

155A 40V N-channel Enhancement Mode Power MOSFET

1 Description

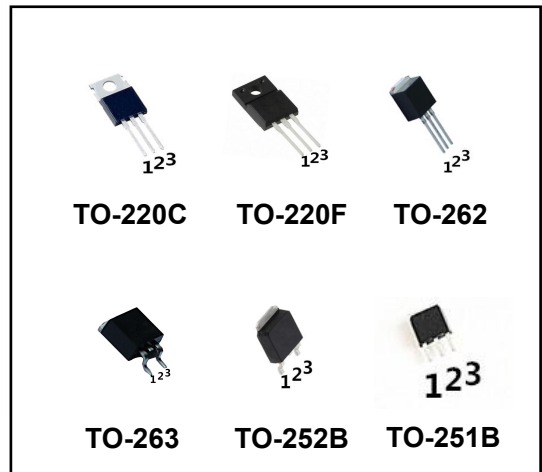
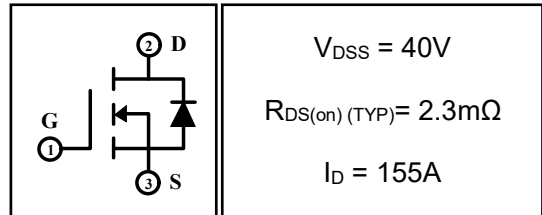
These N-channel enhanced vdmofets used advanced trench technology design, provided excellent $R_{DS(on)}$ and low gate charge. Which accords with the RoHS standard.

2 Features

- Fast switching
- High avalanche Current
- Low on resistance($R_{DS(on)} \leq 3.5m\Omega$)
- Low gate charge(Typ: 121nC)
- Low reverse transfer capacitances(Typ: 640pF)
- 100% single pulse avalanche energy test
- 100% ΔV_{DS} test

3 Applications

- DC-DC converters
- Power supply



4 Electrical Characteristics

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

Parameter	Symbol	Rating		Units	
		DH035N04/ DHI035N04/DHE035N04 /DHB035N04/DHD035N04	DHF035 N04		
Drain-to-Source Voltage	V_{DSS}	40		V	
Gate-to-Source Voltage	V_{GSS}	± 20		V	
Continuous Drain Current	I_D	$T_C=25^\circ C$	155	A	
		$T_C=100^\circ C$	110	A	
Pulsed Drain Current ⁽¹⁾	I_{DM}	520		A	
Single Pulse Avalanche Energy ⁽⁴⁾	E_{AS}	1010		mJ	
Avalanche Current ⁽⁴⁾	I_{AS}	63.5		A	
Power Dissipation	P_{tot}	$T_a=25^\circ C$	2	2	W
		$T_C=25^\circ C$	150	40	W
Isolation Voltage	V_{ISO}	/	2500	V	
Junction Temperature Range	T_j	-55~175		$^\circ C$	
Storage Temperature Range	T_{stg}	-55~175		$^\circ C$	
Maximum Temperature for soldering	T_L	300		$^\circ C$	

4.2 Thermal Characteristics

Parameter	Symbol	Rating		Unit
		DH035N04/ DHI035N04/DHE035N04 /DHB035N04/DHD035N04	DHF035 N04	
Thermal Resistance, Junction to Case-sink	R_{thJC}	1	3.75	$^\circ C/W$
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-to-Source Breakdown Voltage	BV _{DSS}	I _D =250μA, V _{GS} =0V	40	43	—	V
BV _{DSS} Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =250μA, reference 25°C	—	0.04	—	V/°C
Drain-to-Source Leakage Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V, T _C =25°C	—	—	1	μA
		V _{DS} =32V, V _{GS} =0V, T _C =125°C	—	—	100	μA
Gate-to-Source Leakage Current	I _{GSS}	V _{GS} =±20V	—	—	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.5	2.0	2.5	V
Drain-to-Source on-state Resistance	R _{DS(on)}	V _{GS} =10V, I _D =40A	—	2.3	3.5	mΩ
		V _{GS} =4.5V, I _D =30A	—	3.0	4.2	
Forward Transfer Conductance	g _{fs}	V _{DS} =5V, I _D =20A	—	40	—	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =20V, f=1.0MHz	—	5900	—	pF
Output Capacitance	C _{oss}		—	690	—	
Reverse Transfer Capacitance	C _{rss}		—	640	—	
Gate Resisitance	R _G	V _{DD} =0V, V _{GS} =0V, f=1MHz	—	1.3	—	Ω
Switching Characteristics						
Turn-on Delay Time	t _{d(on)}	V _{DS} =20V, I _D =40A, V _{GS} =10V, R _{GEN} =3Ω	—	28	—	nS
Turn-on Rise Time	t _r		—	68	—	
Turn-off Delay Time	t _{d(off)}		—	109	—	
Turn-off Fall Time	t _f		—	33	—	
Total Gate Charge	Q _g	I _D =40A, V _{DS} =32V, V _{GS} =10V	—	121	—	nC
Gate-to-Source Charge	Q _{gs}		—	17	—	
Gate-to-Drain("Miller") Charge	Q _{gd}		—	35	—	
Drain-Source Diode Characteristics						
Diode Forward Voltage ⁽³⁾	V _{FSD}	V _{GS} =0V, I _S =30A	—	0.82	1.2	V
Diode Forward Current	I _S		—	—	60	A
Reverse Recovery Time ⁽³⁾	t _{rr}	T _J =25°C, I _F =40A, dI _F /dt=100A/μS, V _{GS} =0V	—	39	—	nS
Reverse Recovery Charge ⁽³⁾	Q _{rr}		—	41	—	nC

Notes:

- 1: Repetitive rating, pulse width limited by maximum junction temperature.
- 2: Surface mounted on FR4 Board, t_s≤10sec.
- 3: Pulse width ≤ 300μs, duty cycle ≤ 2%.
- 4: L=0.5mH, I_D=63.5A, V_{DD}=32V, V_{GATE}=40V, Start T_J=25°C.

5 Typical characteristics diagrams

Figure 1. Typ. Output Characteristics

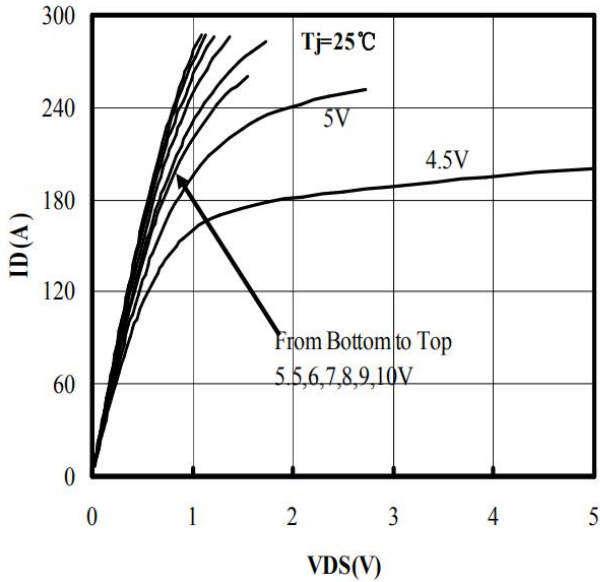


Figure 2. Typ. Output Characteristics

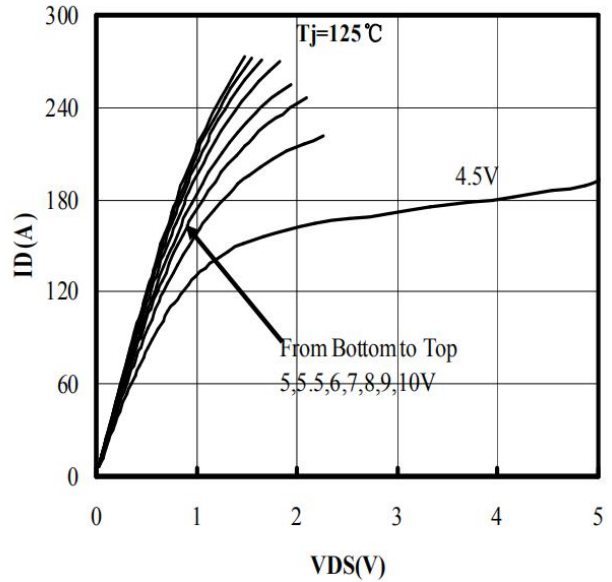


Figure 3. Transfer Characteristics

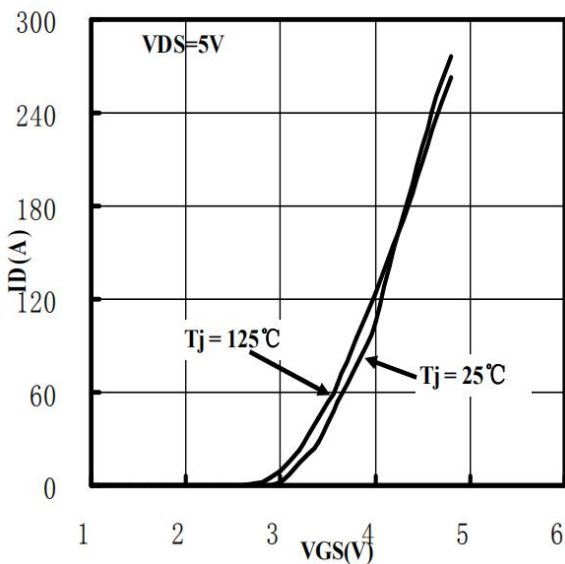
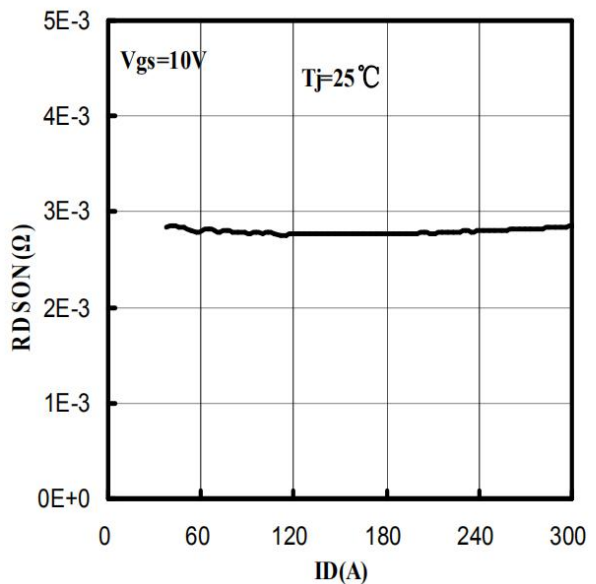


Figure 4. Rds(on) vs. Drain Current Characteristics



5 Typical characteristics diagrams(continues)

Figure 5. Gate Threshold Voltage Characteristics

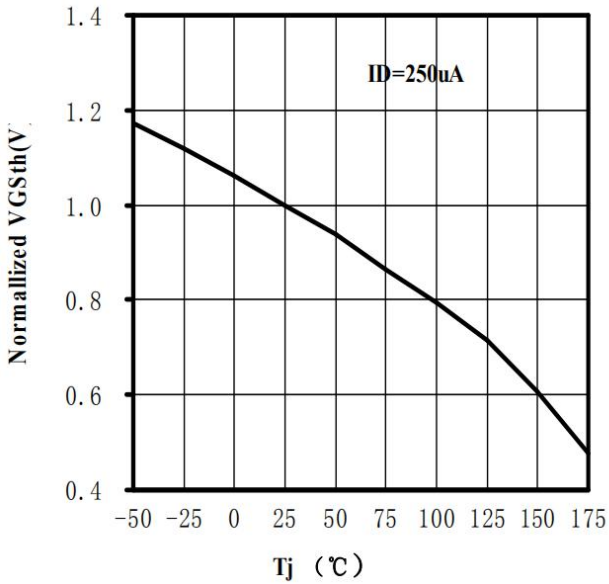


Figure 6. Rdson vs. Junction Tem Characteristics

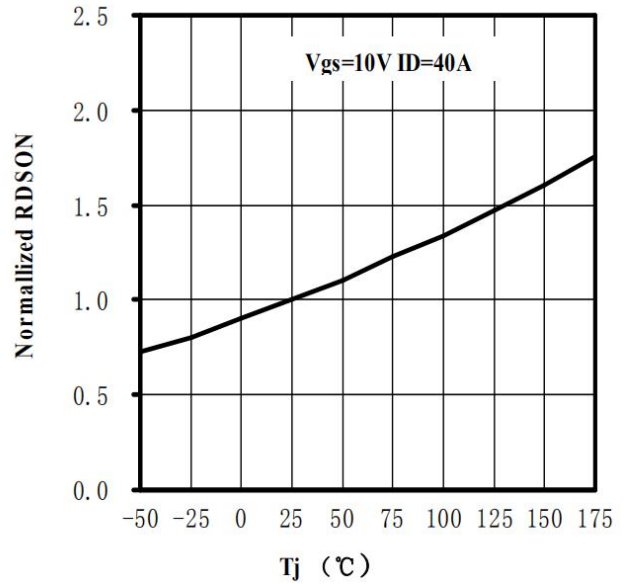


Figure 7. Rdson vs. VGS Characteristics

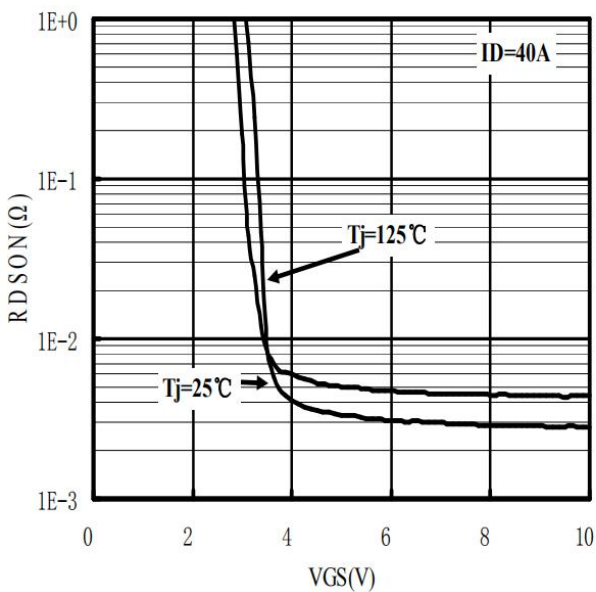
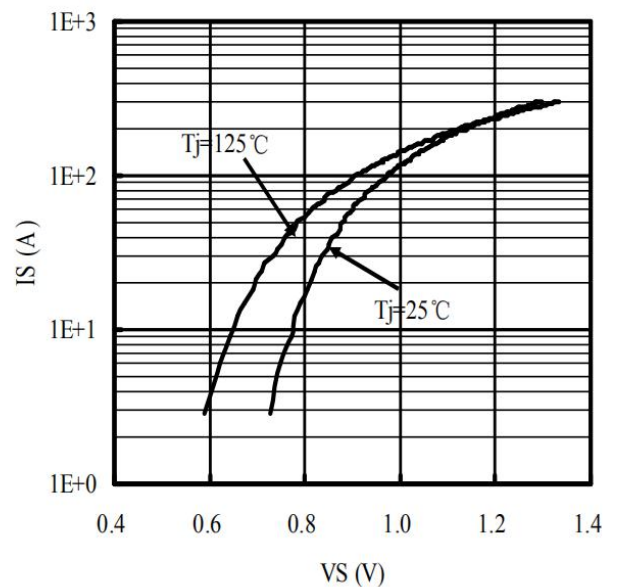


Figure 8. IS vs. VSD Characteristics



5 Typical characteristics diagrams(continues)

Figure 9. Gate Charge Characteristics

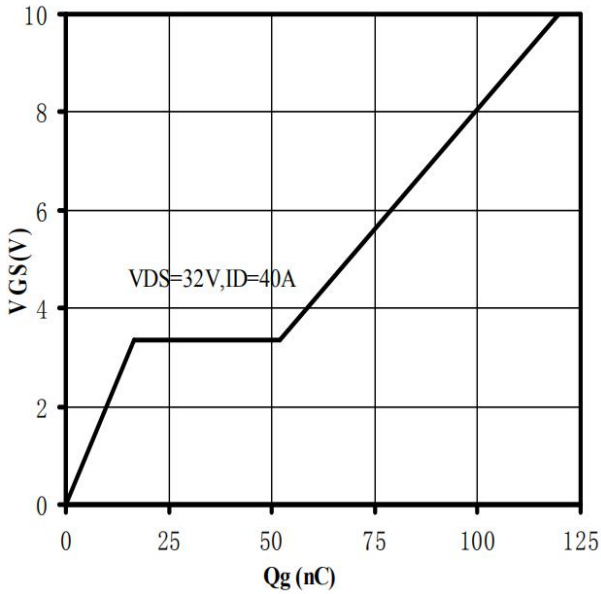


Figure 10. Capacitance Characteristics

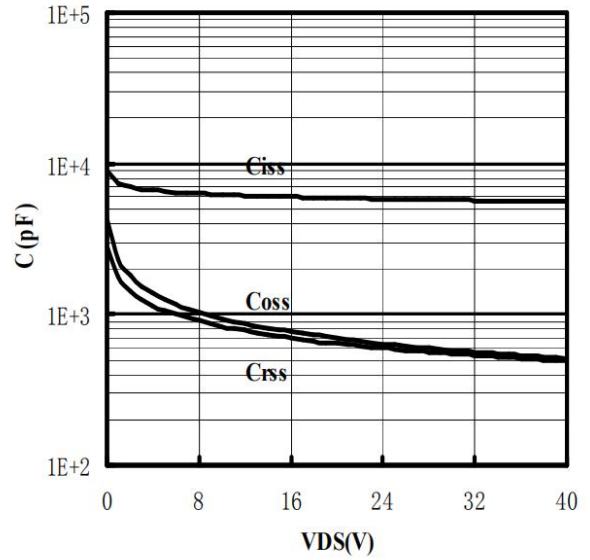


Figure 11. Thermal Resistance Characteristics

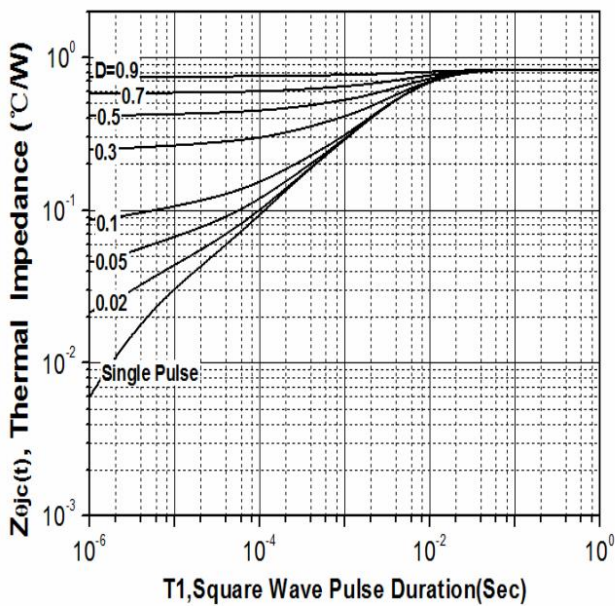
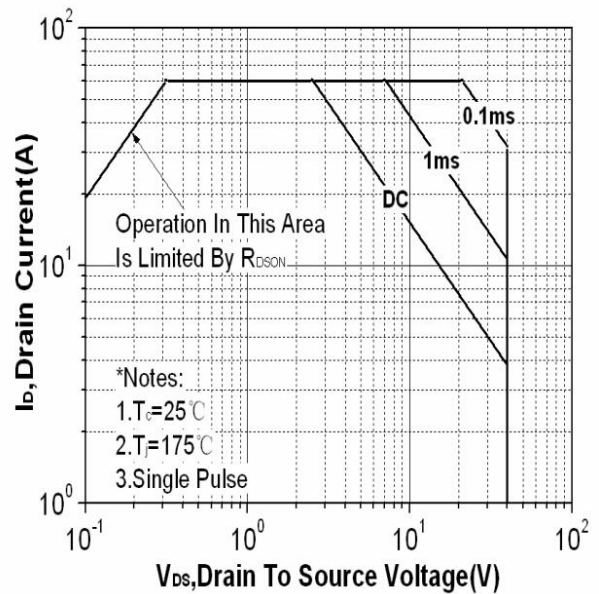
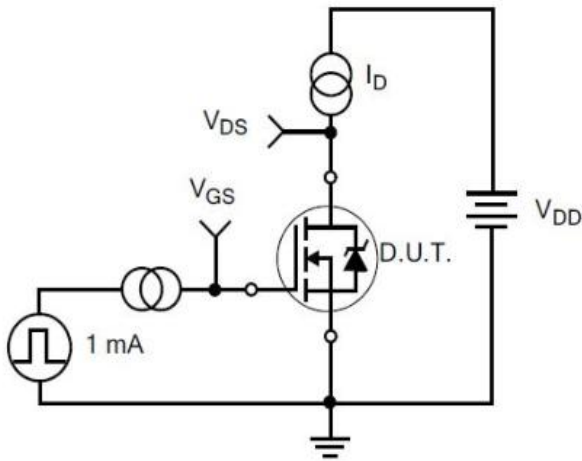


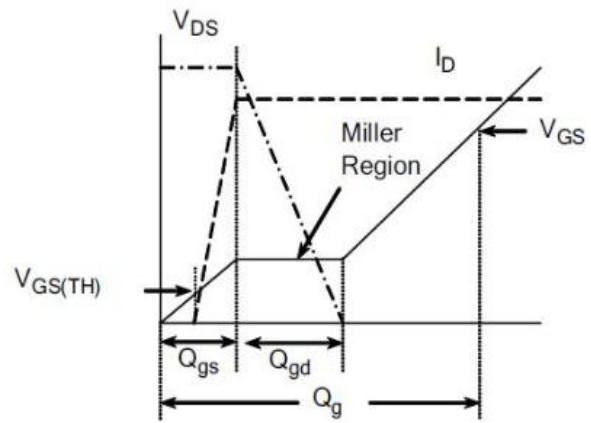
Figure 12. Safe Operating Area



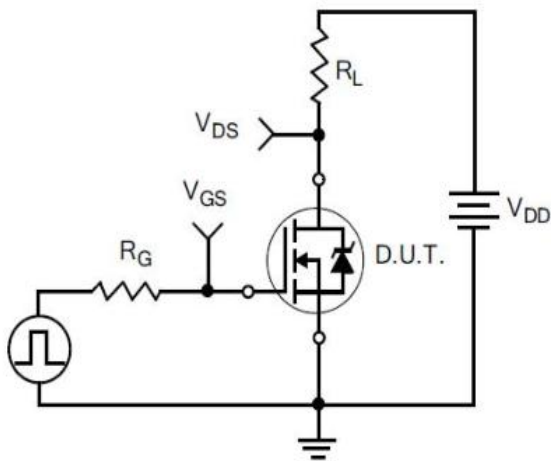
6 Typical Test Circuit and Waveform



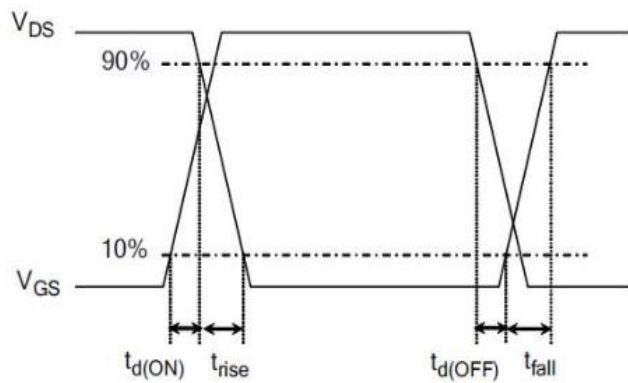
1) Gate Charge Test Circuit



2) Gate Charge Waveform

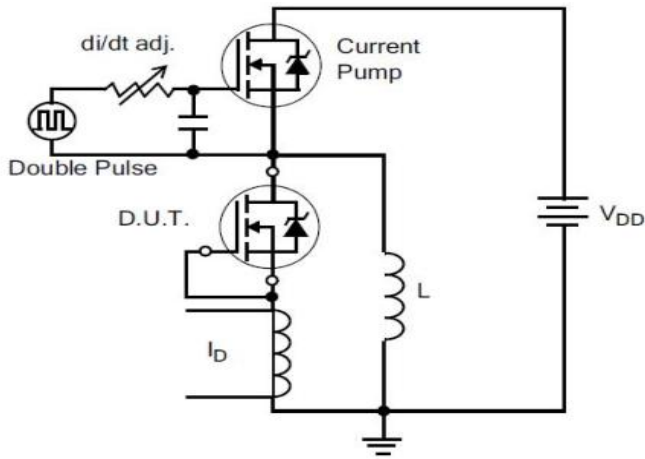


3) Resistive Switching Test Circuit

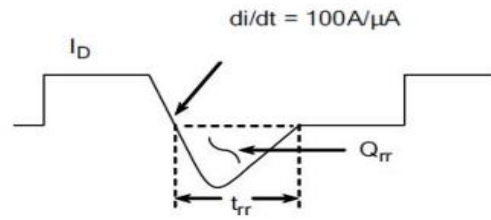


4) Resistive Switching Waveforms

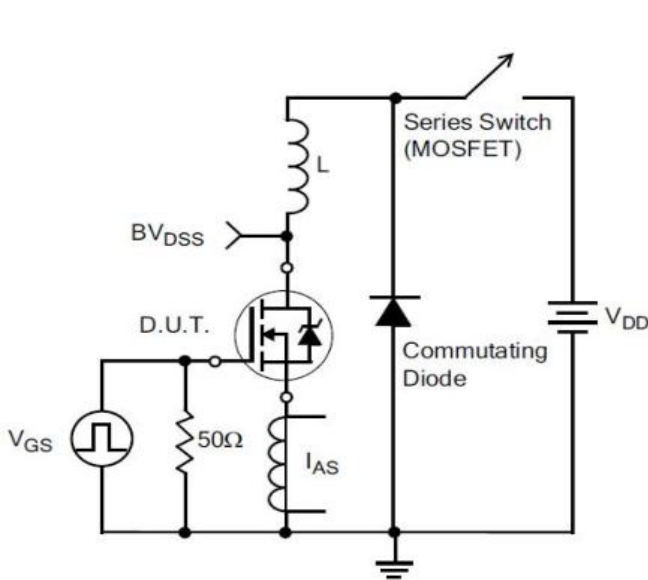
6 Typical Test Circuit and Waveform(continues)



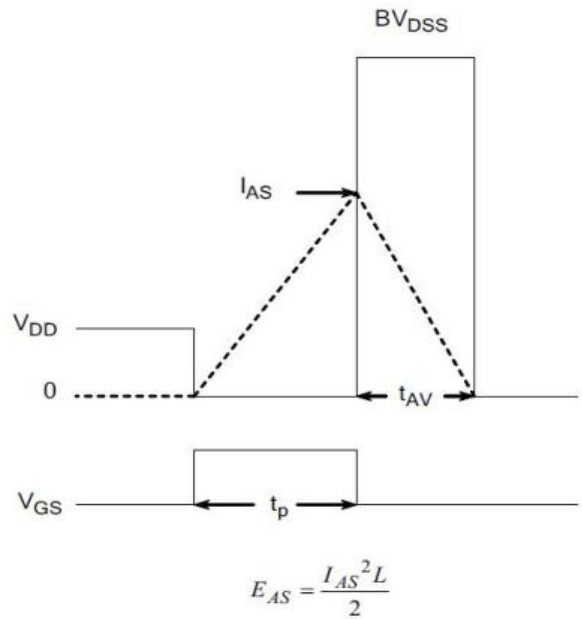
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

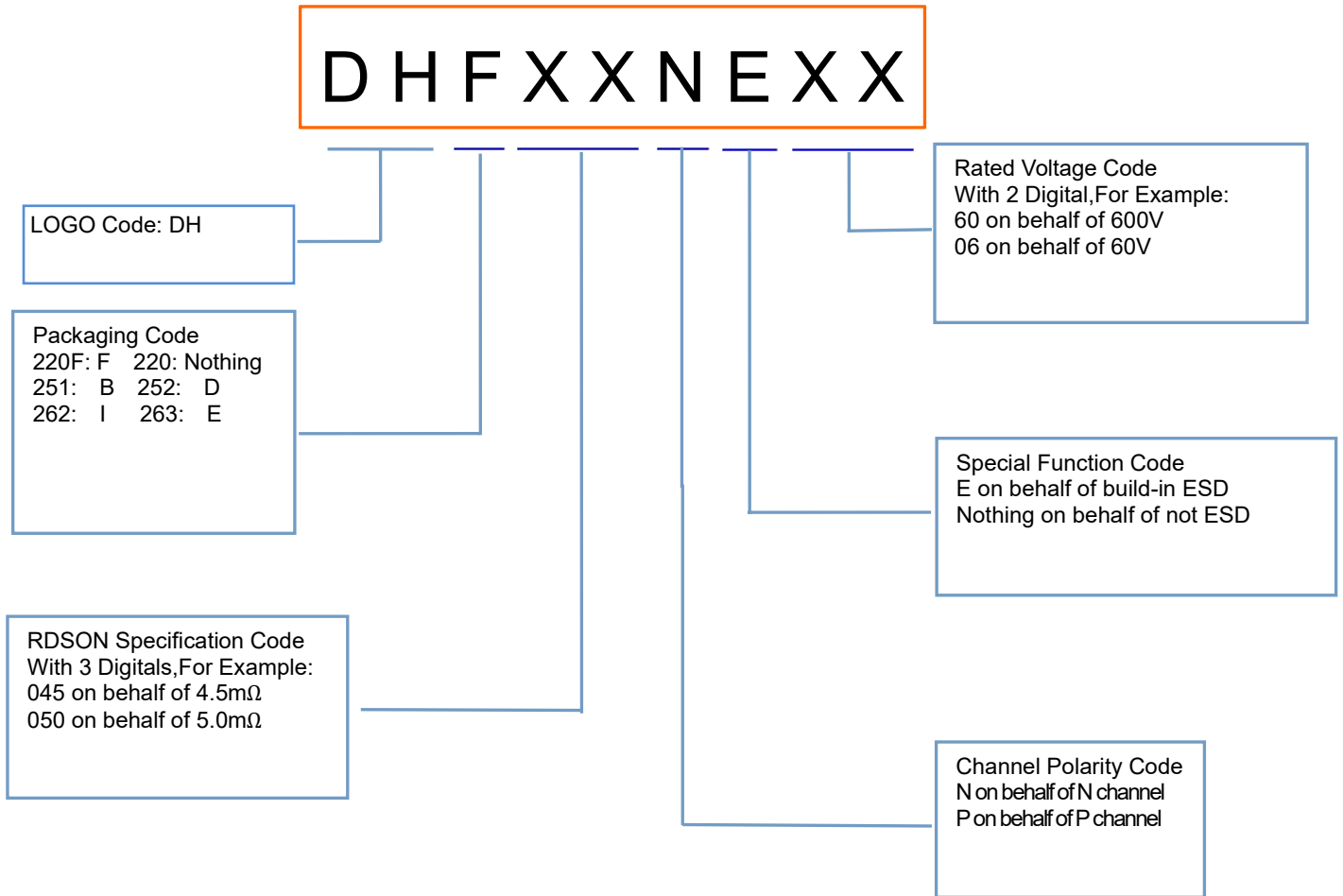


7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

7 Product Names Rules

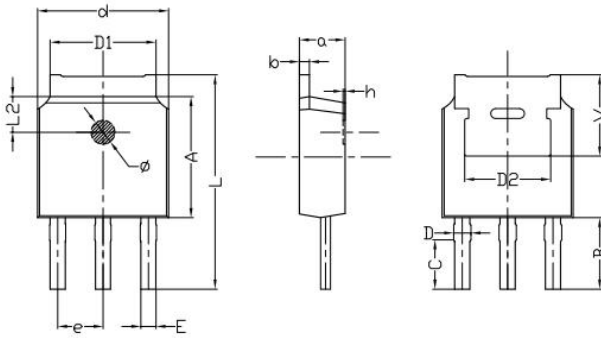


8 Product Specifications and Packaging Models

Product Model	Package Type	Mark Name	RoHS	Package	Quantity
DH035N04	TO-220	DH035N04	Pb-free	Tube	1000/box
DHF035N04	TO-220F	DHF035N04	Pb-free	Tube	1000/box
DHB035N04	TO-251	DHB035N04	Pb-free	Tube	3000/box
DHD035N04	TO-252	DHD035N04	Pb-free	Tape & Reel	2500/box
DHI035N04	TO-262	DHI035N04	Pb-free	Tube	1000/box
DHE035N04	TO-263	DHE035N04	Pb-free	Tape & Reel	800/box

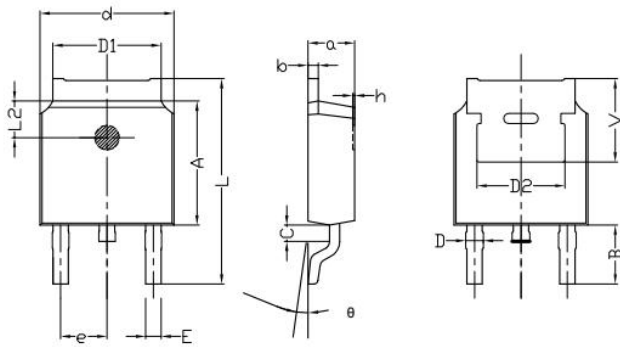
9 Dimensions

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

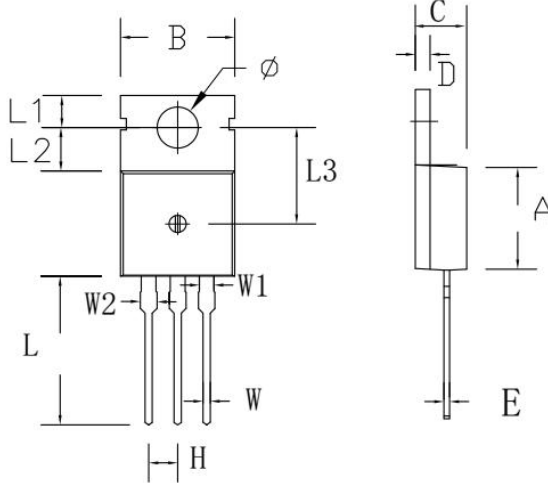
TO-252B PACKAGE OUTLINE DIMENSIONS



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

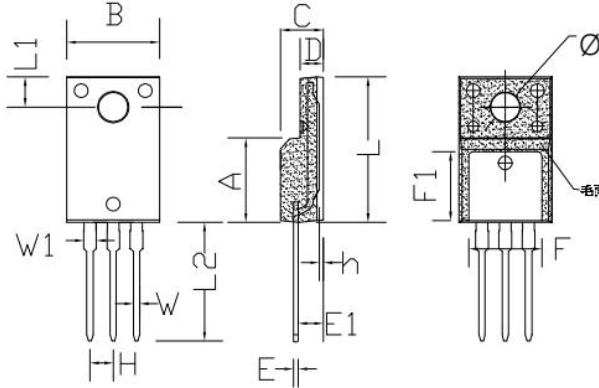
9 Dimensions(continues)

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

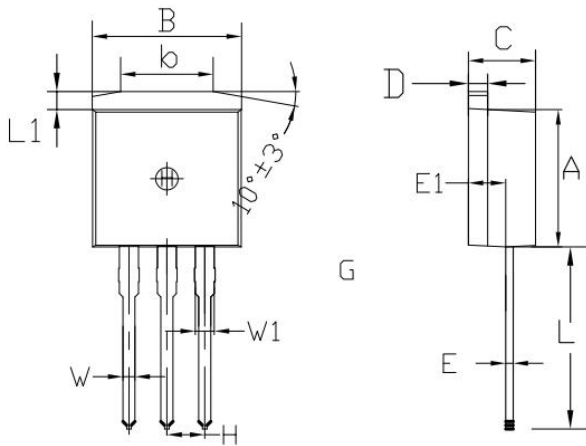
TO-220F PACKAGE OUTLINE DIMENSIONS



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

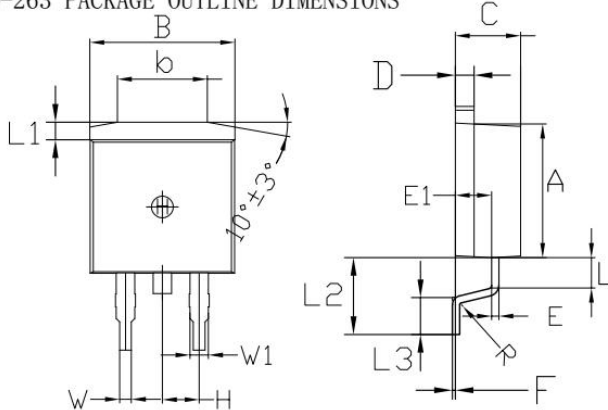
9 Dimensions(continues)

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
2019.01.08	1.0	Original	