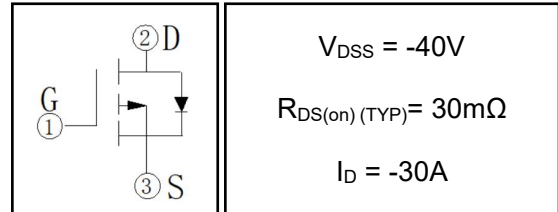


30A 40V P-channel Enhancement Mode Power MOSFET

1 Description

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

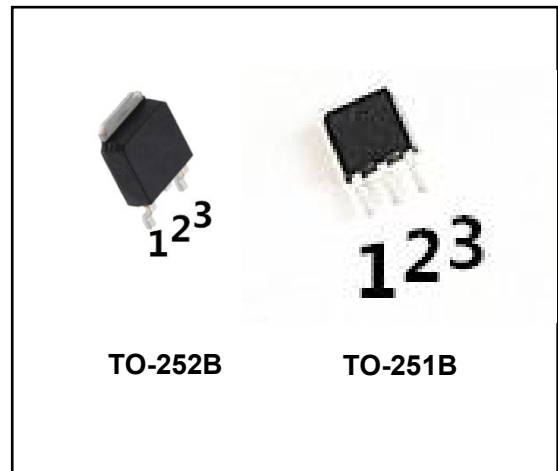


2 Features

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

3 Applications

- Switching power supply.
- DC-DC converters
- Load switching
- Inverter power management system
- Automotive electronics applications



4 Electrical Characteristics

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

Parameter	Symbol	Value	Units
Drain-Source Voltage	V_{DSS}	-40	V
Gate-Drain Voltage	V_{GSS}	± 20	V
Drain Current(continuous)	I_D	$T_C=25^\circ C$	-30
		$T_C=100^\circ C$	-21
Drain Current(Pulsed) ⁽¹⁾	I_{DM}	-77	A
Single Pulse Avalanche Energy ⁽⁴⁾	E_{AS}	110	mJ
Avalanche Current ⁽⁴⁾	I_{AS}	-21	A
Total Dissipation	P_{tot}	$T_A=25^\circ C$	1.57
		$T_C=25^\circ C$	52
Junction Temperature	T_j	175	$^\circ C$
storage Temperature	T_{stg}	-55~175	$^\circ C$
Maximum Temperature for soldering	T_L	300	$^\circ C$

4.2 Thermal Characteristics

Parameter	Symbol	Value	Units
Thermal Resistance Junction to Case-sink	R_{thJC}	2.86	$^\circ C/W$
Thermal Resistance Junction to Ambient	R_{thJA}	95.5	$^\circ C/W$

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	-40	--	--	V	
Drain-to-Source Leakage Current	I _{DSS}	V _{DS} =-40V, V _{GS} =0V, T _C =25°C	--	--	-1	μA	
		V _{DS} =-40V, V _{GS} =0V, T _C =125°C	--	--	-20	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	-1.2	-1.8	-2.5	V	
Drain-source on-state Resistance	R _{DS(on)}	V _{GS} =-10V, I _D =-20A	T _J =25°C	--	30	40	mΩ
			T _J =125°C	--	44.5	60	
		V _{GS} =-4.5V, I _D =-8A	--	44	60		
Dynamic Characteristics							
Forward Transfer Conductance	g _{fs}	V _{DS} =-5V, I _D =-12A	--	17.5	--	S	
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =-20V, f=1.0MHz	--	1445	--	pF	
Output Capacitance	C _{oss}		--	117	--		
Reverse Transfer Capacitance	C _{rss}		--	92	--		
Gate resistance	R _G	V _{GS} =0V, V _{DS} =0V, f=1MHz		6.3		Ω	
Switching Characteristics							
Turn-on Delay Time	t _{d(on)}	V _{DS} =-20V, I _D =-12A, V _{GS} =-10V, R _{GEN} =3Ω	--	11.3	--	nS	
Turn-on Rise Time	t _r		--	54.3	--		
Turn-off Delay Time	t _{d(off)}		--	34.5	--		
Turn-off Fall Time	t _f		--	63.3	--		
Total Gate Charge	Q _g	I _D =-12A, V _{DS} =-20V, V _{GS} =-10V	--	25.3	--	nC	
Gate-to-Source Charge	Q _{gs}		--	8.2	--		
Gate-to-Drain("Miller") Charge	Q _{gd}		--	4.1	--		
Drain-Source Diode Characteristics							
Diode Forward Voltage ⁽³⁾	V _{FSD}	V _{GS} =0V, I _S =-12A	--	-0.9	-1.2	V	
Diode Forward Current	I _S		--	--	-30	A	
Reverse Recovery Time ⁽³⁾	t _{rr}	T _J =25°C, I _F =-12A, dI _F /dt=100A/μS	--	18	--	nS	
Reverse Recovery Charge ⁽³⁾	Q _{rr}		--	5.6	--	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_{AS}=-21A, V_{DD}=-20V, V_{GATE}=-10V, Start T_J=25°C.

5 Typical characteristics diagrams

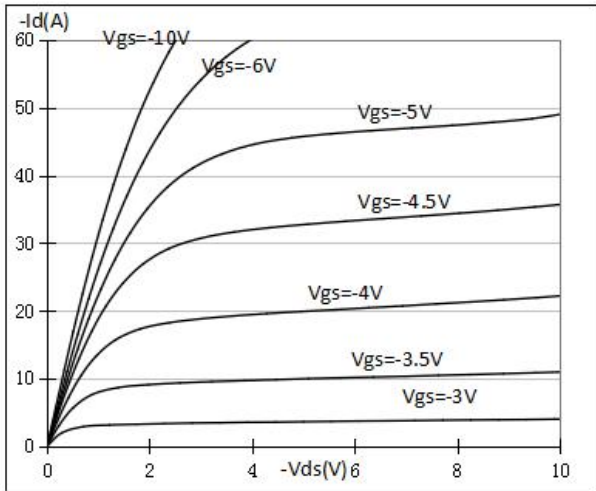


Figure 1 Output Characteristics

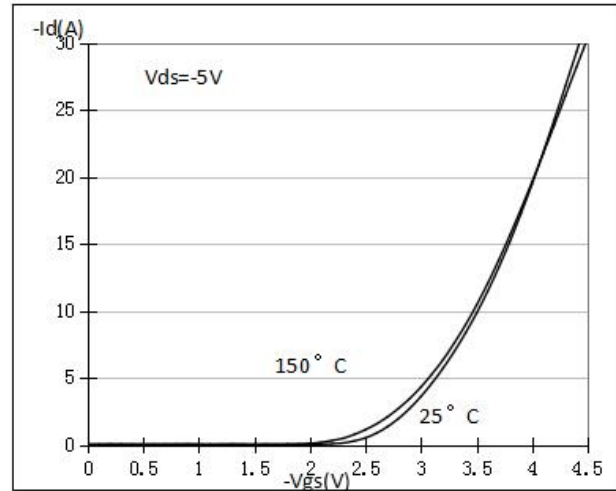


Figure 2 Transfer Characteristics

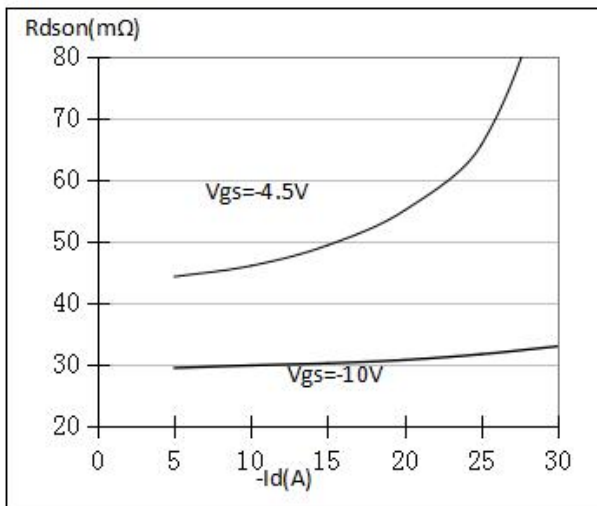


Figure 3. On-resistance vs. Drain Current

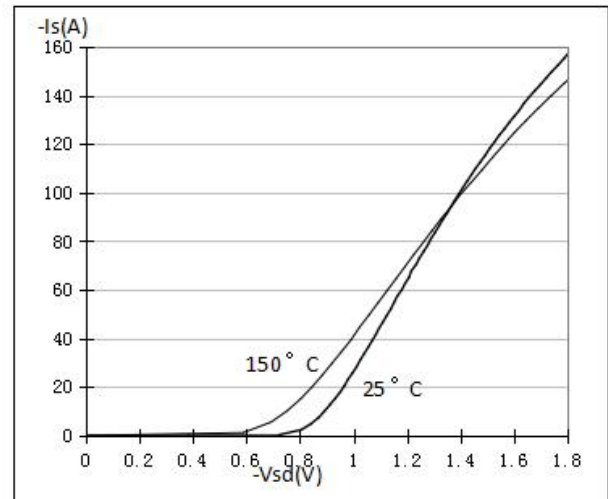


Figure 4. Source- Drain Diode Forward

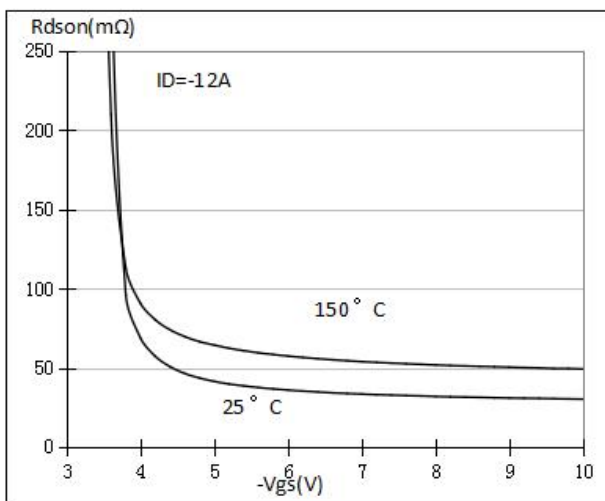


Figure 5. On-resistance vs. V_{gs}

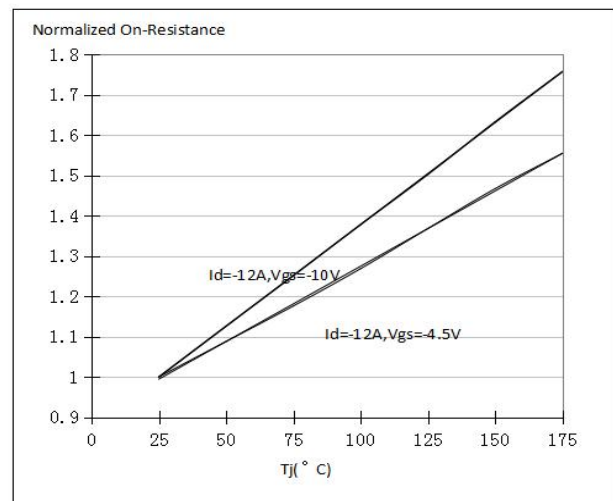


Figure 6. on Resistance vs. Junction Temperature

5 Typical characteristics diagrams(continues)

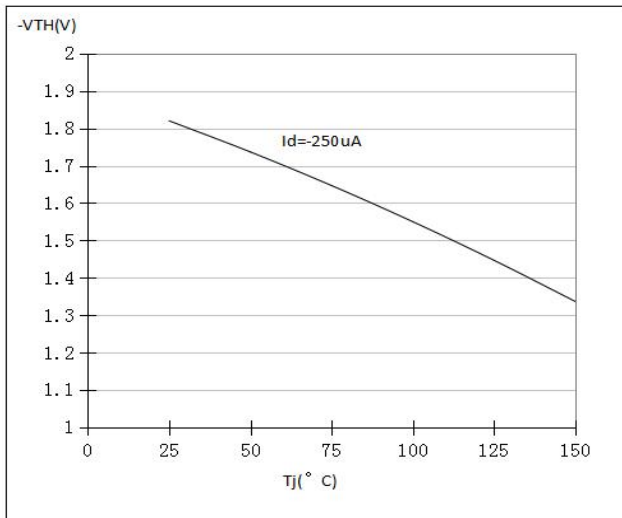


Figure 7. VTH vs. Junction Temperature

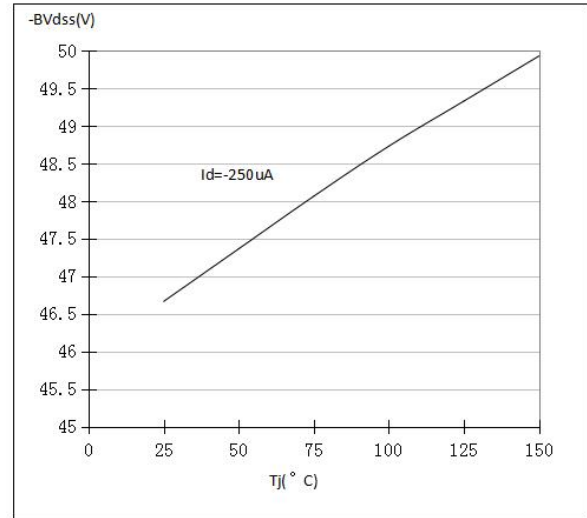


Figure 8. BVdss vs. Junction Temperature

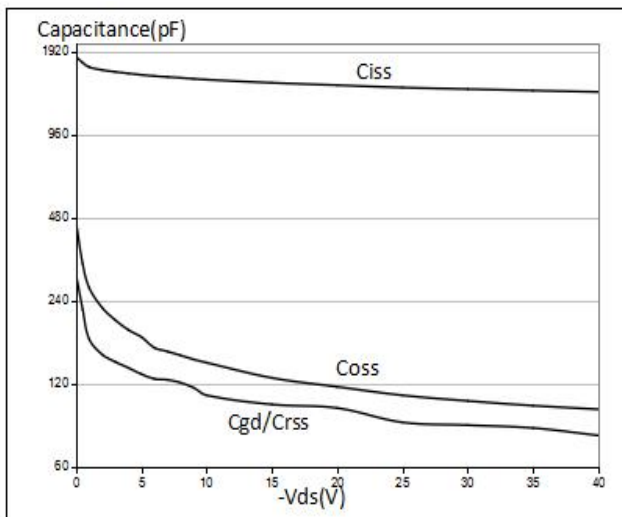


Figure 9. Capacitance vs Vds

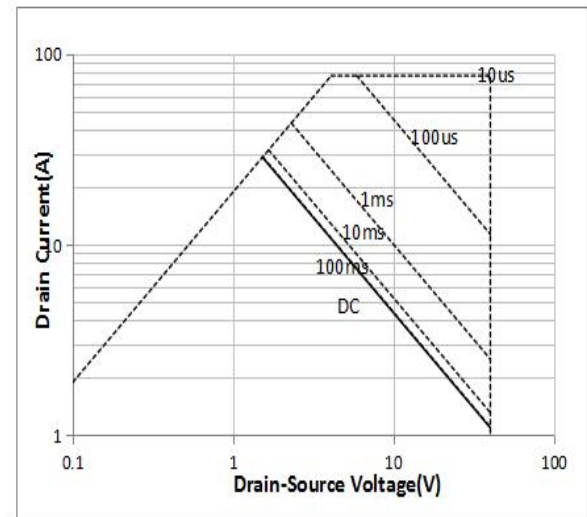


Figure 10. Maximum Safe Operating Area

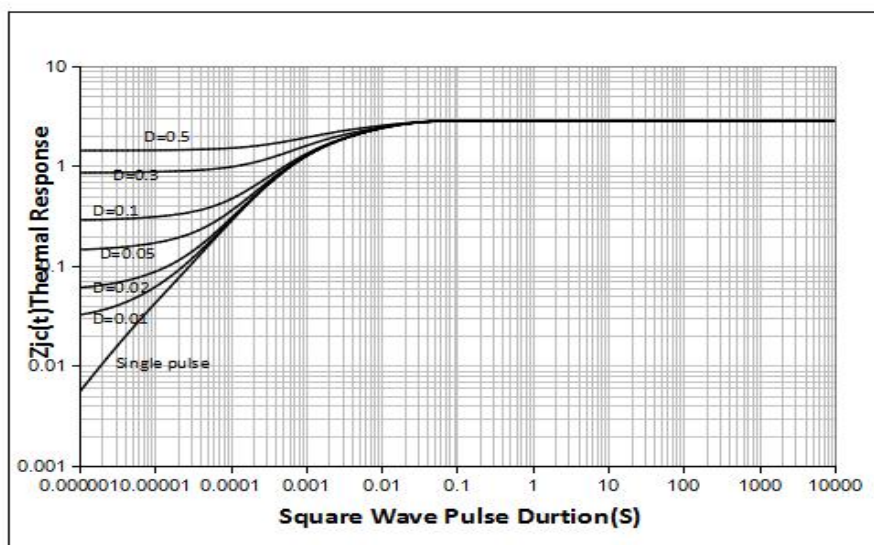
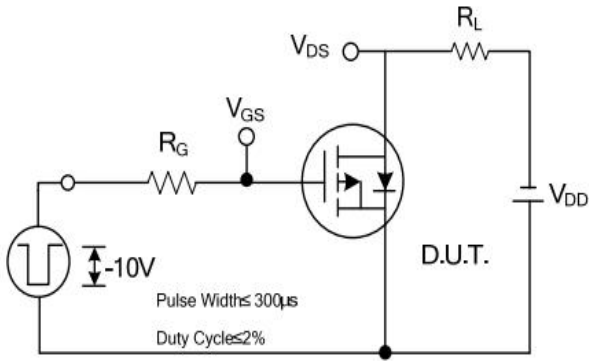
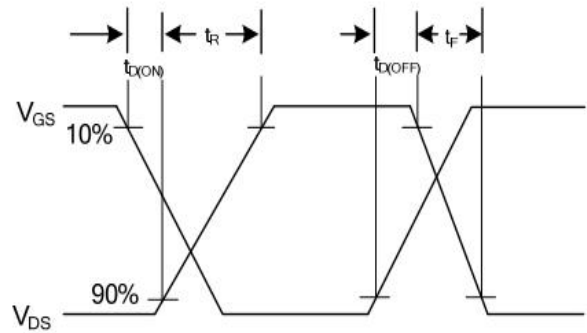


Figure 11. Normalized Maximum Transient Thermal Impedance

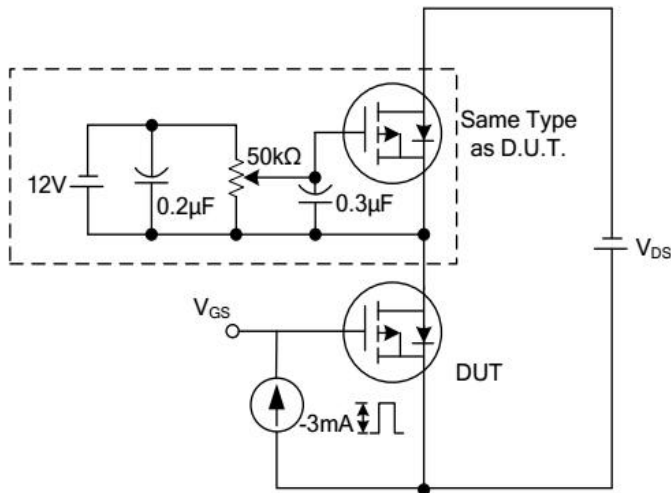
6 Typical Test Circuit and Waveform



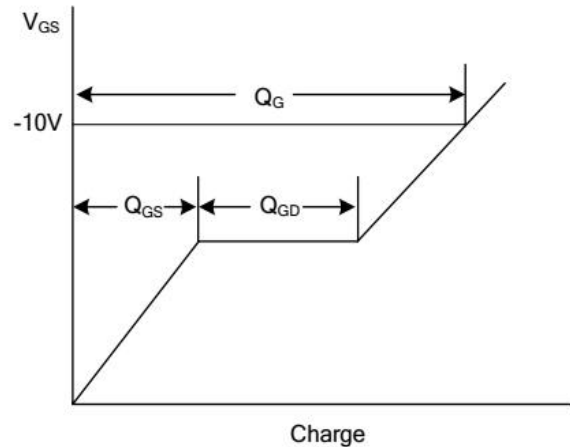
Switching Test Circuit



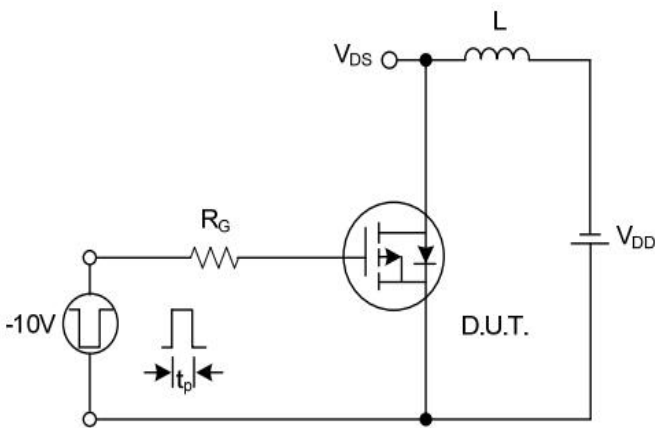
Switching Waveforms



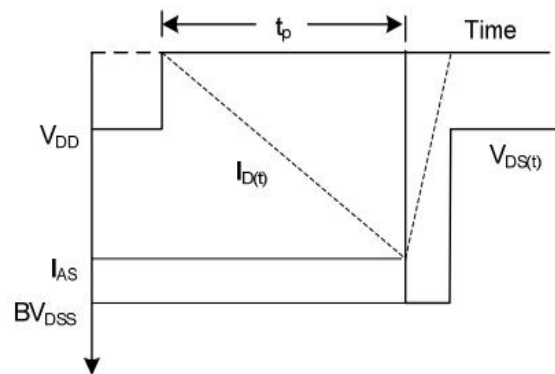
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



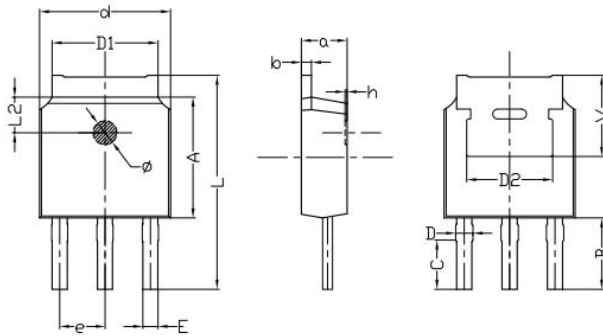
Unclamped Inductive Switching Waveforms

7 Product Specifications and Packaging Models

Product Model	Package Type	Mark Name	RoHS	Package	Quantity
AOB413	TO-251	AOB413	Pb-free	Tube	3000/box
AOD413	TO-252	AOD413	Pb-free	Tape & Reel	2500/box

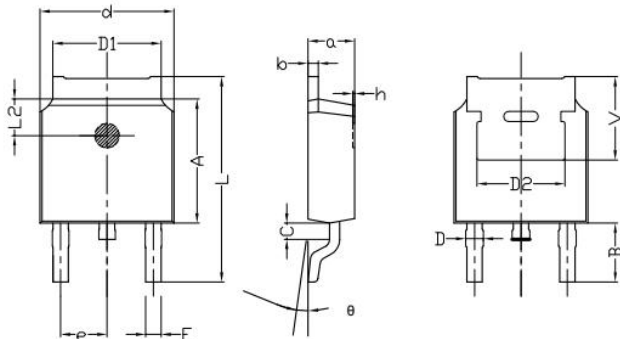
8 Dimensions

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 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.

10 Appendix

Revision history:

Date	REV.	Description	Page
2022.03.06	1.0	Original	