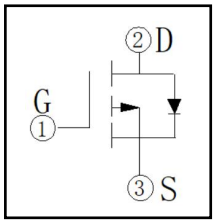
20A 60V P-channel Enhancement Mode Power MOSFET

1 Description

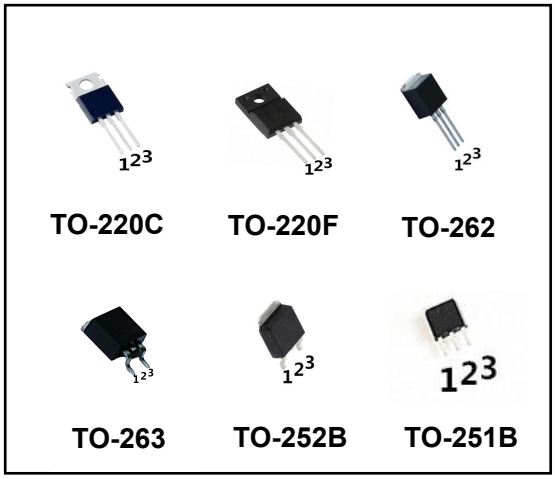
These P-channel enhanced vdmosfets, used advanced trench technology and design, provide to excellent Rdson with low gate charge. Which accords with the RoHS standard.



V_{DSS} = -60V

$R_{DS(on)\ (TYP)}$=58.5mΩ

I_D = -20A



2 Features

- Fast switching
- Low on resistance
- Low gate charge
- Low reverse transfer capacitances
- 100% single pulse avalanche energy test
- 100% ΔV_{DS} test

3 Applications

- Power switching applications
- Inverter management system
- Power tools
- Automotive electronics

4 Electrical Characteristics

4.1 Absolute Maximum Rating (Tc=25℃,unless otherwise noted)

Parameter		Symbol	Value				Units
			DH500P06	DH500P06I DH500P06E	DH500P06B DH500P06D	DH500P06F	
Drian-Source Voltage		V_{DSS}	-60				V
Gate-Drain Voltage		V_{GSS}	±20				V
Drain Current(continuous)	T_C=25℃	I_D	-20				A
	T_C=100℃		-14				A
Drain Current(Pulsed)(1)		I_{DM}	-80				A
Single Pulse Avalanche Energy(4)		E_{AS}	96				mJ
Single Pulse Avalanche Current(4)		I_{AS}	-19.6				A
Total Dissipation	T_a=25℃	P_{tot}	2	2	1.58	2	W
	T_C=25℃	P_{tot}	43	43	43	18	W
Junction Temperature		T_j	-55～175				℃
storage Temperature		T_{stg}	-55～175				℃
Maximum Temperature for soldering		T_L	300				℃

4.2 Thermal Characteristics

Parameter	Symbol	Value				Units
		DH500P06	DH500P06I DH500P06E	DH500P06B DH500P06D	DH500P06F	
Thermal Resistance Junction to Case-sink	R_{thJC}	3.49	3.49	3.49	8.33	℃/W
Thermal Resistance Junction to Ambient	R_{thJA}	75	75	94.88	75	℃/W

4.3 Electrical Characteristics（Tc=25℃,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	--	--	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						
Gate threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250μA	-1	-1.6	-2	V
Drain-source on-state Resistance	$R_{DS(on)}$	V_{GS}=-10V,I_D=-10A	--	58	70	mΩ
		V_{GS}=-4.5V,I_D=-10A	--	70	84	
Forward Transfer Conductance	g_{fs}	V_{DS}=-5V,I_D=-8A	--	17	--	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=-30V, f=1.0MHz	--	1528	--	pF
Output Capacitance	C_{oss}		--	90	--	
Reverse Transfer Capacitance	C_{rss}		--	60	--	
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-30V, I_D=-8A, V_{GS}=-10V, R_{GEN}=3Ω	--	6.6	--	nS
Turn-on Rise Time	t_r		--	42	--	
Turn-off Delay Time	$t_{d(off)}$		--	37	--	
Turn-off Fall Time	t_f		--	63.5	--	
Total Gate Charge	Q_g	I_D=-8A, V_{DD}=-30V, V_{GS}=-10V	--	28.2	--	nC
Gate-to-Source Charge	Q_{gs}		--	7.2	--	
Gate-to-Drain(“Miller”) Charge	Q_{gd}		--	3.8	--	
Drain-Source Diode Characteristics						
Diode Forward Voltage(3)	V_{FSD}	V_{GS}=0V,I_S=-8A	--	--	-1.2	V
Diode Forward Current	I_S		--	--	-20	A
Reverse Recovery Time(3)	t_{rr}	T_J=25℃,I_F=-8A, dI_F/dt=100A/μS,V_{GS}=0V	--	29	--	nS
Reverse Recovery Charge(3)	Q_{rr}		--	12.8	--	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. L=0.5mH,I_D=-19.6A,V_{DD}=-50V,V_{GATE}=-60V,Start T_J=25℃.

5 Typical characteristics diagrams

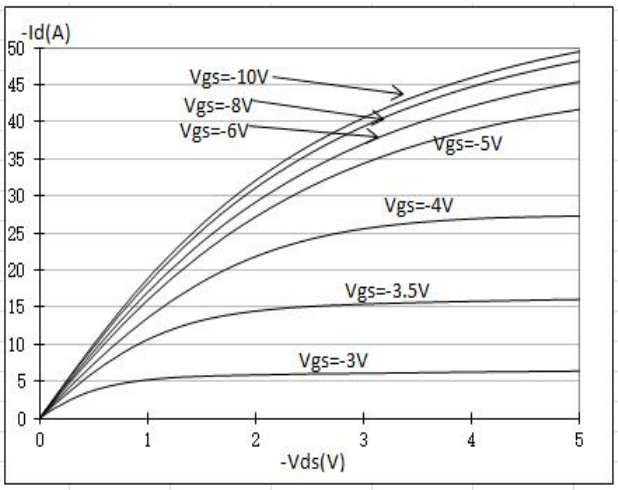


Figure 1 Output Characteristics

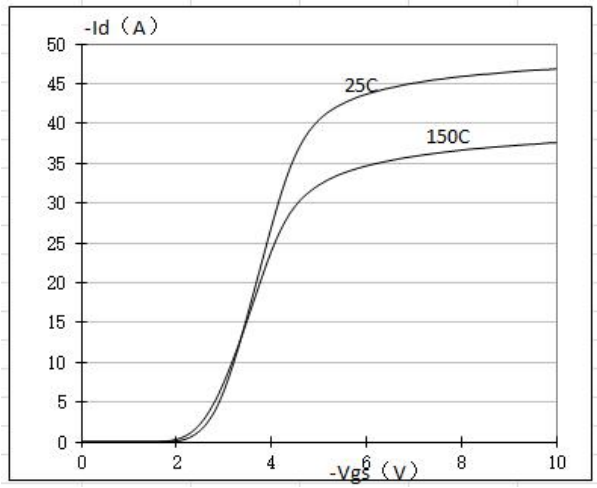


Figure 2 Transfer Characteristics

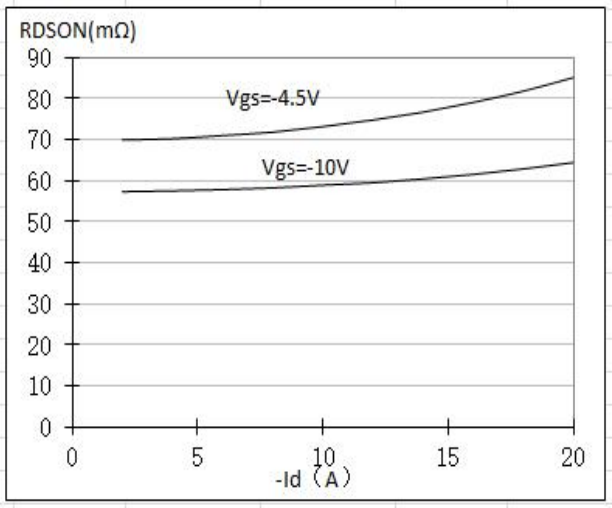


Figure 3. On-resistance vs. Drain Current

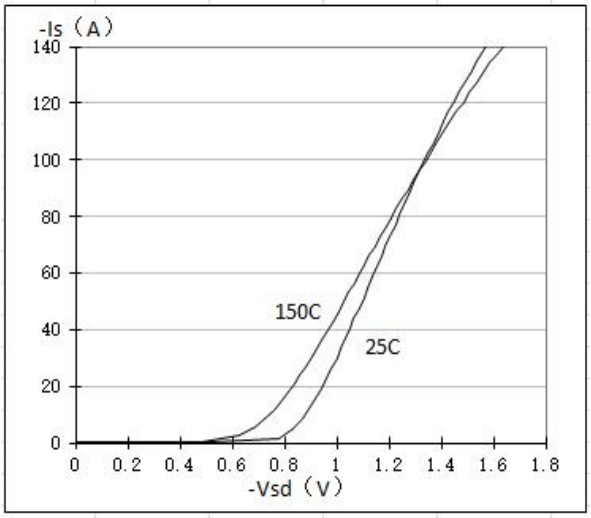


Figure 4. Source- Drain Diode Forward

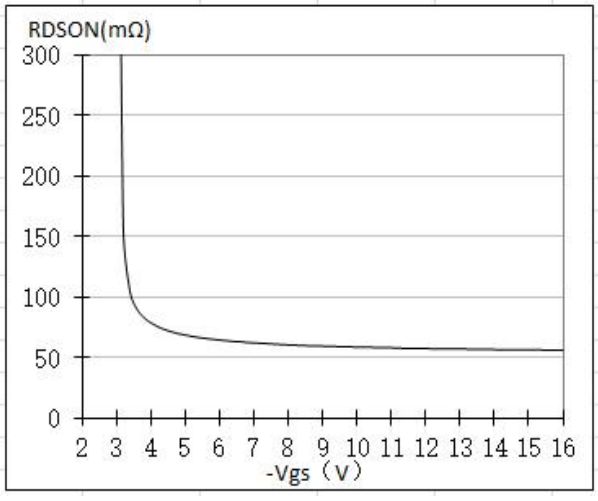


Figure 5. On-resistance vs.Vgs

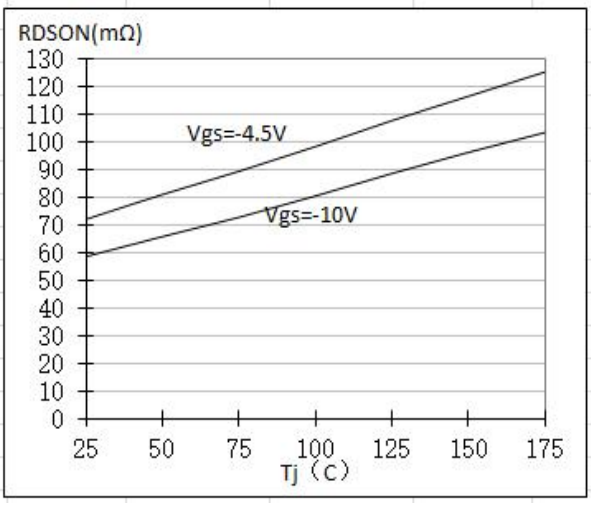


Figure 6. on Resistance vs. Junction Temperature

5 Typical characteristics diagrams(continues)

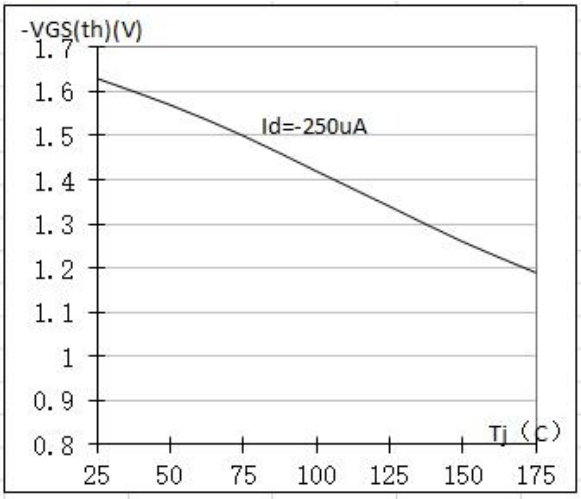


Figure 7. VTH vs. Junction Temperature

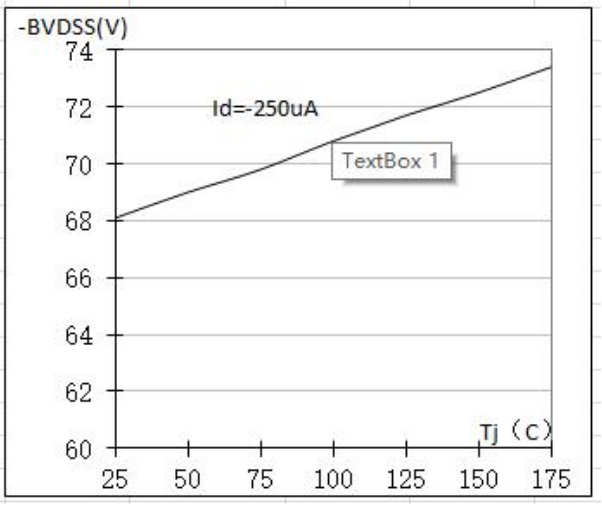


Figure 8. BVdss vs. Junction Temperature

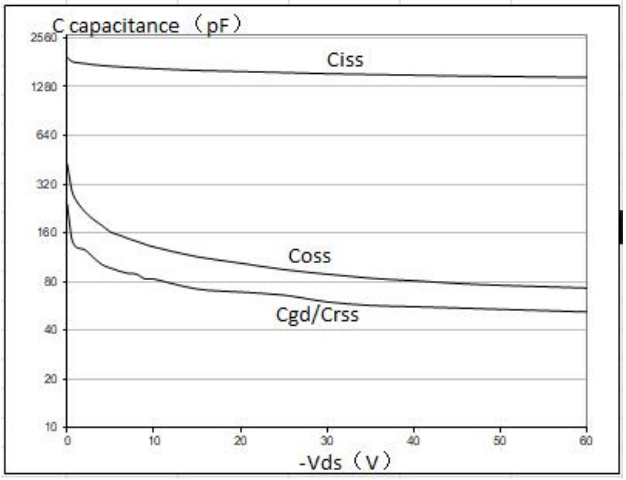


Figure 9. Capacitance vs Vds

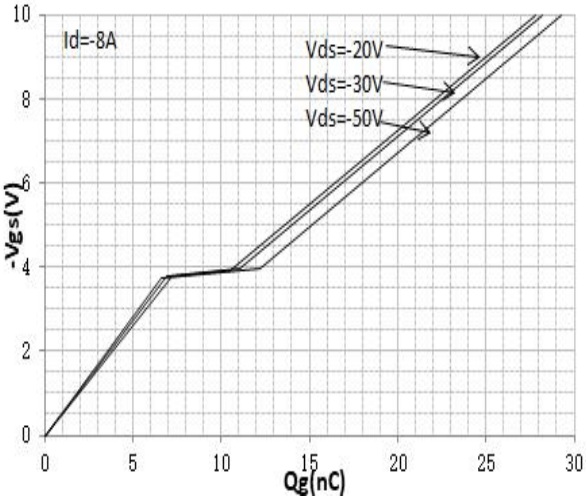


Figure 10. Gate Charge Characteristics

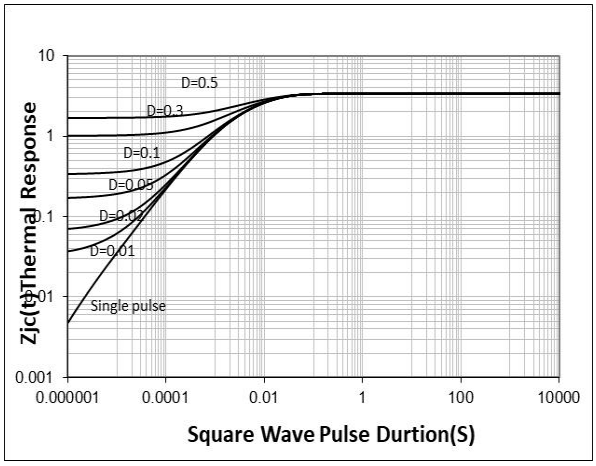


Figure 11. Normalized Maximum Transient Thermal Impedance

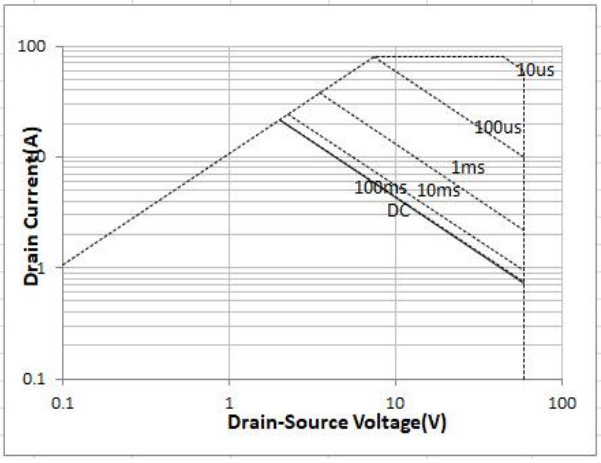
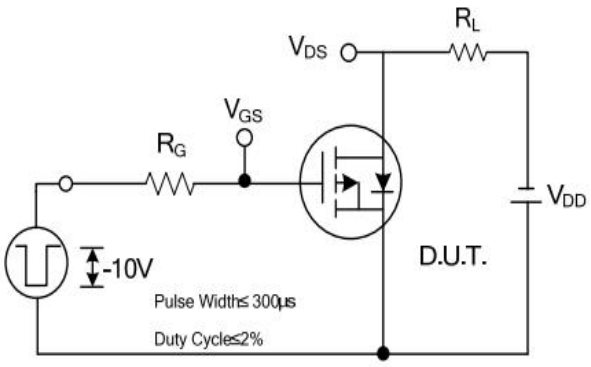
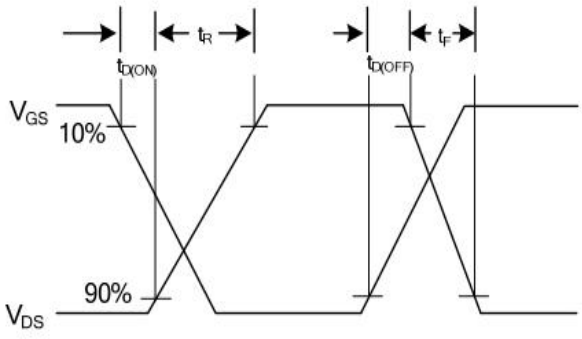


Figure 12. Maximum Safe Operating Area

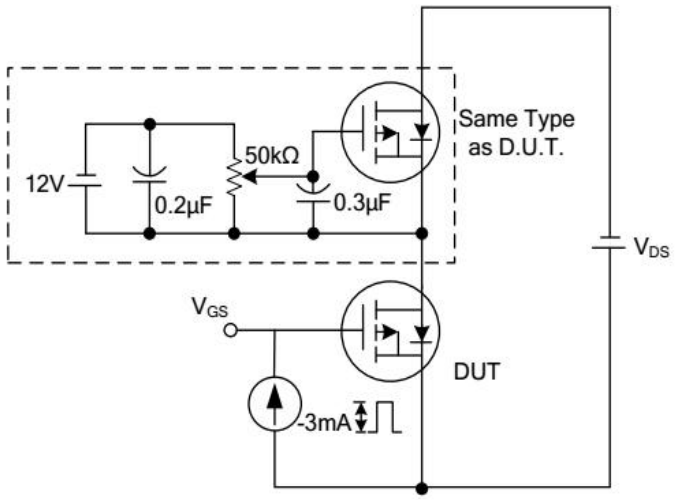
6 Typical Test Circuit and Waveform



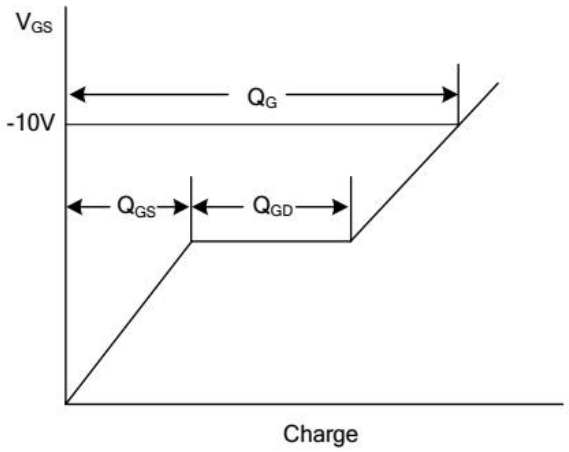
Switching Test Circuit



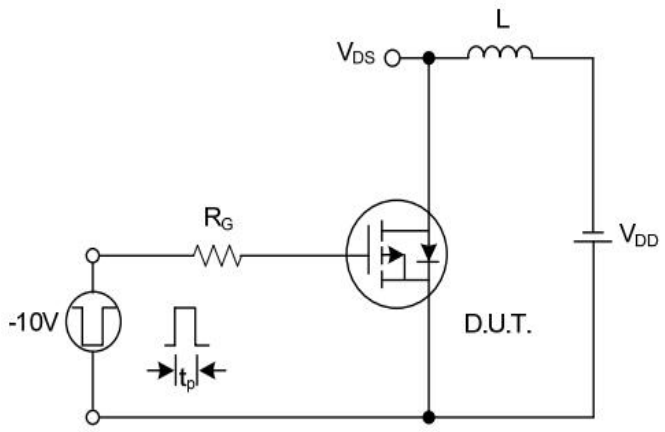
Switching Waveforms



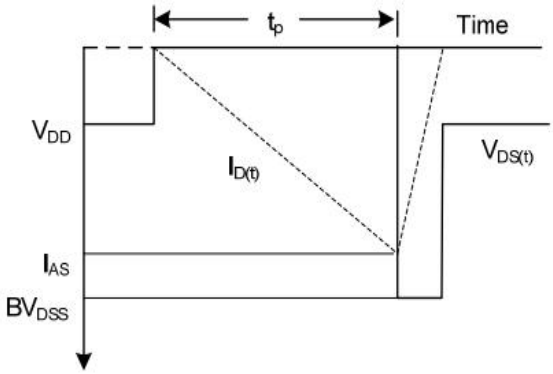
Gate Charge Test Circuit



Gate Charge Waveform

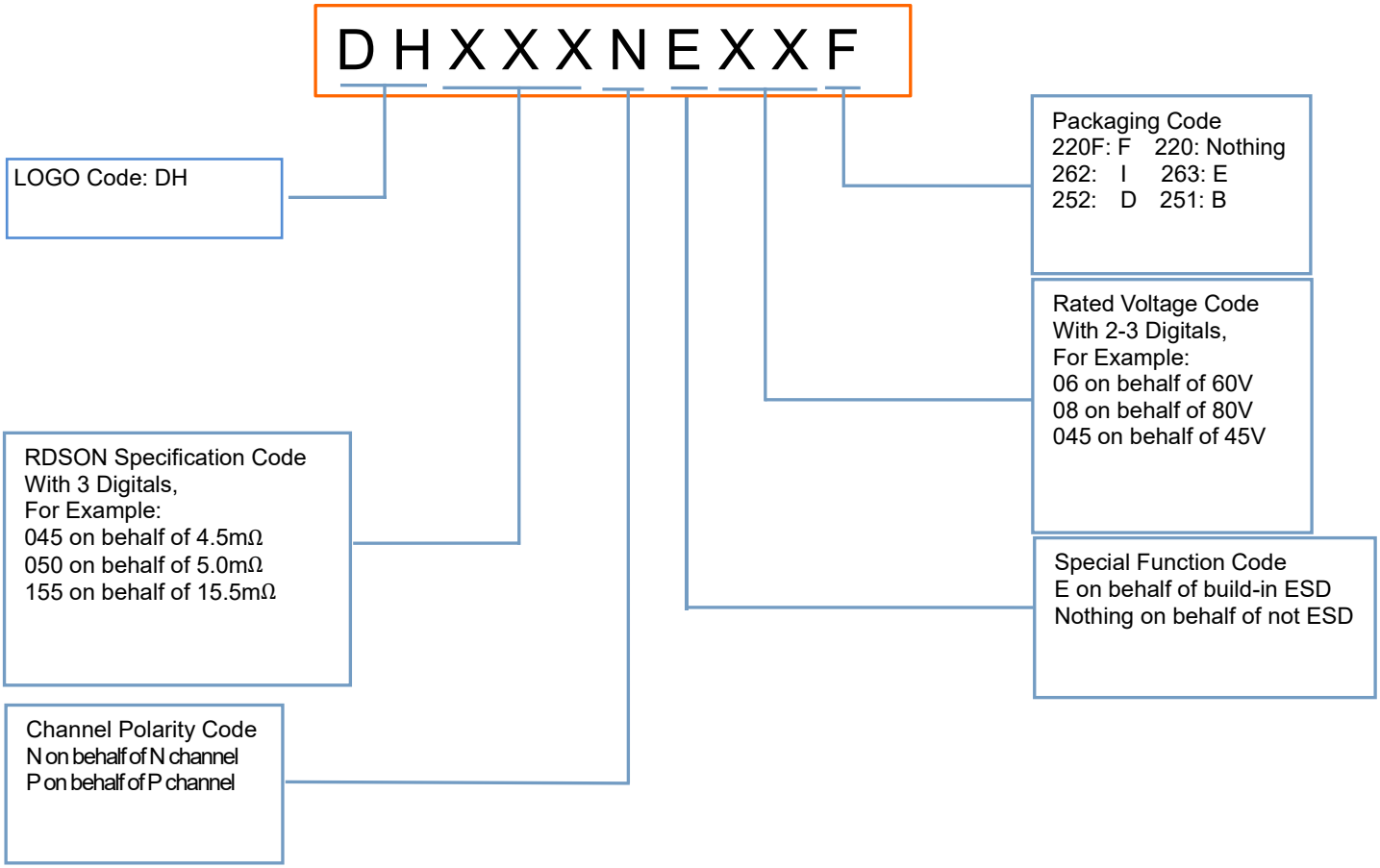


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

7 Product Names Rules

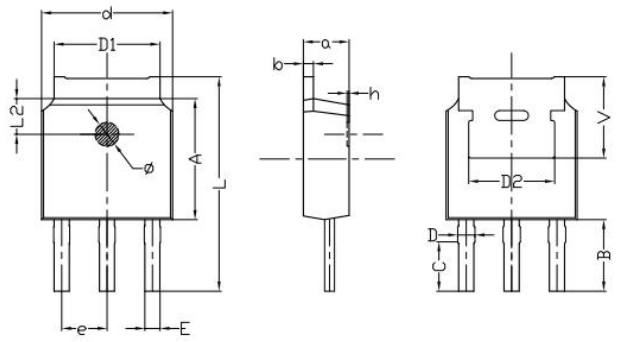


8 Product Specifications and Packaging Models

Product Model	Package Type	Mark Name	RoHS	Package	Quantity
DH500P06	TO-220C	DH500P06	Pb-free	Tube	1000/box
DH500P06F	TO-220F	DH500P06F	Pb-free	Tube	1000/box
DH500P06B	TO-251	DH500P06B	Pb-free	Tube	3000/box
DH500P06D	TO-252	DH500P06D	Pb-free	Tape & Reel	2500/box
DH500P06I	TO-262	DH500P06I	Pb-free	Tube	1000/box
DH500P06E	TO-263	DH500P06E	Pb-free	Tape & Reel	800/box

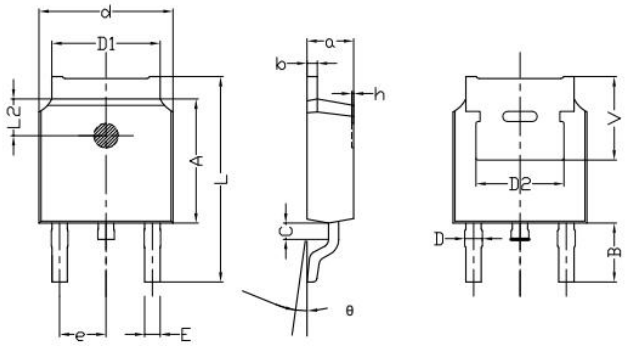
9 Dimensions

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

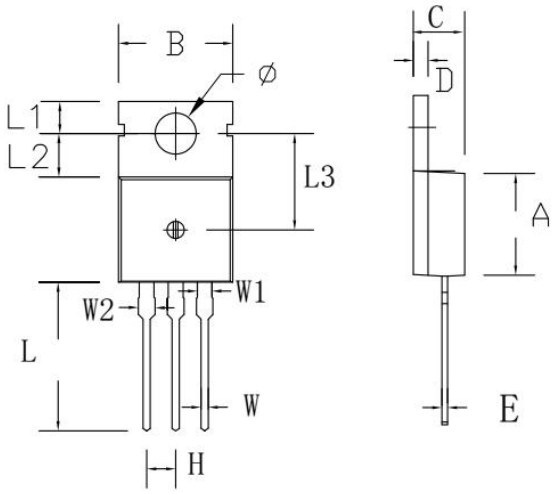
TO-252B PACKAGE OUTLINE DIMENSIONS



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

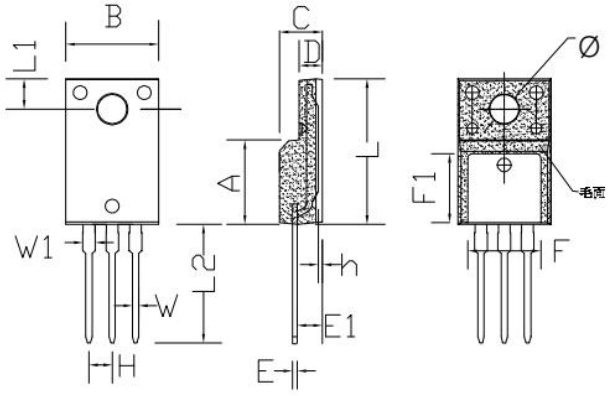
9 Dimensions(continues)

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

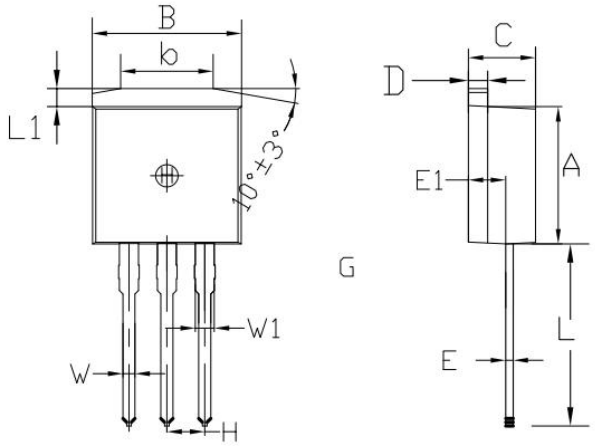
TO-220F PACKAGE OUTLINE DIMENSIONS



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

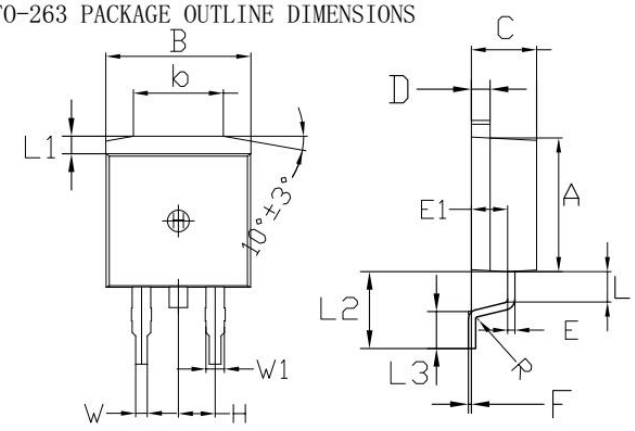
9 Dimensions(continues)

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
2021.09.25	1.0	Original	