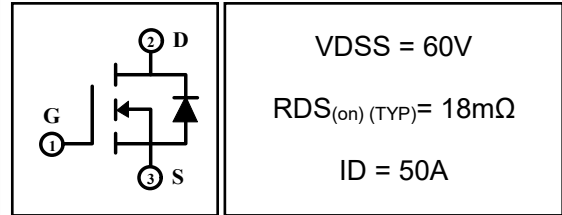


## 50A 60V N-channel Enhancement Mode Power MOSFET

### 1 Description

These N-channel Enhanced VDMOSFETs Used advanced trench technology design, provided excellent RDS(on) and low gate charge. Which accords with the RoHS standard.

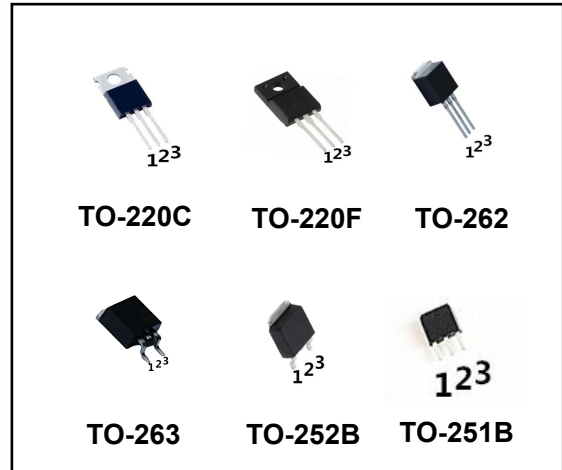


### 2 Features

- Fast Switching
- Low ON Resistance(Rdson≤22mΩ)
- Low Gate Charge(Typ: 60nC)
- Low Reverse Transfer Capacitances(Typ: 275pF)
- 100% Single Pulse Avalanche Energy Test
- 100% ΔV<sub>DS</sub> Test

### 3 Applications

- Power switching applications
- Switch Mode Power Supply(SMPS)
- Uninterruptible power supply(UPS)
- Power Factor Correction(PFC)



### 4 Electrical Characteristics

#### 4.1 Absolute Maximum Rating (T<sub>c</sub>=25°C, unless otherwise noted)

Parameter	Symbol	Rating		Units
		DH50N06FZC/ DHI50N06FZC/DHE50N06FZC/ /DHB50N06FZC/DHD50N06FZC	DHF50N06 FZC	
Maximum Drain-Source DC Voltage	V <sub>DS</sub>	60		V
Maximum Gate-Drain Voltage	V <sub>GS</sub>	±20		V
Drain Current(continuous)	I <sub>D</sub> (T=25°C) (T=100°C)	50		A
		30		A
Drain Current(Pulsed) <sup>(Note 1)</sup>	I <sub>DM</sub>	200		A
Single Pulse Avalanche Energy <sup>(Note 5)</sup>	E <sub>AS</sub>	620		mJ
Avalanche Current <sup>(Note 1)</sup>	I <sub>AS</sub>	50		A
Total Dissipation	T <sub>a</sub> =25°C	2	2	W
	T <sub>C</sub> =25°C	143	83	W
Junction Temperature	T <sub>j</sub>	150		°C
storage Temperature	T <sub>stg</sub>	-55~150		°C
Maximum Temperature for soldering	T <sub>L</sub>	300		°C

#### 4.2 Thermal Characteristics

Parameter	Symbol	Rating		Unit
		DH50N06FZC/ DHI50N06FZC/DHE50N06FZC/ /DHB50N06FZC/DHD50N06FZC	DHF50N06 FZC	
Thermal Resistance Junction to Case-sink	R <sub>thJC</sub>	0.87	1.51	°C/W
Thermal Resistance Junction to Ambient	R <sub>thJA</sub>	62.5	62.5	°C/W

### 4.3 Electrical Characteristics (T<sub>c</sub>=25°C, unless otherwise noted)

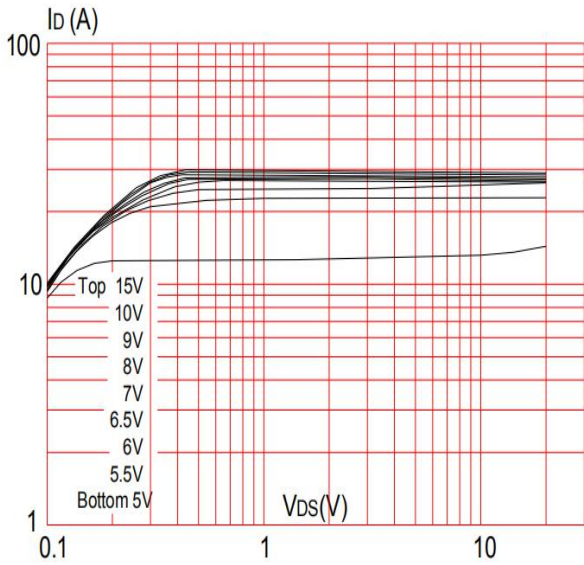
Parameter	Symbol	Test Condition	Value			Units
			Min	Typ	Max	
<b>Off Characteristics</b>						
Drain-source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	60	66	---	V
Drain-to-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V, T <sub>C</sub> =25°C	---	---	1	μA
		V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>C</sub> =125°C	---	---	100	μA
Gate-to-Source Forward Leakage	I <sub>GSSF</sub>	V <sub>GS</sub> =+20V	---	---	100	nA
Gate-to-Source Reverse Leakage	I <sub>GSSR</sub>	V <sub>GS</sub> =-20V	---	---	-100	nA
<b>On Characteristics</b> (Note 3)						
Gate threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2	3	4	V
Drain-source on Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =25A	---	18	22	mΩ
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz	---	1489	---	pF
Output Capacitance	C <sub>oss</sub>		---	608	---	
Reverse Transfer Capacitance	C <sub>riss</sub>		---	275	---	
<b>Switching Characteristics</b> (note4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =30V, I <sub>D</sub> =50A, V <sub>GS</sub> =10V, R <sub>GEN</sub> =25Ω	---	22	---	nS
Turn-on Rise Time	t <sub>r</sub>		---	82	---	
Turn-off Delay Time	t <sub>d(off)</sub>		---	52	---	
Turn-off Fall Time	t <sub>f</sub>		---	93	---	
Total Gate Charge	Q <sub>g</sub>	I <sub>D</sub> =50A, V <sub>DS</sub> =48V, V <sub>GS</sub> =10V	---	60	---	nC
Gate-to-Source Charge	Q <sub>gs</sub>		---	6	---	
Gate-to-Drain("Miller") Charge	Q <sub>gd</sub>		---	31	---	
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <sup>(3)</sup>	V <sub>FSD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =30A	---	0.9	1.2	V
Diode Forward Current <sup>(2)</sup>	I <sub>S</sub>		---	---	50	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> =25°C, I <sub>F</sub> =50A, di <sub>F</sub> /dt=100A/μS, V <sub>GS</sub> =0V	---	68	---	nS
Reverse Recovery Charge	Q <sub>rr</sub>		---	4200	---	nC

**Notes:**

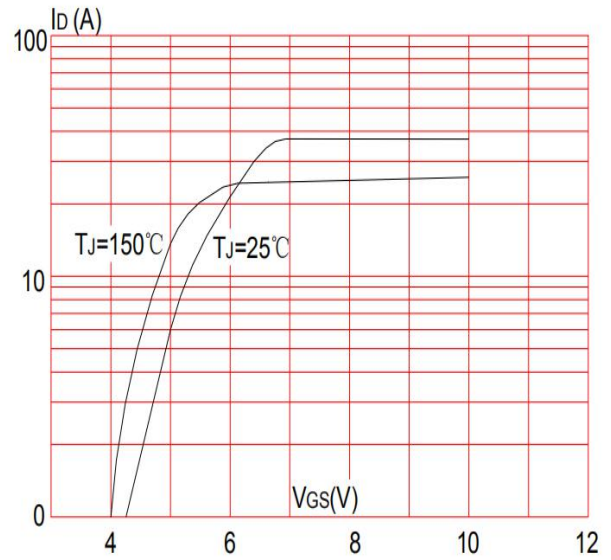
- 1: Repetitive rating, pulse width limited by maximum junction temperature.
- 2: Surface mounted on FR4 Board, t<sub>s</sub>≤10sec.
- 3: Pulse width ≤ 300μs, duty cycle ≤ 2%.
- 4: Guaranteed by design, not subject to production.
- 5: L=0.5mH, I<sub>D</sub>=50A, V<sub>DD</sub>=50V, V<sub>GATE</sub>=60V, Start T<sub>J</sub>=25°C.

**5 Typical characteristics diagrams**

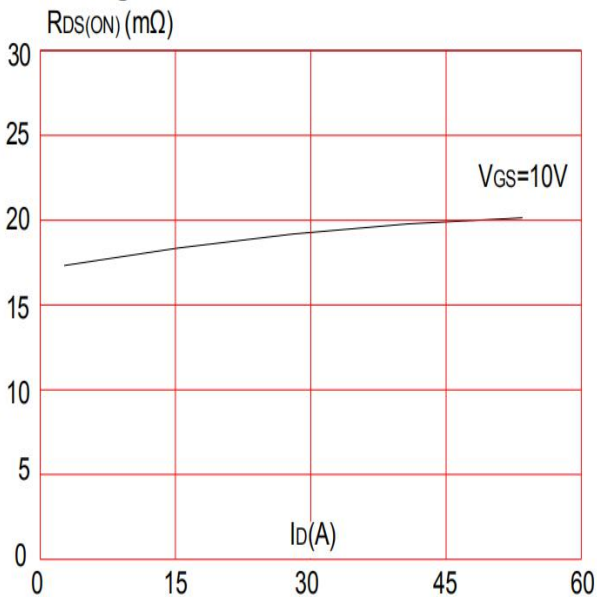
**Figure 1: Output Characteristics**



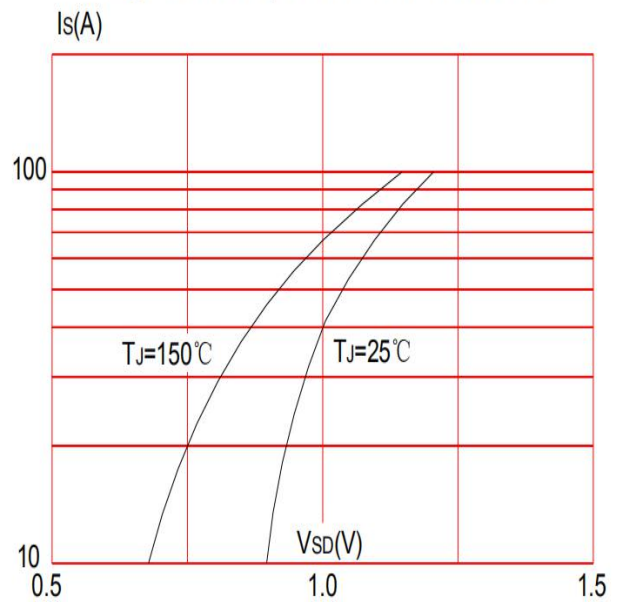
**Figure 2: Typical Transfer Characteristics**



**Figure 3: On-resistance vs. Drain Current**



**Figure 4: Body Diode Characteristics**



5 Typical characteristics diagrams(continues)

Figure 5: Gate Charge Characteristics

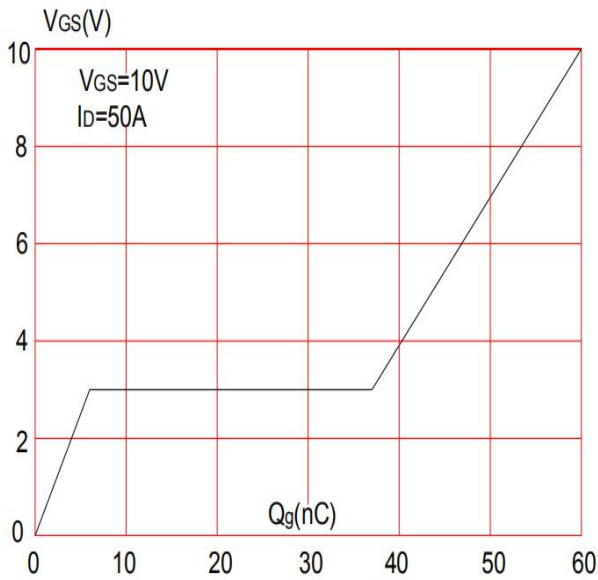


Figure 6: Capacitance Characteristics

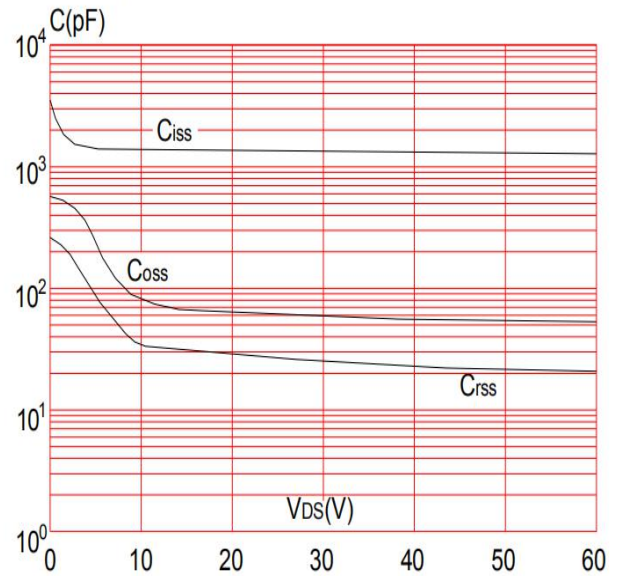


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

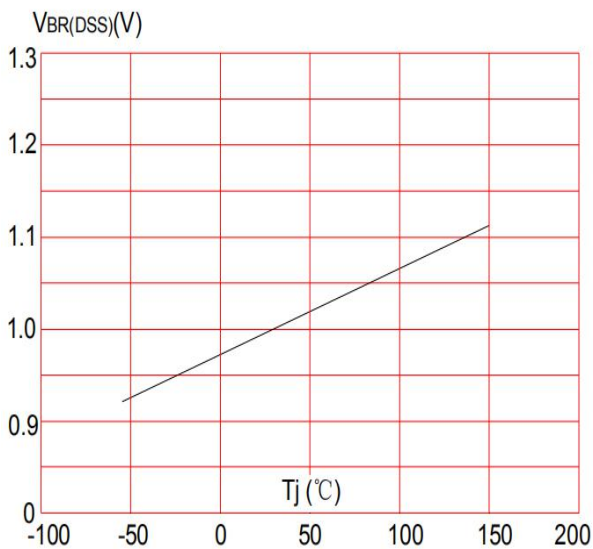
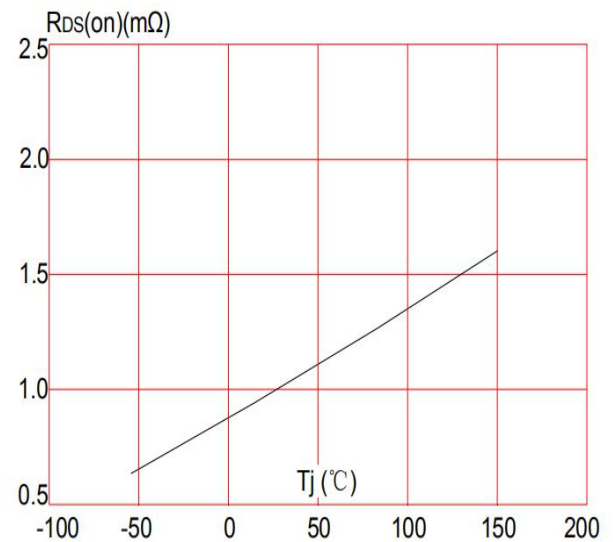


Figure 8: Normalized on Resistance vs. Junction Temperature





5 Typical characteristics diagrams(continues)

Figure 9: Maximum Safe Operating Area

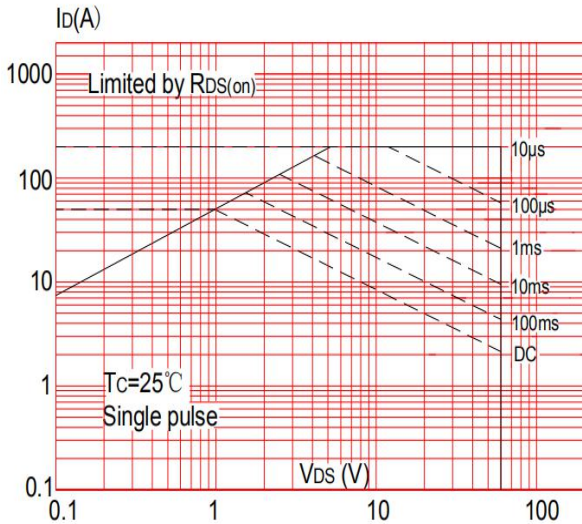


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

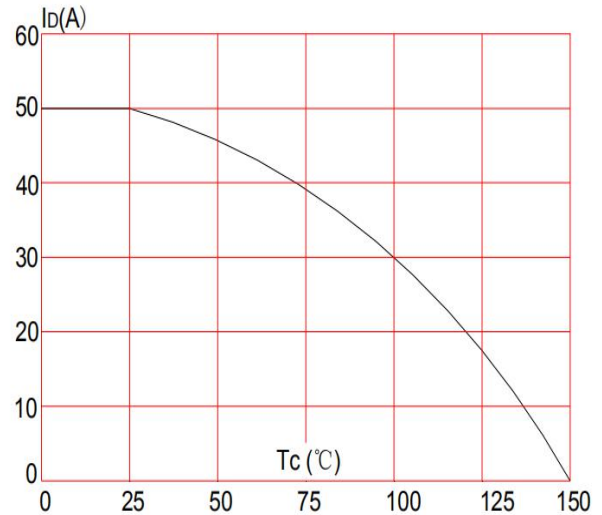


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-220C,TO-263)

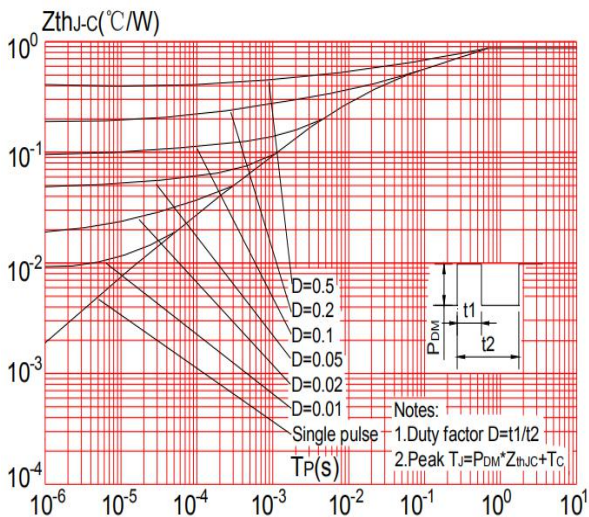
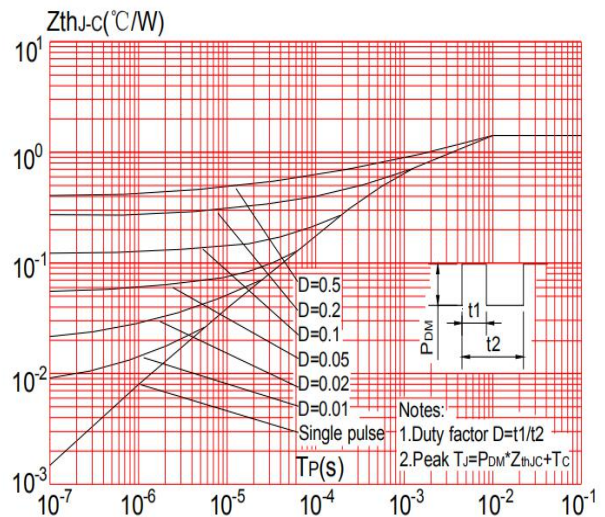
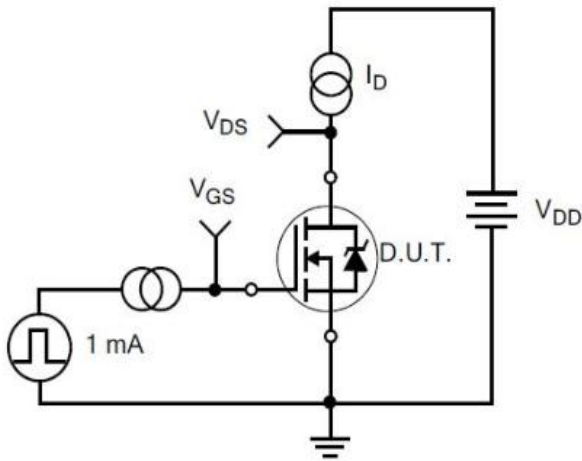


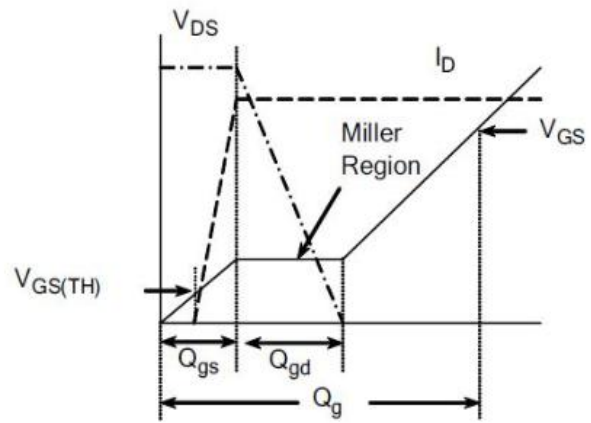
Figure.12: Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-220F)



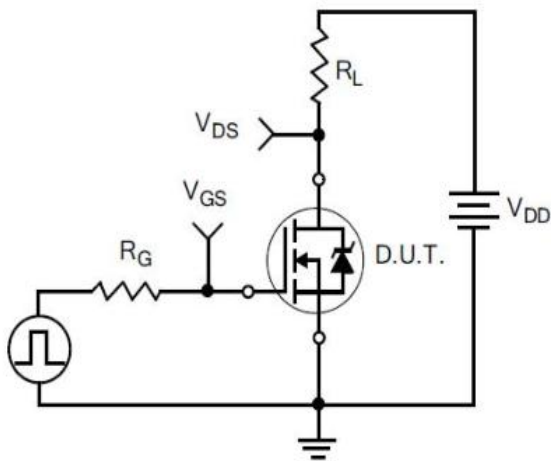
## 6 Typical Test Circuit and Waveform



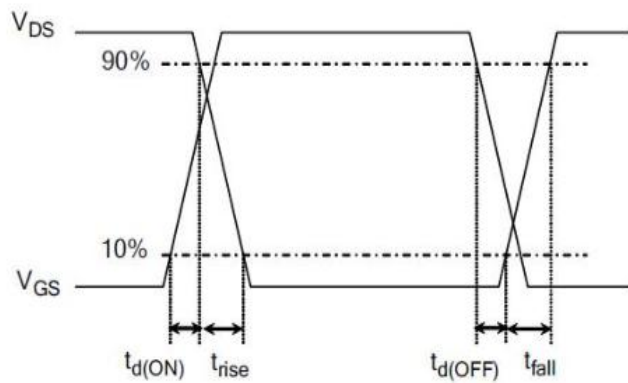
1) Gate Charge Test Circuit



2) . Gate Charge Waveform

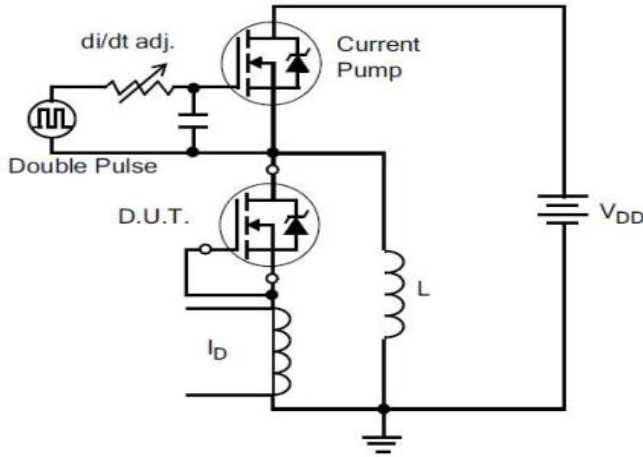


3) Resistive Switching Test Circuit

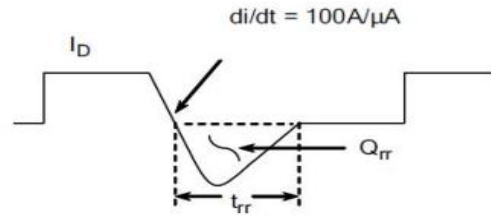


4) Resistive Switching Waveforms

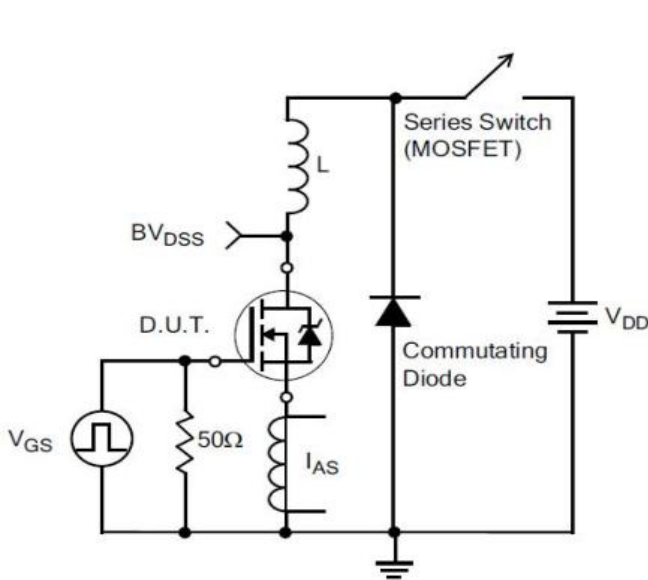
6 Typical Test Circuit and Waveform(continues)



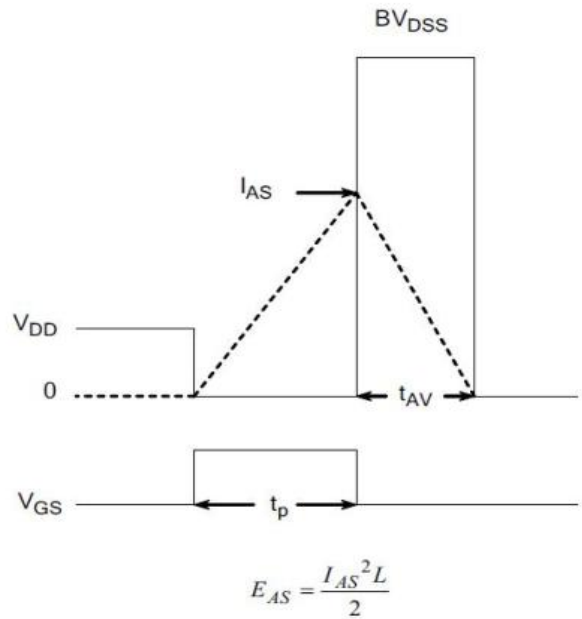
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

## 7 Product Names Rules

D H F X X N E X X

LOGO Code: DH

Packaging Code  
 220F: F    220: Nothing  
 251: B    252: D  
 262: I    263: E

Rated Current Code  
 With 1-2 Digital  
 For Example:  
 4 on behalf of 4A  
 10 on behalf of 10A  
 08 on behalf of 0.8A

Rated Voltage Code  
 With 2 Digital, For Example:  
 60 on behalf of 600V  
 06 on behalf of 60V

Special Function Code  
 E on behalf of build-in ESD  
 Nothing on behalf of not ESD

Channel Polarity Code  
 N on behalf of N channel  
 P on behalf of P channel

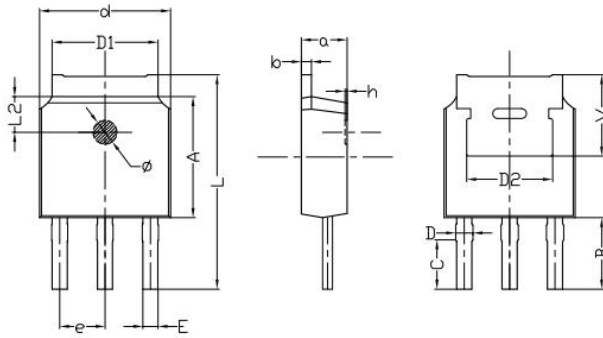
## 8 Product Specifications and Packaging Models

Product Model	Package Type	Mark Name	Identification Code	RoHS	Package	Quantity
DH50N06	TO-220C	DH50N06	FZC	Pb-free	Tube	1000/box
DHF50N06	TO-220F	DHF50N06	FZC	Pb-free	Tube	1000/box
DHB50N06	TO-251	DHB50N06	FZC	Pb-free	Tube	1000/box
DHD50N06	TO-252	DHD50N06	FZC	Pb-free	Tape & Reel	3000/box
DHI50N06	TO-262	DHI50N06	FZC	Pb-free	Tube	1000/box
DHE50N06	TO-263	DHE50N06	FZC	Pb-free	Tape & Reel	800/box



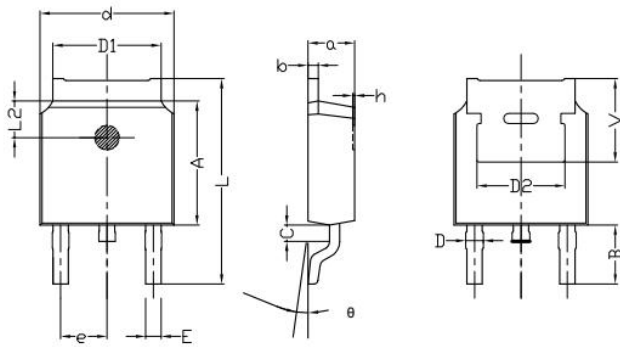
## 9 Dimensions

TO-251B PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
a	2.20	2.40	0.087	0.0946
b	0.46	0.58	0.018	0.023
C	2.45	2.65	0.097	0.104
D	0.80	0.90	0.032	0.035
d	6.30	6.70	0.248	0.264
D1	5.00	5.50	0.197	0.217
D2	TYP 4.83		TYP 0.190	
A	5.80	6.20	0.228	0.244
e	2.19	2.39	0.086	0.094
L	10.40	11.00	0.4098	0.4334
B	3.50	3.70	0.1379	0.1458
L2	1.5	1.8	0.059	0.071
Φ	1.10	1.30	0.0433	0.0512
h	0.00	0.30	0.000	0.012
V	5.25	5.85	0.207	0.230
E	0.60	0.80	0.0236	0.0315

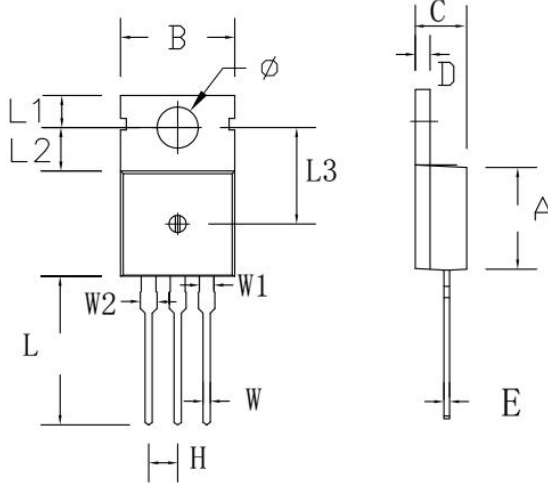
TO-252B PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
a	2.20	2.40	0.087	0.095
b	0.46	0.58	0.018	0.023
c	0.70	0.90	0.028	0.035
D	0.80	1.00	0.032	0.039
d	6.30	6.70	0.248	0.264
D1	5.00	5.50	0.197	0.217
D2	TYP 4.83		TYP 0.190	
A	5.80	6.20	0.228	0.244
e	2.19	2.39	0.086	0.094
L	9.40	10.40	0.370	0.409
B	2.6	3.2	0.102	0.126
L2	1.5	1.8	0.059	0.071
θ	0	8	0	8
h	0	0.3	0	0.012
V	5.25	5.85	0.207	0.230
E	0.6	0.8	0.024	0.032

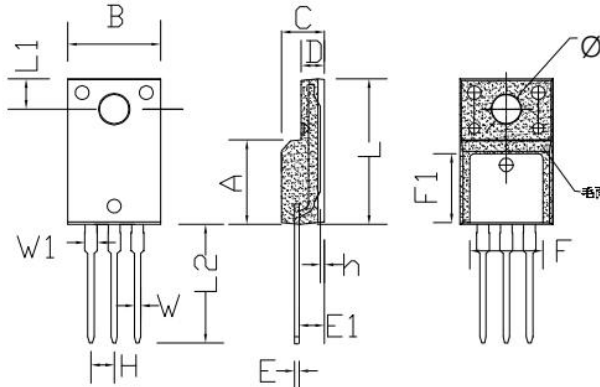
**9 Dimensions(continues)**

TO-220C PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	9.70	10.30	0.382	0.406
C	4.25	4.75	0.167	0.187
D	1.20	1.45	0.047	0.057
E	0.40	0.60	0.016	0.024
H	2.54 TYP		0.100 TYP	
W	0.60	0.95	0.024	0.037
W1	1.05	1.45	0.041	0.057
W2	1.20	1.60	0.047	0.063
L	12.60	13.40	0.496	0.528
L1	2.45	2.95	0.096	0.116
L2	3.45	3.95	0.136	0.156
L3	8.15	8.65	0.321	0.341
$\Phi$	3.50	3.90	0.138	0.154

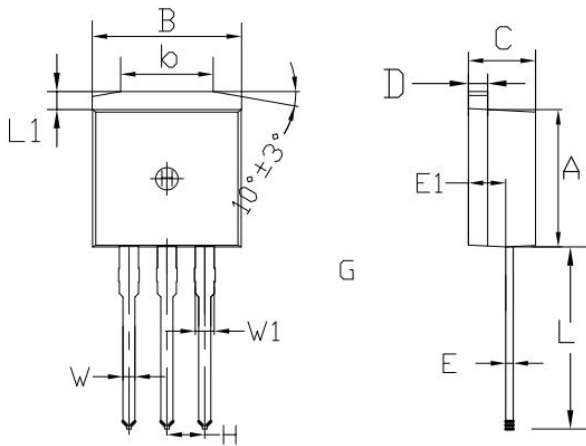
TO-220F PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	10.00	10.50	0.394	0.413
C	4.30	4.90	0.169	0.193
D	2.30	2.70	0.091	0.106
L	15.55	16.15	0.612	0.636
h	0.40	0.60	0.016	0.024
L1	3.15	3.55	0.124	0.140
L2	12.65	13.35	0.498	0.526
W	0.70	0.90	0.028	0.035
W1	1.15	1.55	0.045	0.061
H	2.54 TYP		0.100 TYP	
E	0.48	0.53	0.019	0.021
$\Phi$	2.90	3.40	0.114	0.134
E1	2.40	2.90	0.094	0.114
F	7.75	8.25	0.305	0.325
F1	7.35	7.85	0.289	0.309

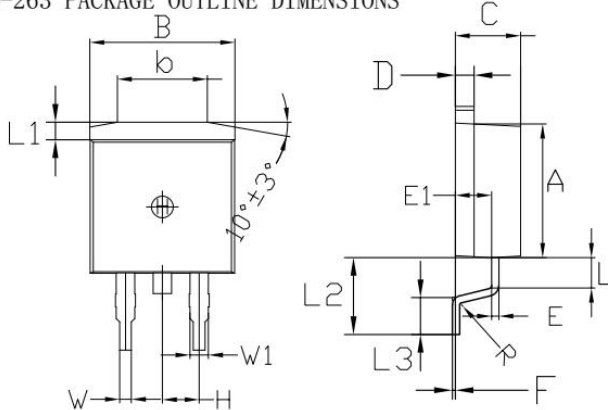
**9 Dimensions(continues)**

TO-262 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	9.70	10.30	0.382	0.406
C	4.25	4.75	0.167	0.187
D	1.20	1.45	0.047	0.057
E	0.40	0.60	0.016	0.024
L	12.25	13.75	0.482	0.541
L1	1.15	1.45	0.045	0.057
E1	2.4	2.6	0.0945	0.1024
W	0.80	0.82	0.0315	0.034
W1	1.20	1.30	0.047	0.051
H	2.54 TYP		0.200 TYP	
b	5.50	6.50	0.216	0.256

TO-263 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	9.70	10.30	0.382	0.406
C	4.25	4.75	0.167	0.187
D	1.20	1.45	0.047	0.057
E	0.40	0.60	0.016	0.024
L	1.90	2.30	0.075	0.091
L1	1.15	1.45	0.045	0.057
R	0.24	0.26	0.0095	0.0102
W	0.80	0.82	0.0315	0.0323
W1	1.20	1.30	0.047	0.051
H	2.54 TYP		0.200 TYP	
b	5.50	6.50	0.216	0.256
E1	2.4	2.6	0.0946	0.1024
L2	5.20	5.80	0.205	0.228
L3	2.20	3.20	0.087	0.126
F	0.03	0.23	0.0012	0.0091

## 10 Attentions

- Jiangsu Donghai Semiconductor Technology CO.,LTD. reserves the right to change the specification without prior notice! The customer should obtain the latest version of the information before making the order and verify that the information is complete and up to date.
- It is the responsibility of the purchaser for any failure or failure of any semiconductor product under certain conditions. It is the responsibility of the purchaser to comply with safety standards and to take safety measures in the system design and machine manufacturing of Donghai products in order to avoid potential risk of failure. Injury or property damage.
- Product promotion is endless, our company will be dedicated to provide customers with better products.

## 11 Appendix

Revision history:

Date	REV.	Description	Page
2018.08.12	1.0	Original	