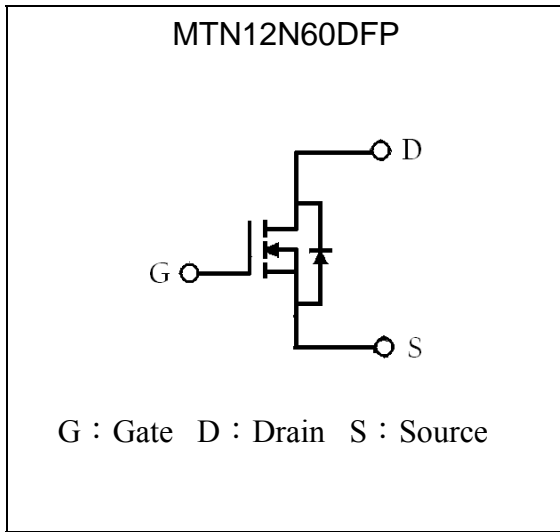
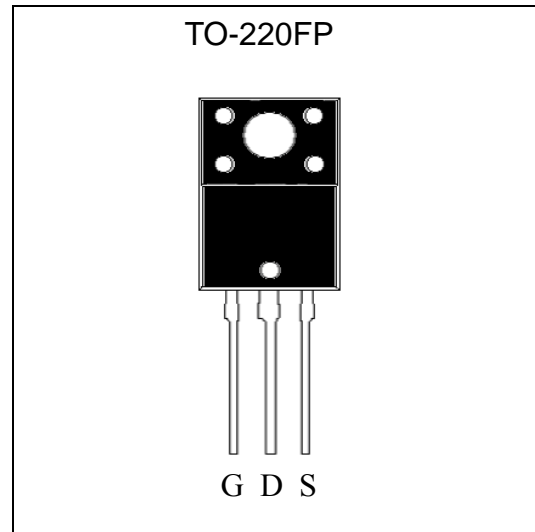
## Applications

- Ballast
- Inverter

## Ordering Information

Device	Package	Shipping
MTN12N60DFP-0-UB-S	TO-220FP (RoHS compliant package)	50 pcs/tube, 20 tubes/box, 4 boxes / carton



**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	$V_{GS}$	$\pm 30$	
Continuous Drain Current @ $T_C=100^\circ\text{C}$ , $V_{GS}=10\text{V}$	$I_D$	12*	A
Continuous Drain Current @ $T_C=100^\circ\text{C}$ , $V_{GS}=10\text{V}$		7.4*	
Pulsed Drain Current @ $V_{GS}=10\text{V}$ (Note 2)	$I_{DM}$	48*	
Avalanche Current (Note 2)	$I_{AS}$	12	
Single Pulse Avalanche Energy @ $L=1\text{mH}$ , $I_{AS}=12\text{A}$ , $V_{DD}=50\text{V}$ (Note 3)	$E_{AS}$	72	mJ
Repetitive Avalanche Energy (Note 2)	$E_{AR}$	6.3	
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 ( $T_C=25^\circ\text{C}$ )	$P_D$	62.5	W
Linear Derating Factor above $25^\circ\text{C}$		0.5	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. Pulse width limited by maximum junction temperature.

3. 100% tested by conditions of  $I_{AS}=6\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $L=1\text{mH}$ ,  $V_{GS}=10\text{V}$ , starting  $T_j=+25^\circ\text{C}$ .

**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	2.0	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-ambient, max	$R_{th,j-a}$	62.5	



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

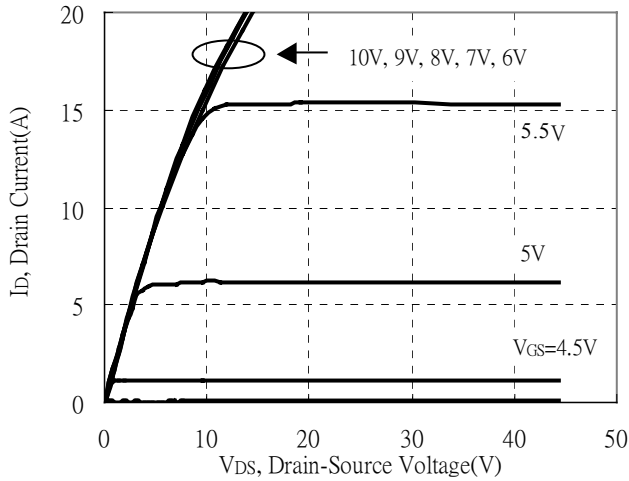
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	600	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
ΔBV <sub>DSS</sub> /ΔT <sub>j</sub>	-	0.7	-	V/°C	Reference to 25°C, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	2.0	-	4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA
*G <sub>FS</sub>	-	15	-	S	V <sub>DS</sub> =15V, I <sub>D</sub> =6A
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±30V
I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V
	-	-	25		V <sub>DS</sub> =480V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C
*R <sub>DS(ON)</sub>	-	0.47	0.65	Ω	V <sub>GS</sub> =10V, I <sub>D</sub> =6A
<b>Dynamic</b>					
*Q <sub>g</sub>	-	41.3	62	nC	I <sub>D</sub> =12A, V <sub>DD</sub> =480V, V <sub>GS</sub> =10V
*Q <sub>gs</sub>	-	10	-		
*Q <sub>gd</sub>	-	11.4	-		
*t <sub>d(ON)</sub>	-	22.2	45	ns	V <sub>DD</sub> =300V, I <sub>D</sub> =12A, V <sub>GS</sub> =10V, R <sub>G</sub> =25Ω
*t <sub>r</sub>	-	10.4	21		
*t <sub>d(OFF)</sub>	-	141.4	283		
*t <sub>f</sub>	-	24	48		
C <sub>iss</sub>	-	1966	2950	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz
C <sub>oss</sub>	-	166	260		
C <sub>rss</sub>	-	24	36		
<b>Source-Drain Diode</b>					
*I <sub>S</sub>	-	-	12	A	
*I <sub>SM</sub>	-	-	48		
*V <sub>SD</sub>	-	0.85	1.5	V	I <sub>S</sub> =12A, V <sub>GS</sub> =0V
*t <sub>rr</sub>	-	446	-	ns	V <sub>GS</sub> =0V, I <sub>F</sub> =12A, dI <sub>F</sub> /dt=100A/μs
*Q <sub>rr</sub>	-	4.4	-	μC	

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

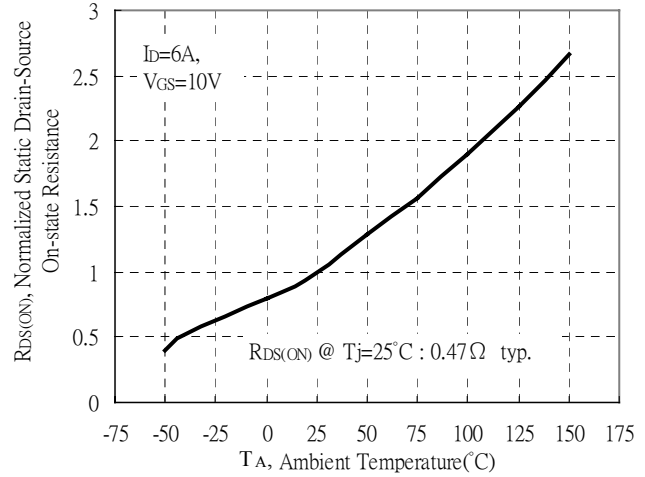


**Typical Characteristics**

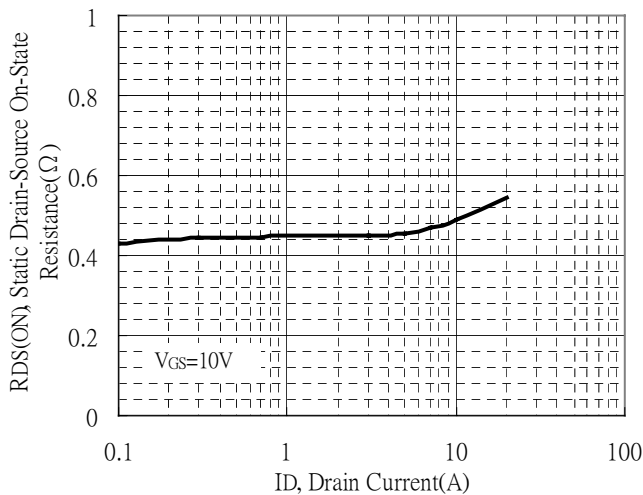
Typical Output Characteristics



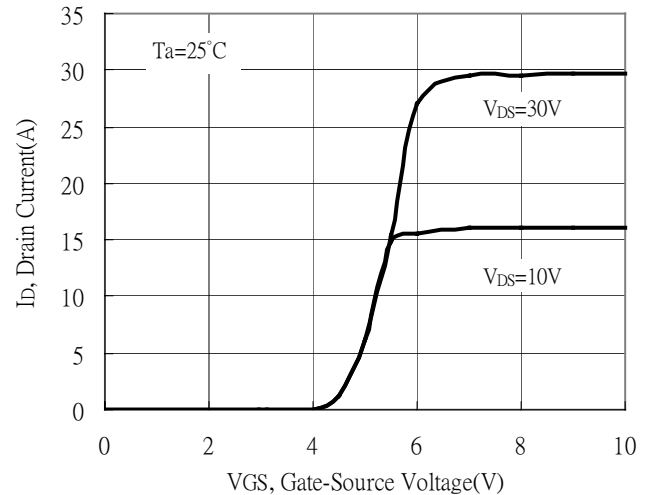
Static Drain-Source On-resistance vs Ambient Temperature



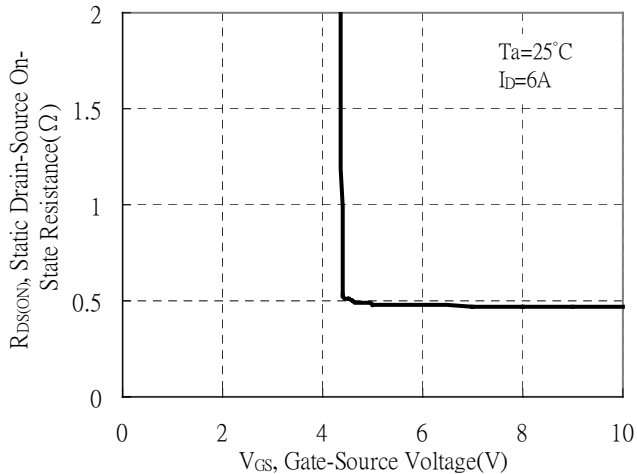
Static Drain-Source On-State resistance vs Drain Current



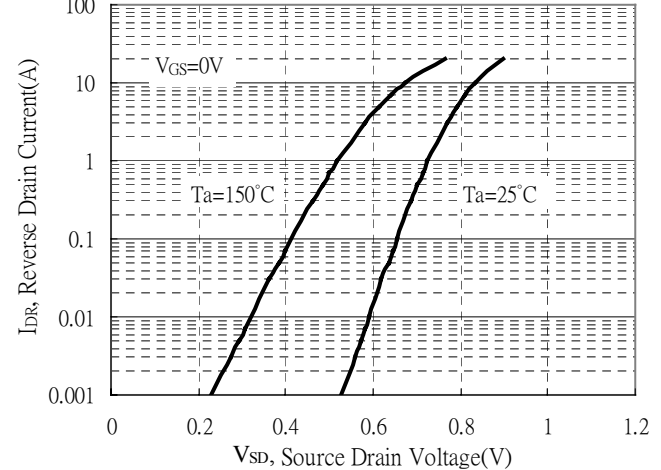
Drain Current vs Gate-Source Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage

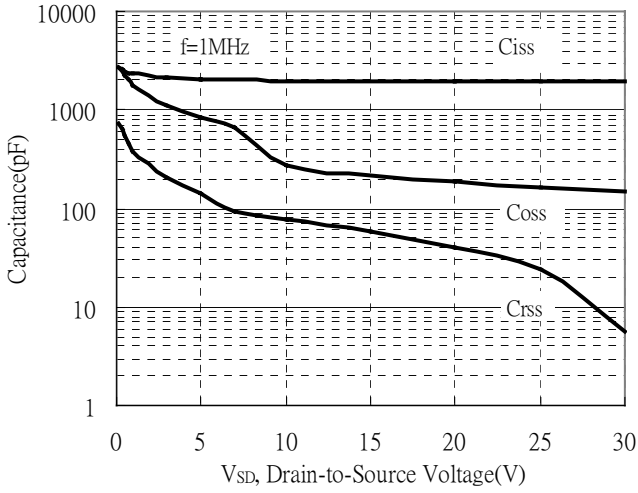


Body Diode Forward Voltage Variation vs Source Current and Temperature

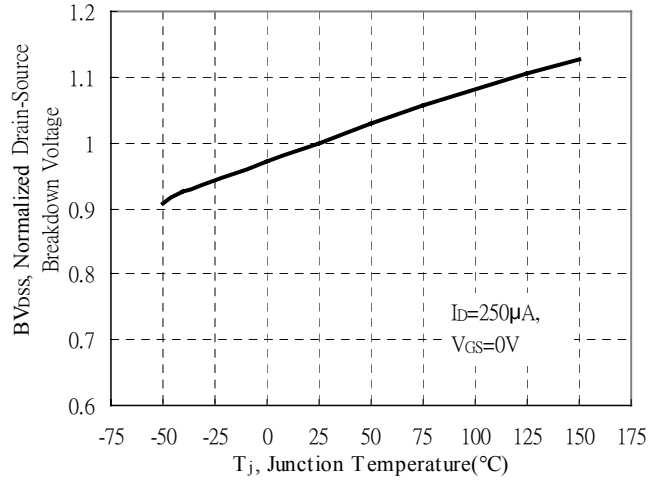


## Typical Characteristics (Cont.)

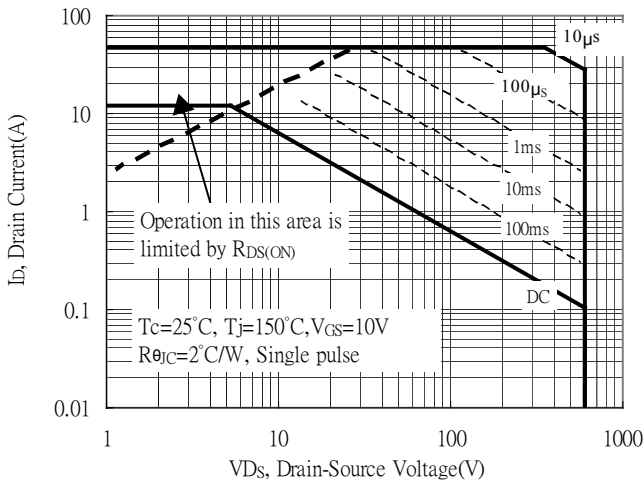
Capacitance vs Reverse Voltage



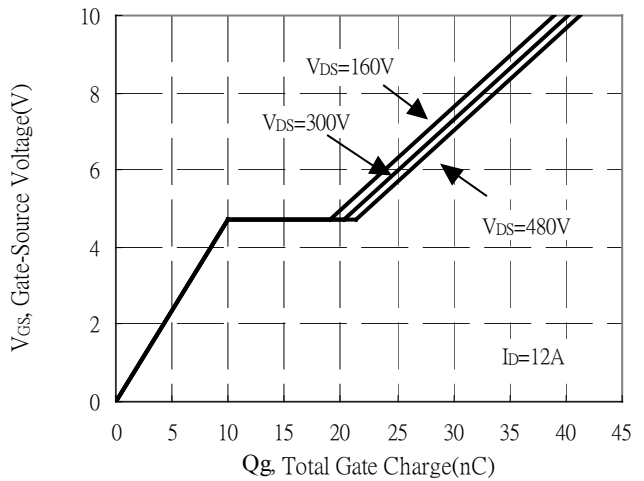
Brekdown Voltage vs Ambient Temperature



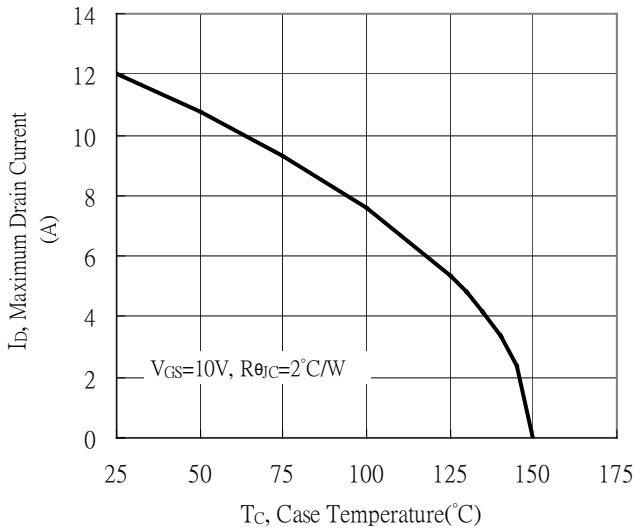
Maximum Safe Operating Area



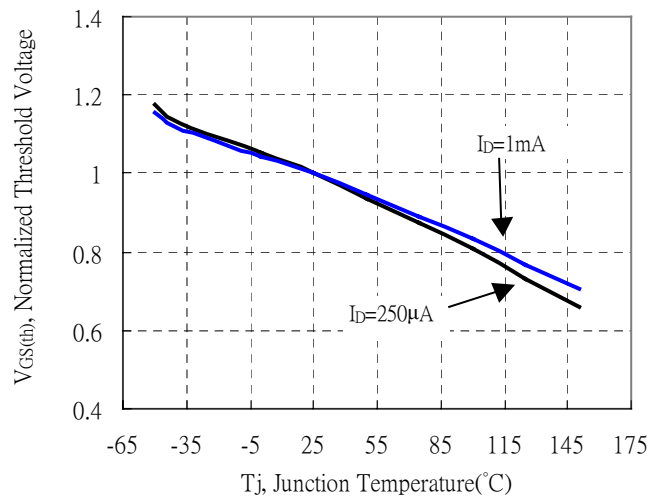
Gate Charge Characteristics



Maximum Drain Current vs Case Temperature



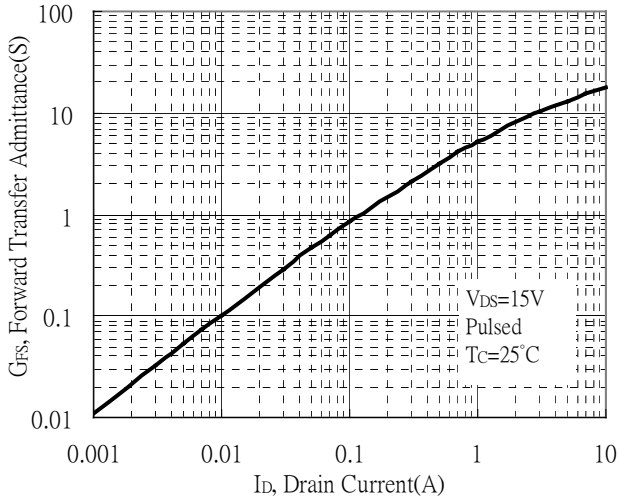
Threshold Voltage vs Junction Temperature



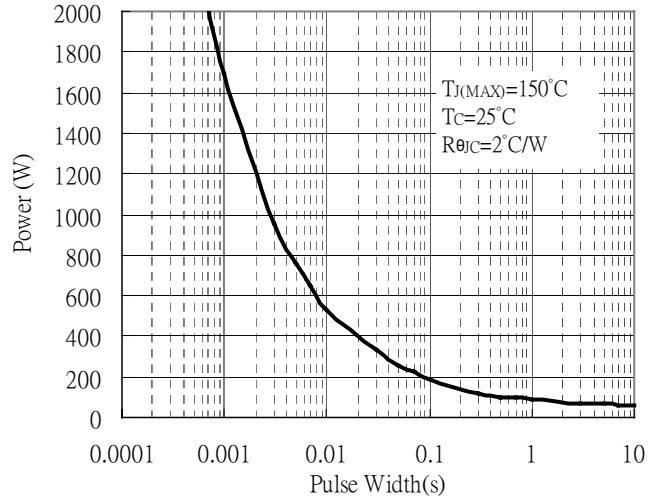


**Typical Characteristics (Cont.)**

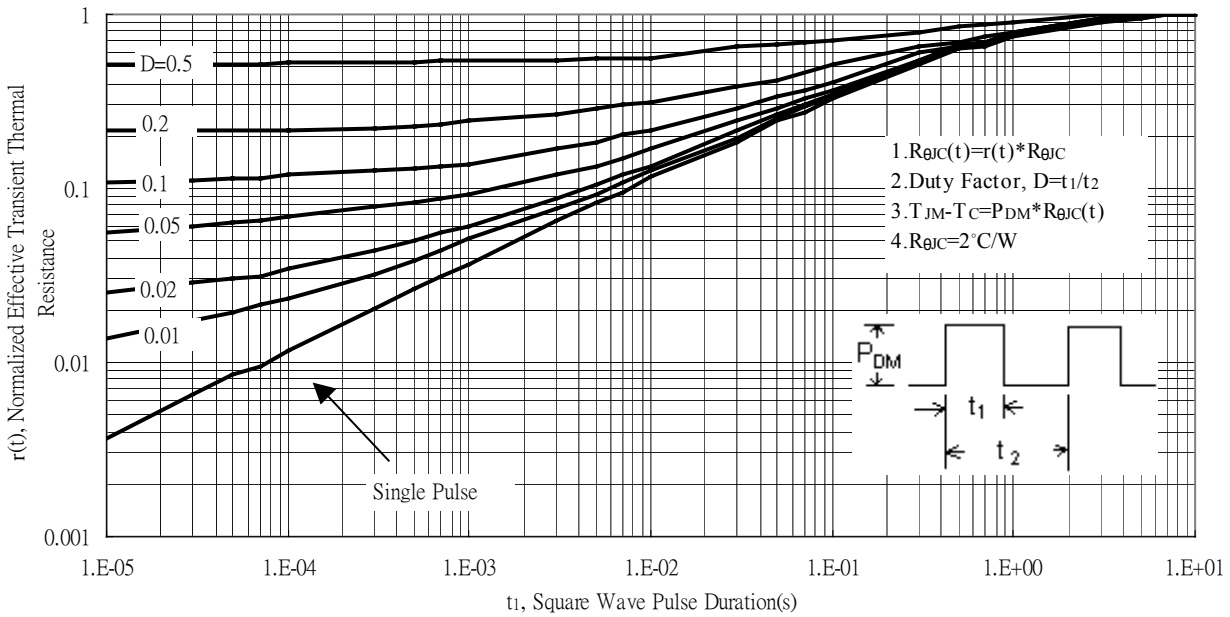
Forward Transfer Admittance vs Drain Current



Single Pulse Power Rating, Junction to Case



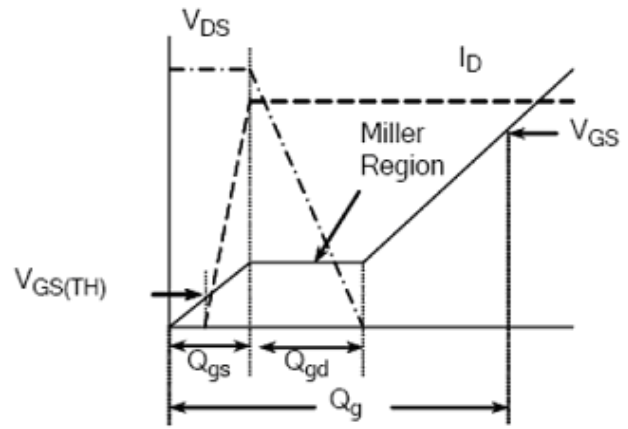
Transient Thermal Response Curves



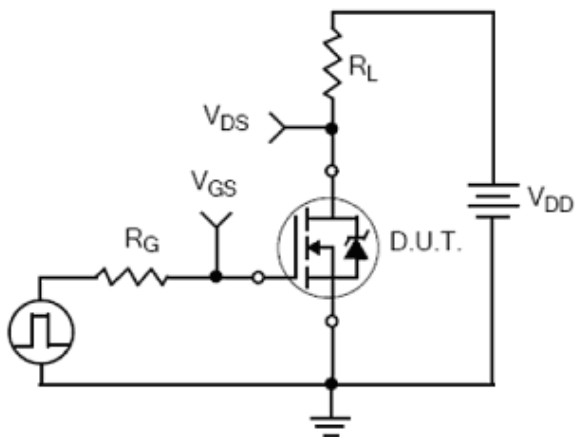
**Test Circuit and Waveforms**



**Gate Charge Test Circuit**



**Gate Charge Waveform**



**Resistive Switching Test Circuit**



**Resistive Switching Waveforms**

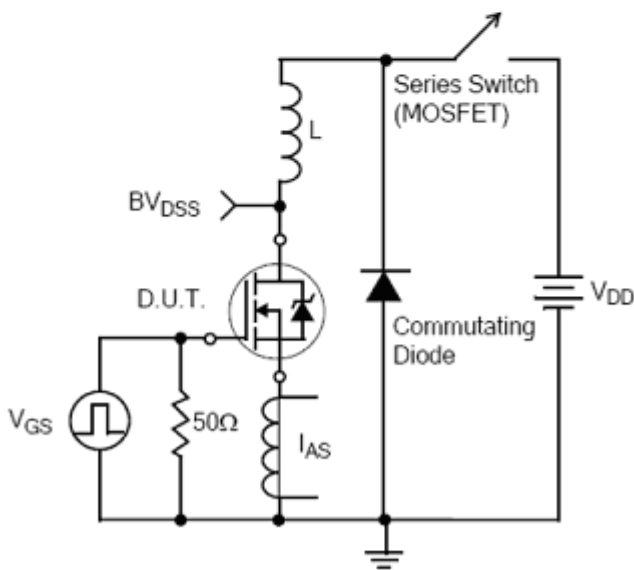
**Test Circuit and Waveforms(Cont.)**



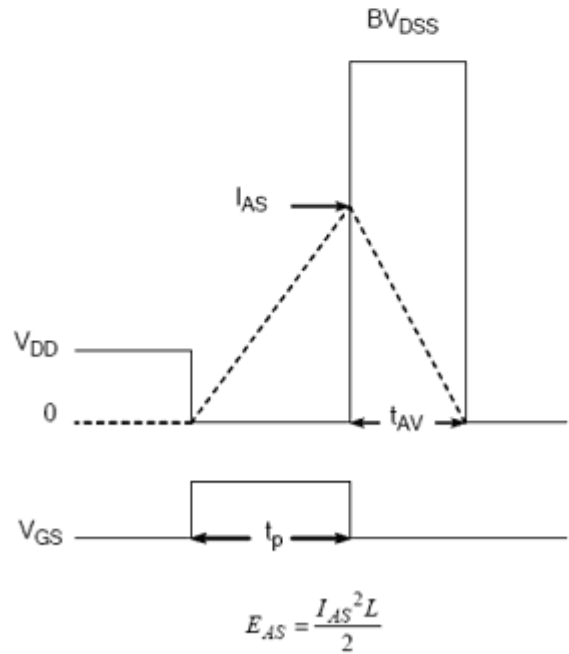
**Diode Reverse Recovery Test Circuit**



**Diode Reverse Recovery Waveform**



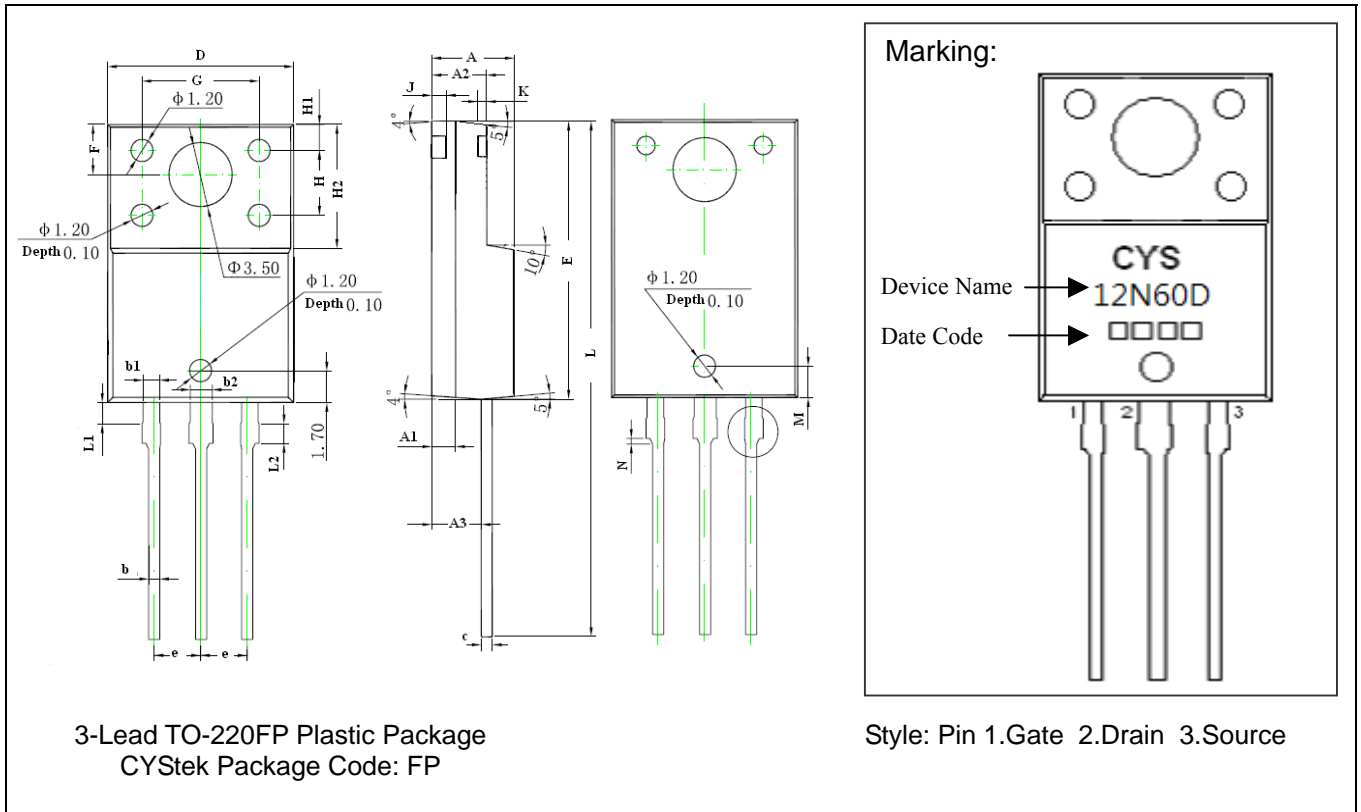
**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**



**TO-220FP Dimension**



\*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.

**Important Notice:**

- All rights are reserved. Reproduction in whole or in part is prohibited without the prior written approval of CYStek.
- CYStek reserves the right to make changes to its products without notice.
- CYStek **semiconductor products are not warranted to be suitable for use in Life-Support Applications, or systems.**
- CYStek assumes no liability for any consequence of customer product design, infringement of patents, or application assistance.