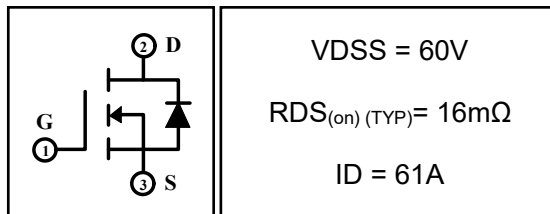


61A 60V N-channel Enhancement Mode Power MOSFET

1 Description

These N-channel Enhanced VDMOSFETs Used by the self-aligned planar technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. Which accords with the RoHS standard.

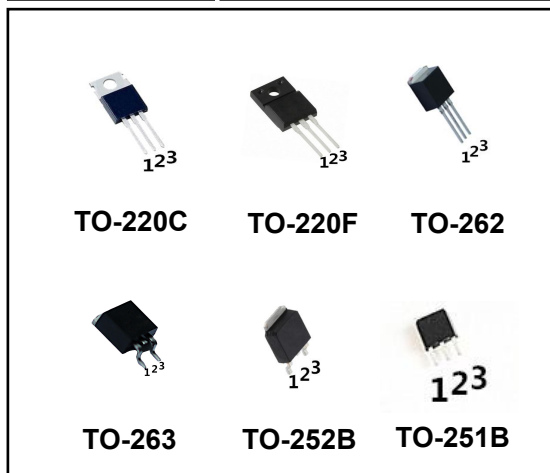


2 Features

- Fast Switching
- Low ON Resistance($R_{DS(on)} \leq 23m\Omega$)
- Low Gate Charge(Typ: 39.3nC)
- Low Reverse Transfer Capacitances(Typ: 90pF)
- 100% Single Pulse Avalanche Energy Test
- 100% ΔV_{DS} Test

3 Applications

- Battery power supply management circuit
- DC-DC Convertors
- UPS power supply
- Load switch



4 Electrical Characteristics

4.1 Absolute Maximum Rating ($T_c = 25^\circ C$, unless otherwise noted)

Parameter		Symbol	Value		Units
			DH16N06/DHI16N06/DHE16N06/DHB16N06/DHD16N06	DHF16N06	
Maximum Drain-Source DC Voltage		V_{DS}	60		V
Maximum Gate-Drain Voltage		V_{GS}	± 20		V
Drain Current(continuous)		I_D ($T = 25^\circ C$) ($T = 100^\circ C$)	61		A
			39		A
Drain Current(Pulsed)(Note 1)		I_{DM}	200		A
Single Pulse Avalanche Energy(Note 5)		E_{AS}	670		mJ
Avalanche Current(Note 1)		I_{AS}	52		A
Total Dissipation	$T_a = 25^\circ C$	P_{tot}	2	2	W
	$T_c = 25^\circ C$	P_{tot}	120	42	W
Junction Temperature		T_j	175		$^\circ C$
storage Temperature		T_{stg}	$-55 \sim 175$		$^\circ C$
Maximum Temperature for soldering		T_L	300		$^\circ C$

4.2 Thermal Characteristics

Parameter		Symbol	Value		Unit
			DH16N06/DHI16N06/DHE16N06/DHB16N06/DHD16N06	DHF16N06	
Thermal Resistance Junction to Case-sink		R_{thJC}	1.25	3.57	$^\circ C/W$
Thermal Resistance Junction to Ambient		R_{thJA}	75	75	$^\circ C/W$

4.3 Electrical Characteristics (T_c=25°C, unless otherwise noted)

Parameter	Symbol	Test Condition	Value			Units
			Min	Typ	Max	
Off Characteristics						
Drain-source Breakdown Voltage	BV _{DSS}	I _D =250μA,V _{GS} =0V	60	68	--	V
Drain-to-Source Leakage Current	I _{DSS}	V _{DS} =60V,V _{GS} =0V,T _C =25℃	--	--	1	μA
		V _{DS} =48V,V _{GS} =0V,T _C =125℃	--	--	100	μA
Gate-to-Source Forward Leakage	I _{GSSF}	V _{GS} =+20V	--	--	100	nA
Gate-to-Source Reverse Leakage	I _{GSSR}	V _{GS} =-20V	--	--	-100	nA
On Characteristics ^(Note 3)						
Gate threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	2	3.1	4	V
Drain-source on Resistance	R _{DS(on)}	V _{GS} =10V,I _D =25A	--	16	23	mΩ
Dynamic Characteristics ^(Note 4)						
Forward Transfer Conductance	g _{fs}	V _{DS} =10V,I _D =25A	--	27	--	S
Input Capacitance	C _{iss}	V _{GS} =0V,V _{DS} =25V,f=1.0MHz	--	1630	--	pF
Output Capacitance	C _{oss}		--	607	--	
Reverse Transfer Capacitance	C _{rss}		--	90	--	
Switching Characteristics ^(note4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, I _D =25A, V _{GS} =10V, R _{GEN} =25Ω	--	19	--	nS
Turn-on Rise Time	t _r		--	123	--	
Turn-off Delay Time	t _{d(off)}		--	72	--	
Turn-off Fall Time	t _f		--	69	--	
Total Gate Charge	Q _g	I _D =50A,V _{DS} =48V,V _{GS} =10V	--	39.3	--	nC
Gate-to-Source Charge	Q _{gs}		--	9.2	--	
Gate-to-Drain(“Miller”) Charge	Q _{gd}		--	16	--	
Drain-Source Diode Characteristics						
Diode Forward Voltage ⁽³⁾	V _{FSD}	V _{GS} =0V,I _S =50A	--	--	1.5	V
Diode Forward Current ⁽²⁾	I _S		--	--	61	A
Reverse Recovery Time	t _{rr}	T _J =25℃,I _F =50A, dI _F /dt=100A/μS,V _{GS} =0V	--	73	--	nS
Reverse Recovery Charge	Q _{rr}		--	105	--	nC

Notes:

- 1: Repetitive rating, pulse width limited by maximum junction temperature.
- 2: Surface mounted on FR4 Board, t≤10sec.
- 3: Pulse width ≤ 300μs, duty cycle ≤ 2%.
- 4: Guaranteed by design, not subject to production.
5. L=0.5mH, I_D=52A, V_{DD}=50V, R_G=25Ω, V_{GATE}=60V, Start T_J=25°C.

5 Typical characteristics diagrams

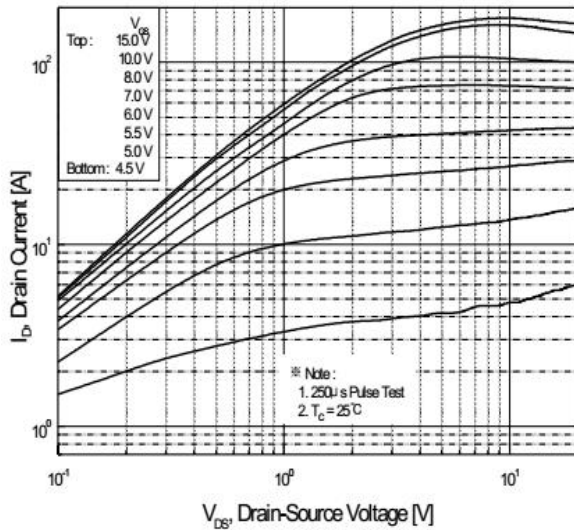


Figure 1. On-Region Characteristics

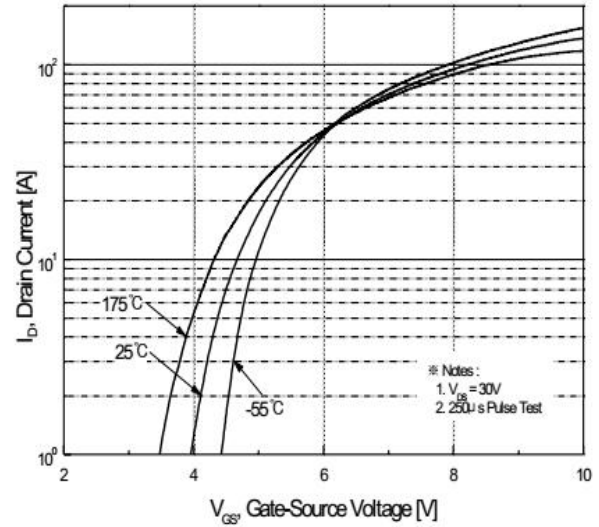


Figure 2. Transfer Characteristics

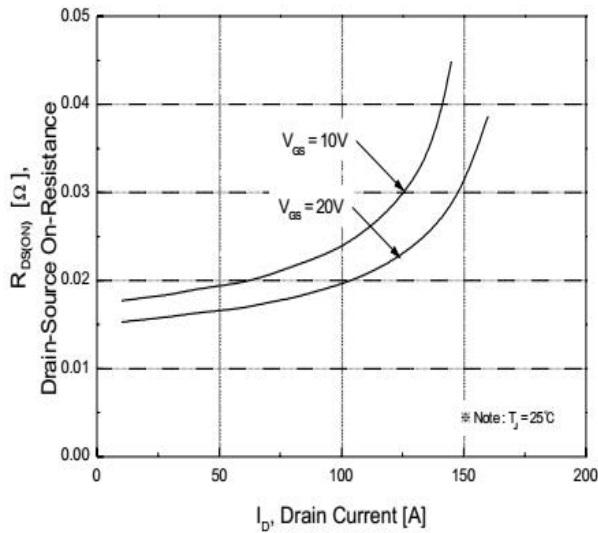


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

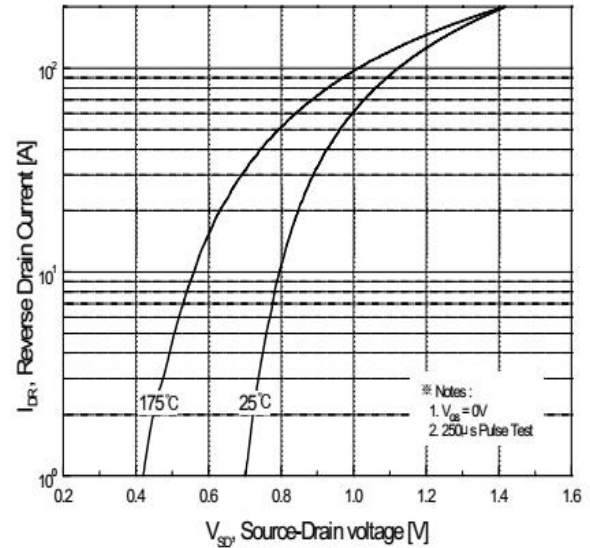


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

5 Typical characteristics diagrams(continues)

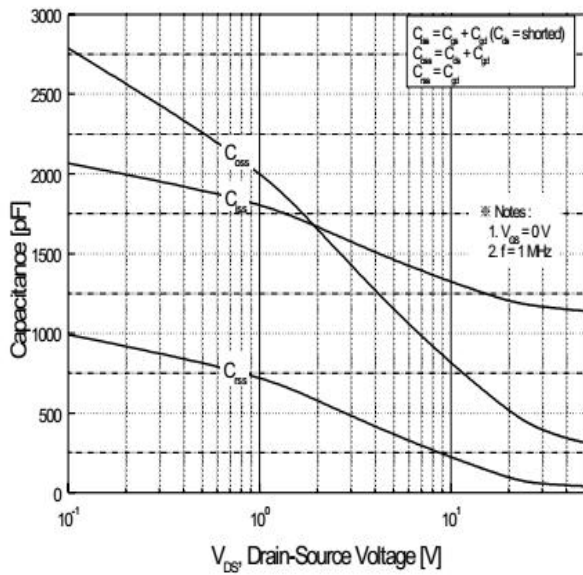


Figure 5. Capacitance Characteristics

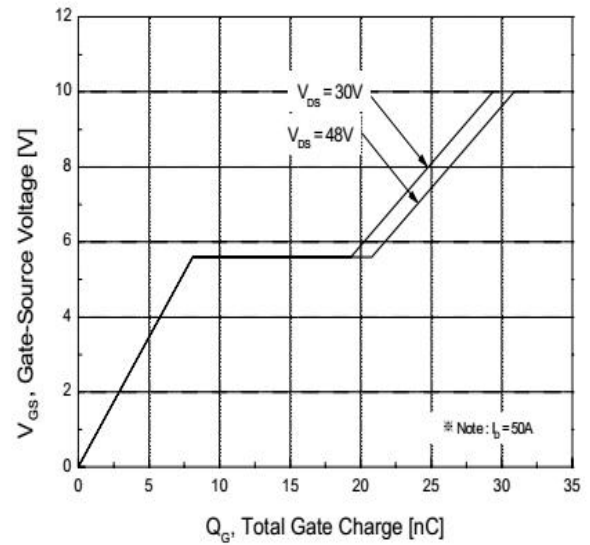


Figure 6. Gate Charge Characteristics

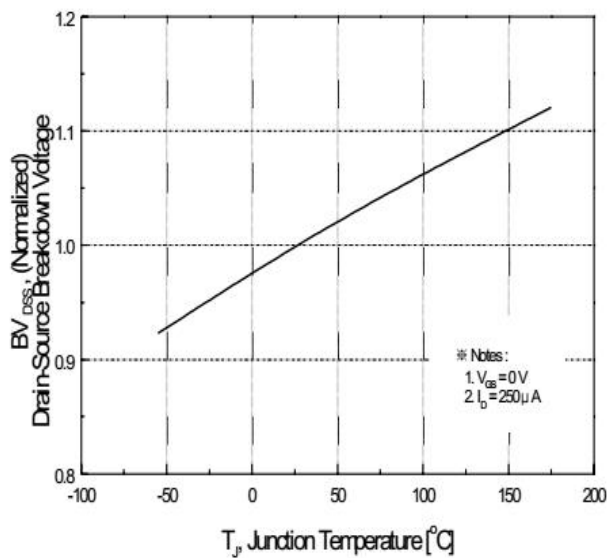


Figure 7. Breakdown Voltage Variation vs. Temperature

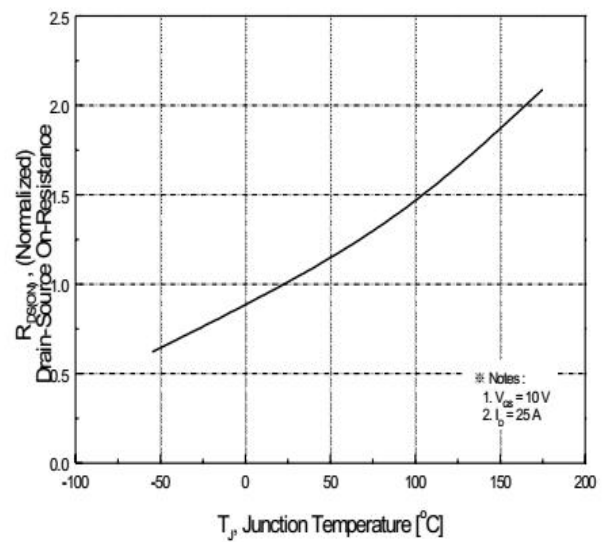


Figure 8. On-Resistance Variation vs. Temperature

5 Typical characteristics diagrams(continues)

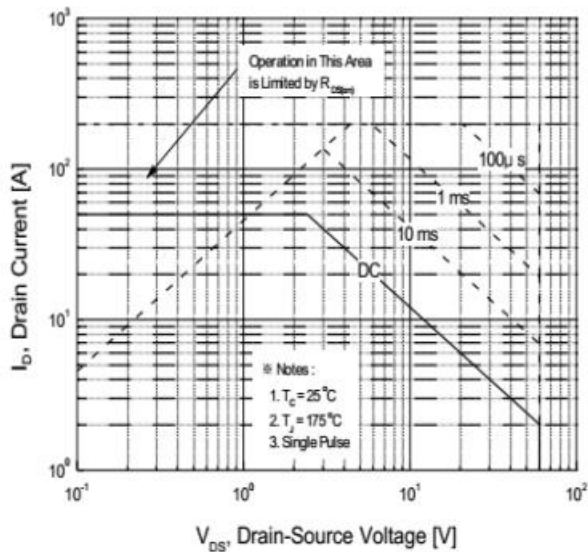


Figure 9. Maximum Safe Operating Area

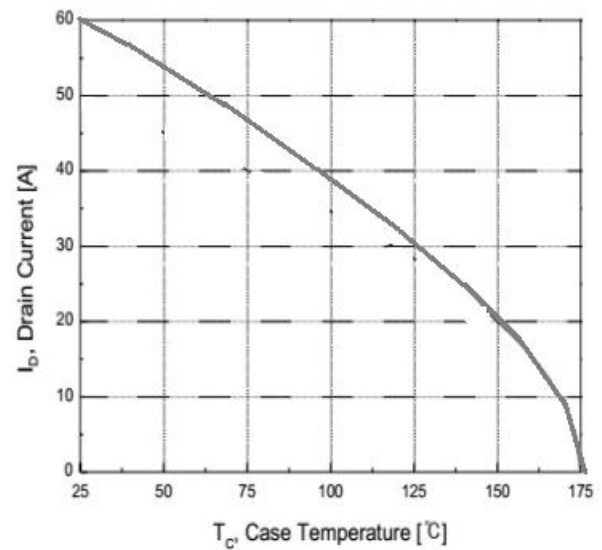


Figure 10. Maximum Drain Current vs. Case Temperature

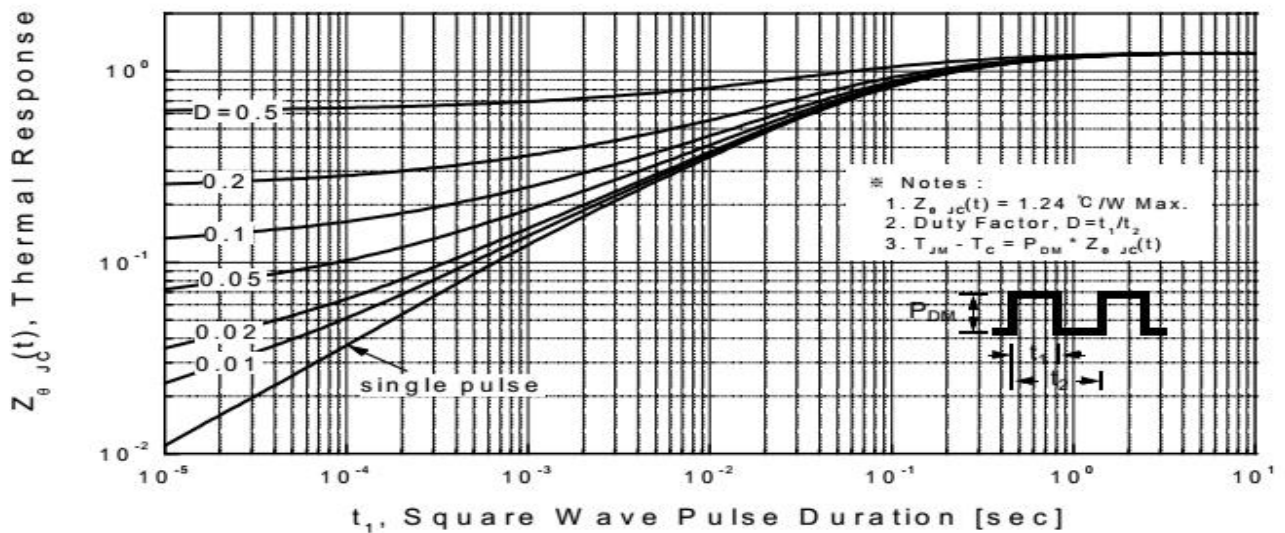
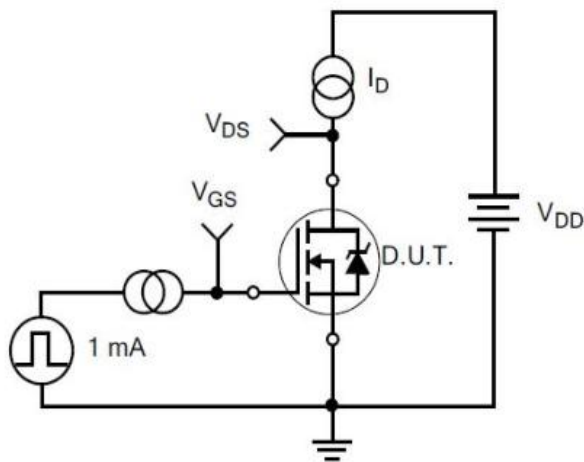
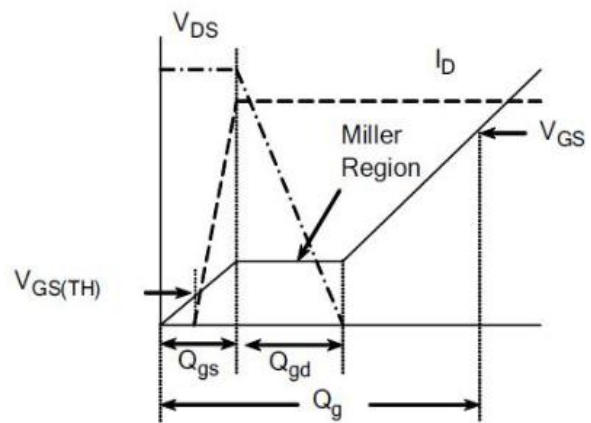


Figure 11. Transient Thermal Response Curve

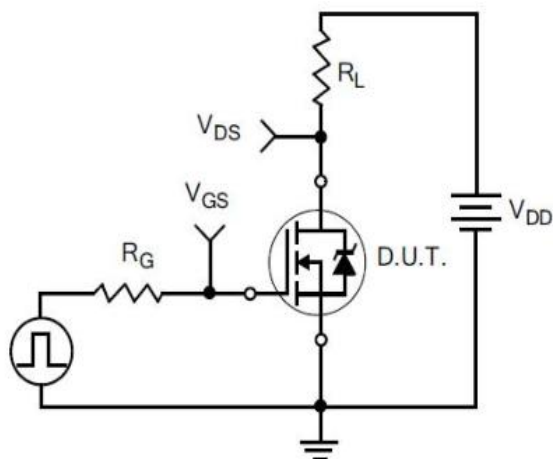
6 Typical Test Circuit and Waveform



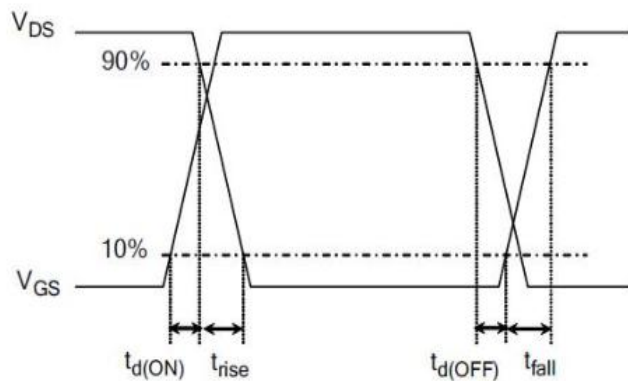
1) Gate Charge Test Circuit



2) . Gate Charge Waveform

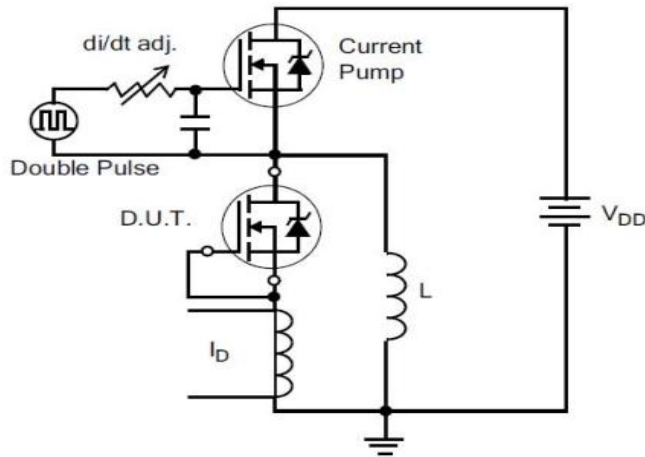


3) Resistive Switching Test Circuit

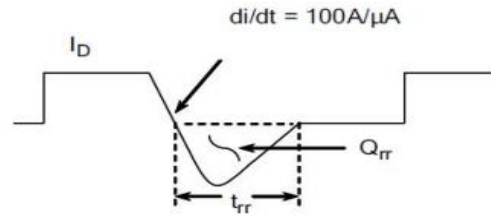


4) Resistive Switching Waveforms

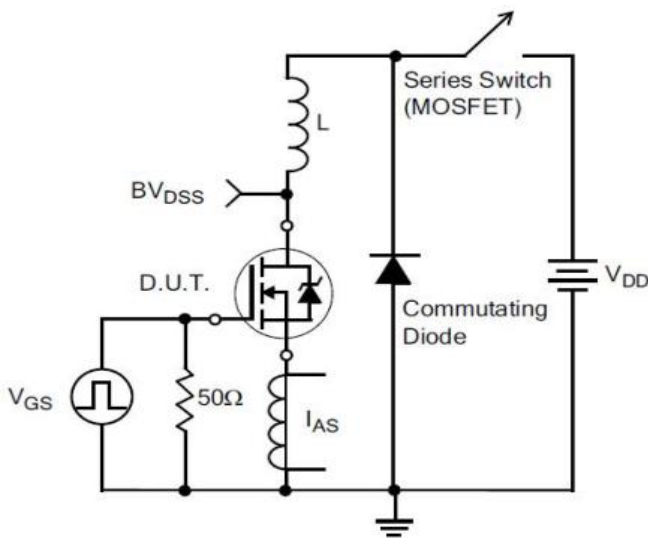
6 Typical Test Circuit and Waveform(continues)



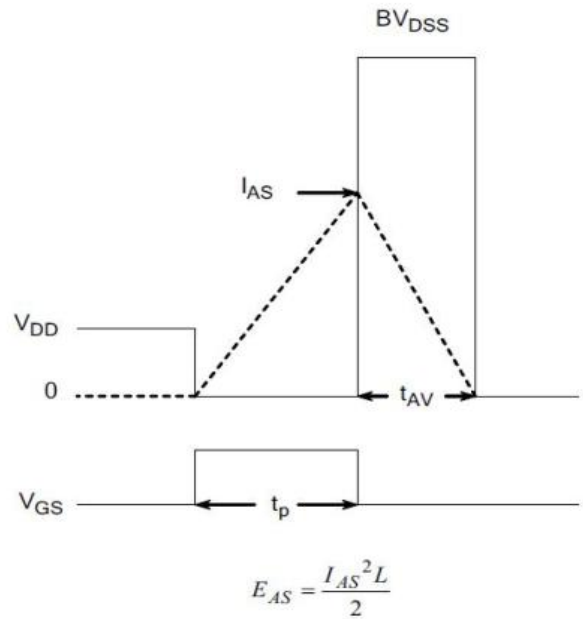
5) Diode Reverse Recovery Test Circuit



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

RDSON Typ Code
With 2-3 Digitals
For Example:
16 on behalf of 16mΩ
045 on behalf of 4.5mΩ

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

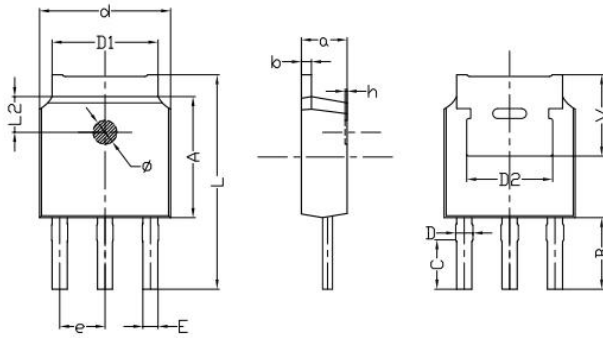
Channel Polarity Code
N on behalf of N channel
P on behalf of P channel

8 Product Specifications and Packaging Models

Product Model	Package Type	Mark Name	Indentification Code	RoHS	Package	Quantity
DH16N06	TO-220C	DH16N06	GY5	Pb-free	Tube	1000/box
DHF16N06	TO-220F	DHF16N06	GY5	Pb-free	Tube	1000/box
DHB16N06	TO-251	DHB16N06	GY5	Pb-free	Tube	1000/box
DHD16N06	TO-252	DHD16N06	GY5	Pb-free	Tape & Reel	3000/box
DHI16N06	TO-262	DHI16N06	GY5	Pb-free	Tube	1000/box
DHE16N06	TO-263	DHE16N06	GY5	Pb-free	Tape & Reel	800/box

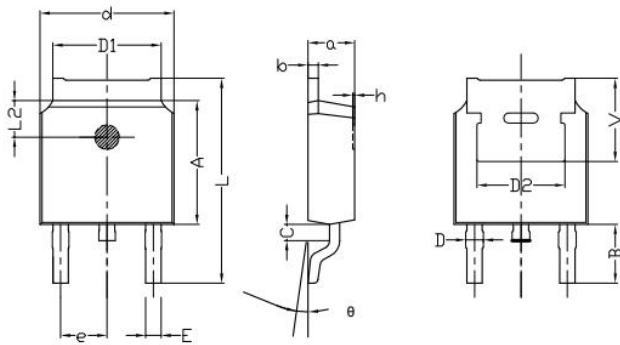
9 Dimensions

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

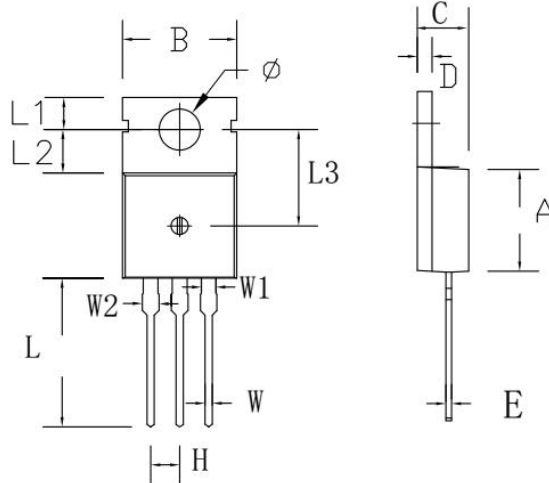
TO-252B PACKAGE OUTLINE DIMENSIONS



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

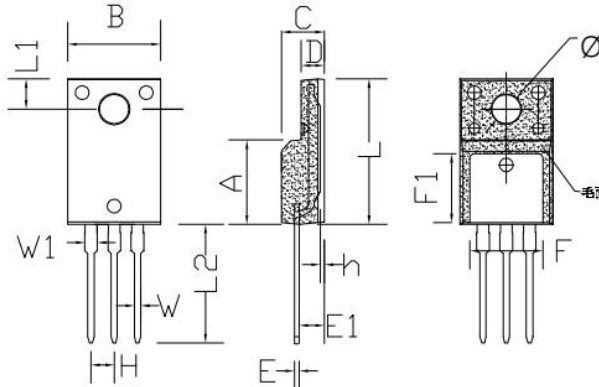
9 Dimensions(continues)

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
Φ	3.50	3.90	0.138	0.154

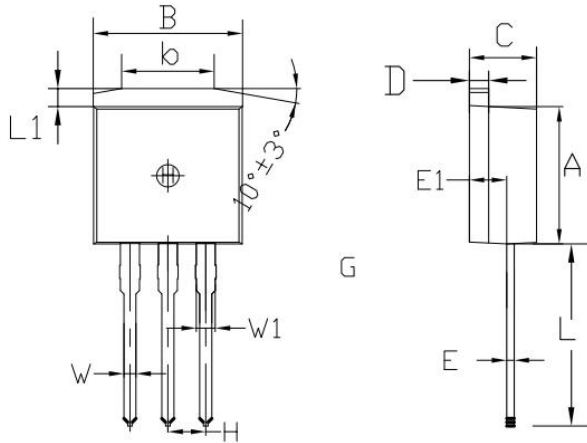
TO-220F PACKAGE OUTLINE DIMENSIONS



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
Φ	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

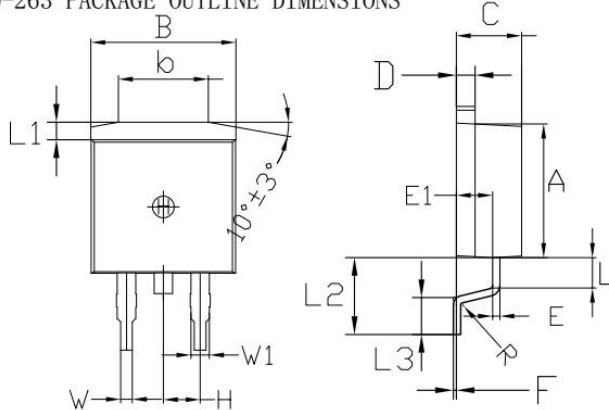
9 Dimensions(continues)

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
2018.07.12	1.0	Original	