

# PWE180N65CS

Perfect MOS6 N-MOSFET 650V, 150mΩ, 20A



重庆平伟实业股份有限公司

## Features

- Uses PingWei advanced PerfectMOS6 technology
- Extremely low on-resistance  $R_{DS(on)}$
- Excellent  $Q_g \times R_{DS(on)}$  product(FOM)
- Excellent Low Ciss
- Qualified according to JEDEC criteria



**100% DVDS Tested**  
**100% Avalanche Tested**

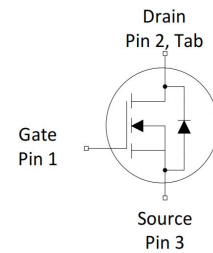
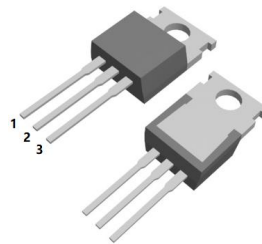
## Applications

- PFC stages, hard switching PWM stages and resonant switching
- PWM stages for e.g. PC Silverbox, Adapter, LCD & PDP TV, Lighting, Server, Telecom and UPS

## Product Summary

$V_{DS}$	650V
$R_{DS(on)@10V\ typ}$	150mΩ
$I_D$	20A

TO-220CB-3L



## Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWE180N65CS	E180N65CS	TO-220CB-3L	Tube	N/A	N/A	50pcs

## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	650	V
Continuous drain current $T_C = 25^\circ\text{C}$ (Silicon limit) $T_C = 100^\circ\text{C}$ (Silicon limit)	$I_D$	20 13	A
Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p = 100\mu\text{s}$ )	$I_{D\ pulse}$	80	A
Avalanche energy, single pulse ( $L=10\text{mH}$ , $V_{ds}=50\text{V}$ )	$E_{AS}$	195	mJ
Gate-Source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_C = 25^\circ\text{C}$ $T_a = 25^\circ\text{C}$	$P_{tot}$	125 1.5	W
Operating junction and storage temperature	$T_j, T_{stg}$	-55...+150	$^\circ\text{C}$
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	$T_{sold}$	260	$^\circ\text{C}$



## Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case.	RthJC	-	-	1.0	°C/W	-
Thermal resistance, junction - ambient(min. footprint)	RthJA	-	-	82	°C/W	-

## Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

## Static Characteristic

Drain-source breakdown voltage	$BV_{DSS}$	650	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2	-	4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	$I_{DSS}$	-	0.04	1	$\mu A$	$V_{DS}=650V, V_{GS}=0V$ $T_j=25^\circ C$ $T_j=150^\circ C$
Gate-source leakage current	$I_{GSS}$	-	$\pm 10$	$\pm 100$	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	150	180	mΩ	$V_{GS}=10V, I_D=10A$
Transconductance	$g_{fs}$	-	12	-	S	$V_{DS}=5V, I_D=10A$

## Dynamic Characteristic

Input Capacitance	$C_{iss}$	-	1625	-	pF	$V_{GS}=0V, V_{DS}=400V,$ $f=1MHz$
Output Capacitance	$C_{oss}$	-	52	-		
Reverse Transfer Capacitance	$C_{rss}$	-	43	-		
Gate Total Charge	$Q_G$	-	42	-	nC	$V_{DS}=520V, I_D=20A,$ $V_{GS}=10V$
Gate-Source charge	$Q_{gs}$	-	11	-		
Gate-Drain charge	$Q_{gd}$	-	18	-		
Turn-on delay time	$t_{d(on)}$	-	30	-	ns	$V_{GS}=10V, V_{DD}=325V,$ $R_{G\_ext}=10\Omega, I_D=3.6A$
Rise time	$t_r$	-	40	-		
Turn-off delay time	$t_{d(off)}$	-	50	-		
Fall time	$t_f$	-	25	-		
Gate resistance	$R_G$	-	10	-	Ω	$V_{GS}=0V, V_{DS}=0V,$ $f=1MHz$



## Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$	-	0.83	1.5	V	$V_{GS}=0V, I_{SD}=10A$
Body Diode Continuous Forward Current	$I_S$	-	-	20	A	$TC = 25^{\circ}C$
Body Diode Pulsed Current	$I_S$ pulse	-	-	81	A	$TC = 25^{\circ}C$
Body Diode Reverse Recovery Time	$t_{rr}$	-	256	-	ns	$I_F=1A, dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	2542	-	nC	



## Typical Performance Characteristics

Fig 1: Output Characteristics

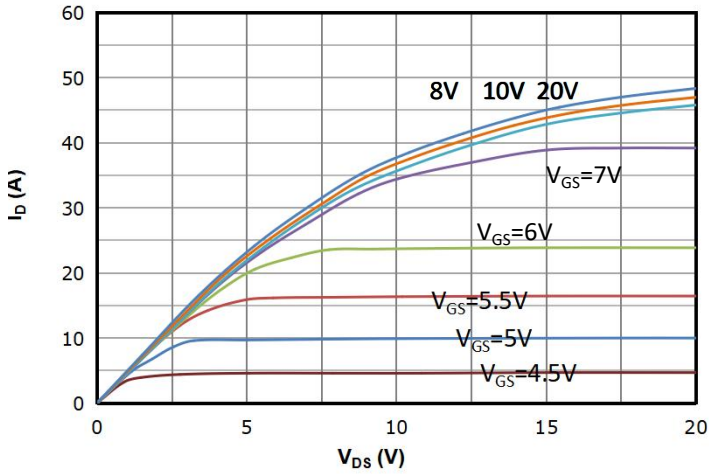


Fig 2: Transfer Characteristics

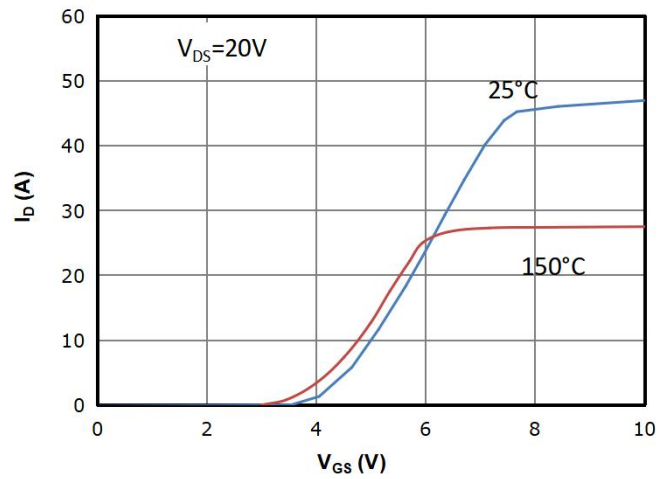


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

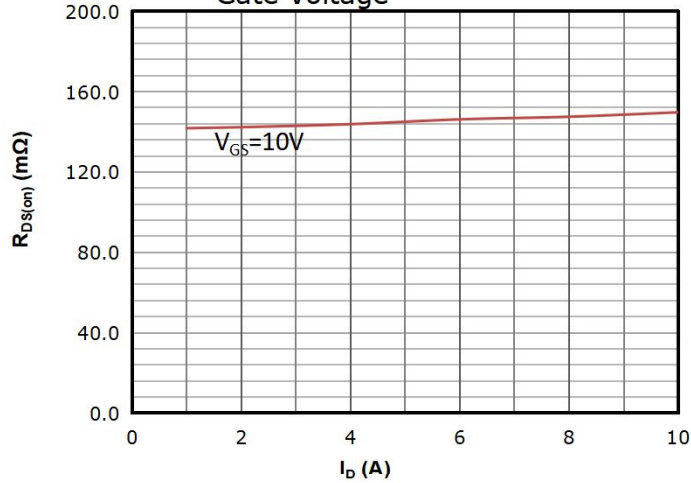


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

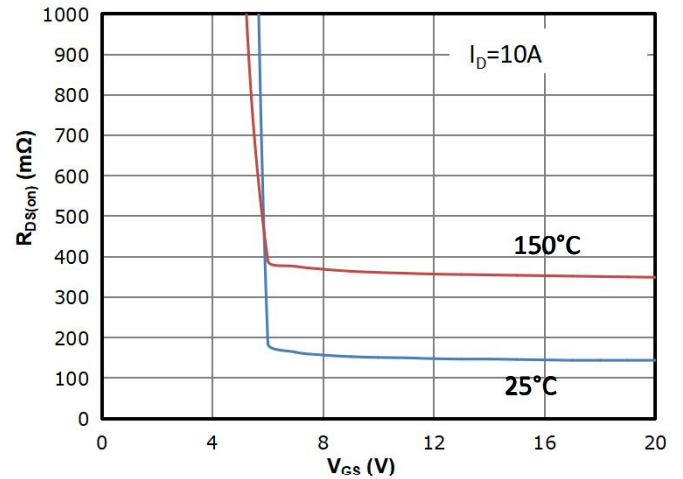


Fig 5:  $R_{DS(on)}$  vs. Temperature

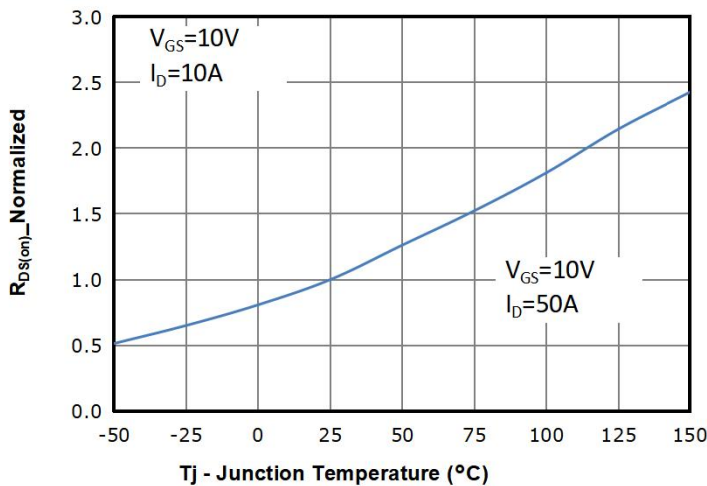


Fig 6:  $V_{GS(th)}$  vs. Temperature

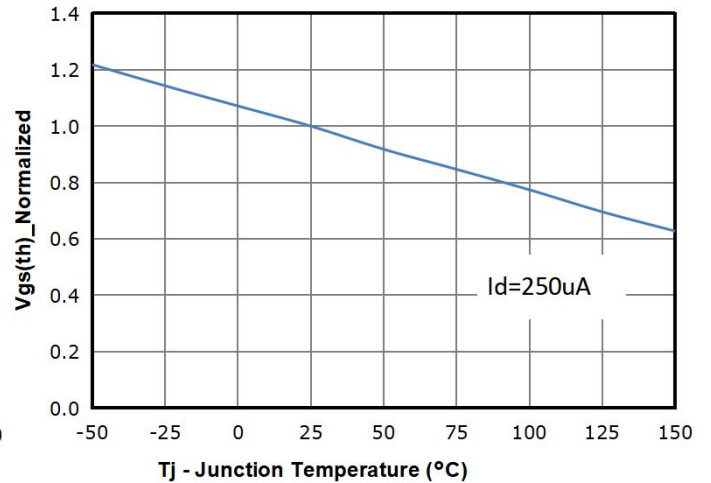


Fig 7: BV<sub>dss</sub> vs. Temperature

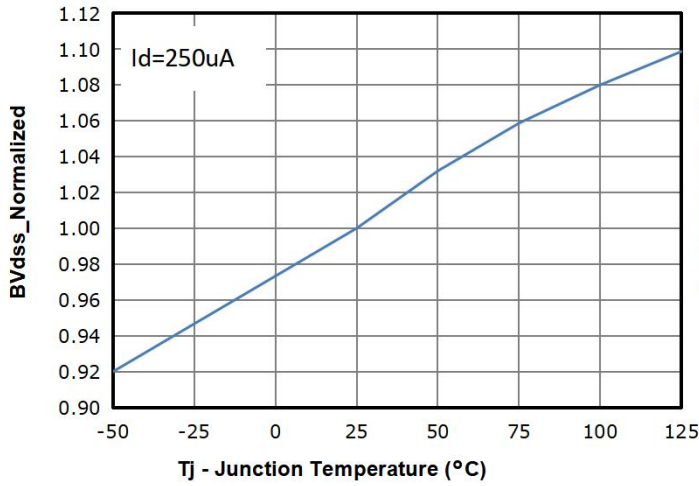


Fig 8: Capacitance Characteristics

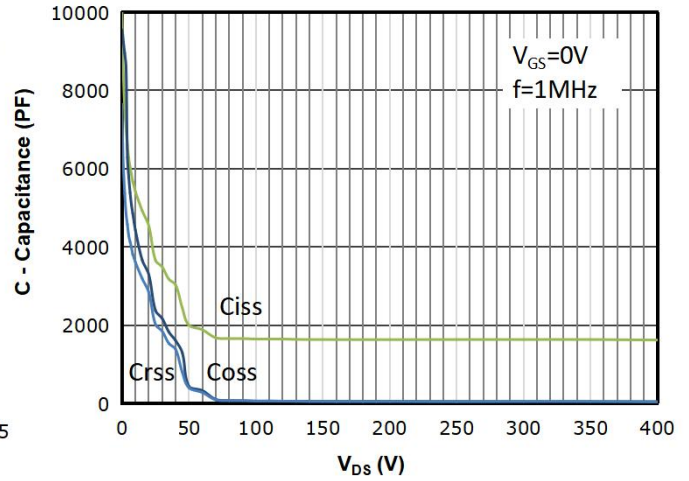


Fig 9: Gate Charge Characteristics

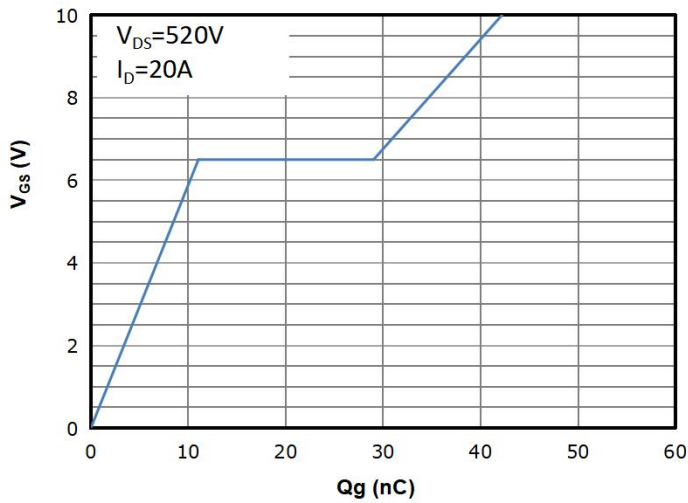


Fig 10: Body-diode Forward Characteristics

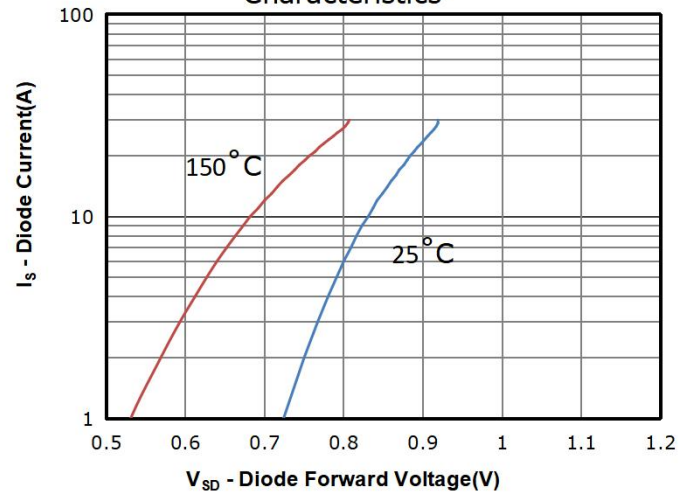


Fig 11: Power Dissipation

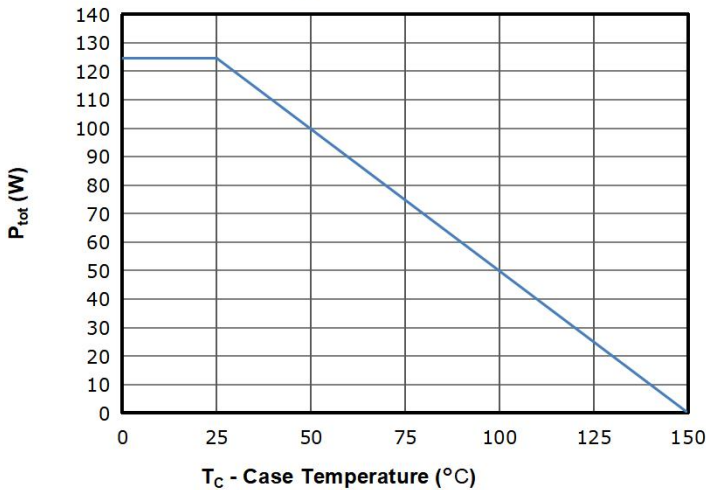


Fig 12: Drain Current Derating

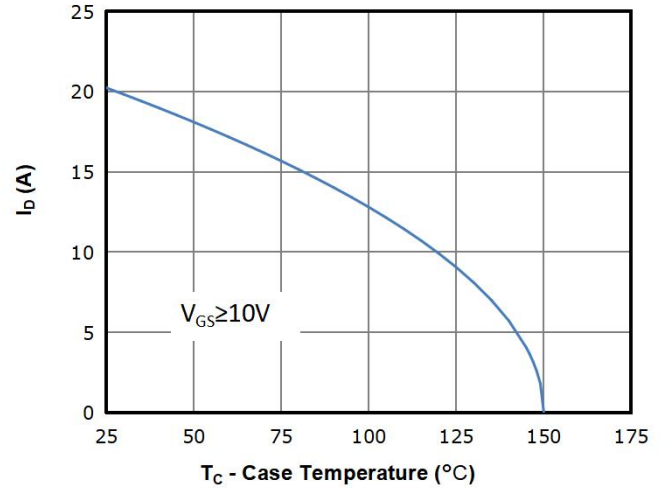




Fig 13: Safe Operating Area

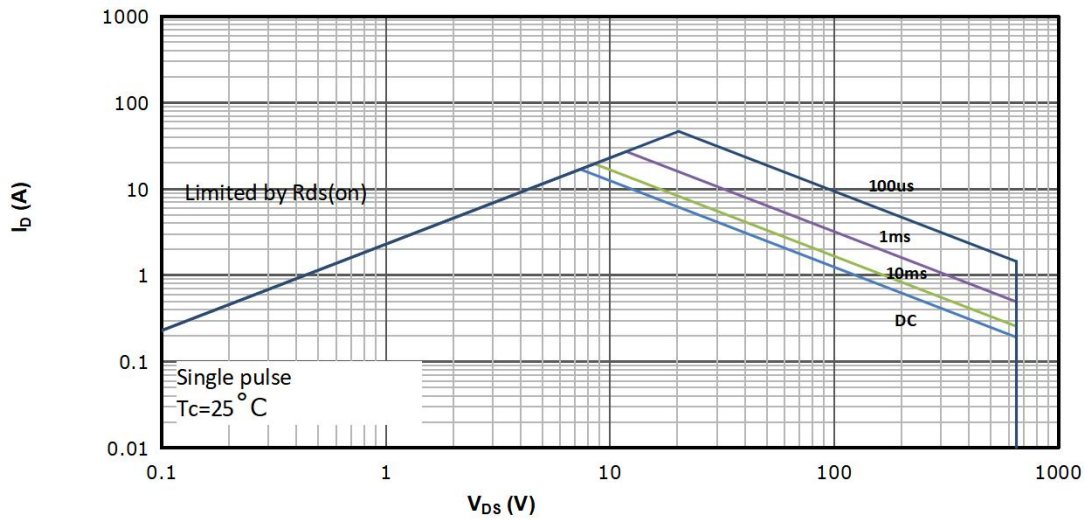
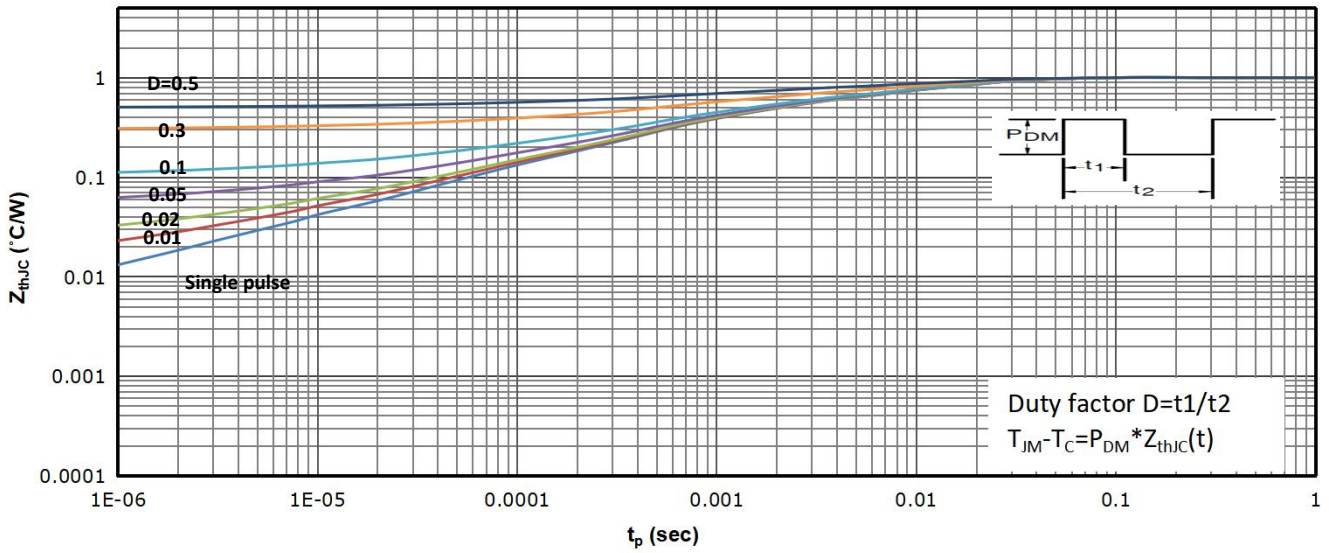
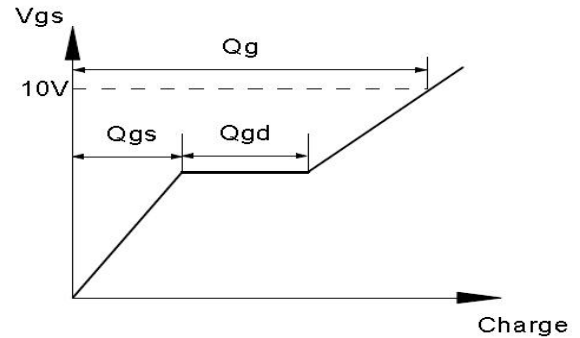
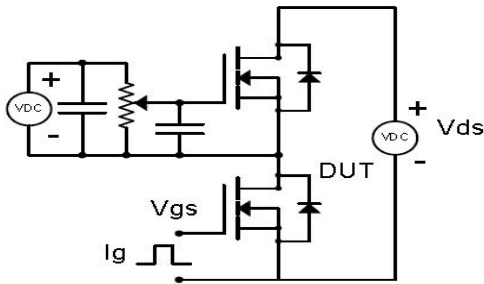


Fig 14: Max. Transient Thermal Impedance

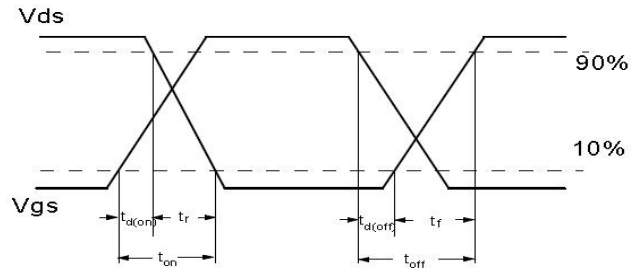
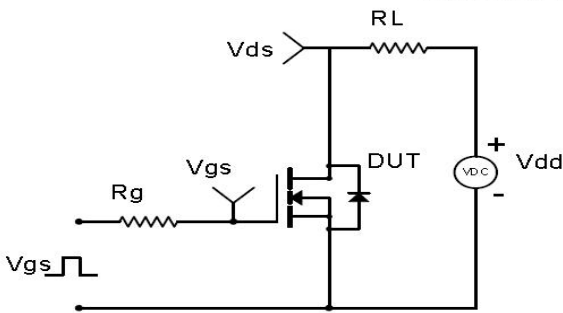


## Test Circuit & Waveform

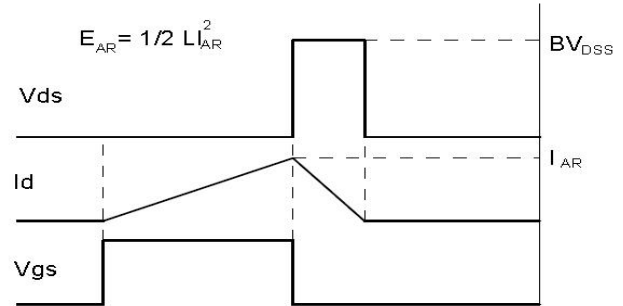
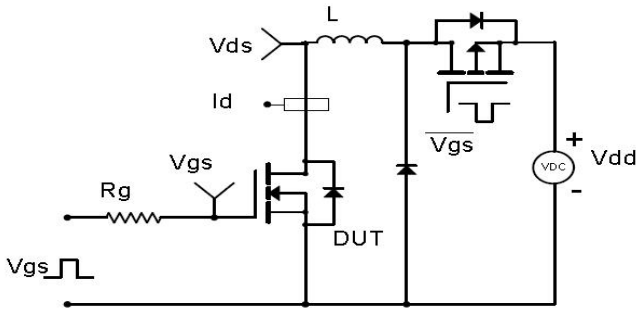
Gate Charge Test Circuit & Waveform



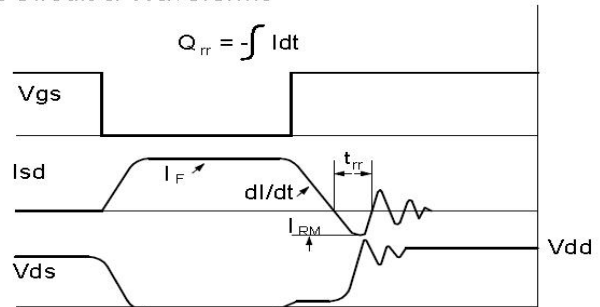
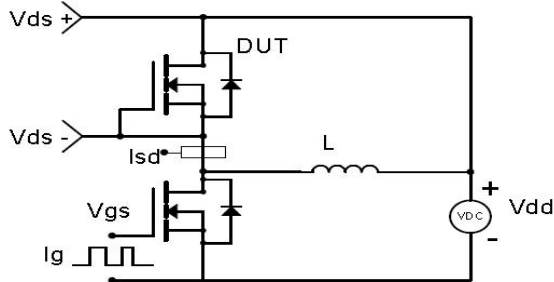
Resistive Switching Test Circuit & Waveforms



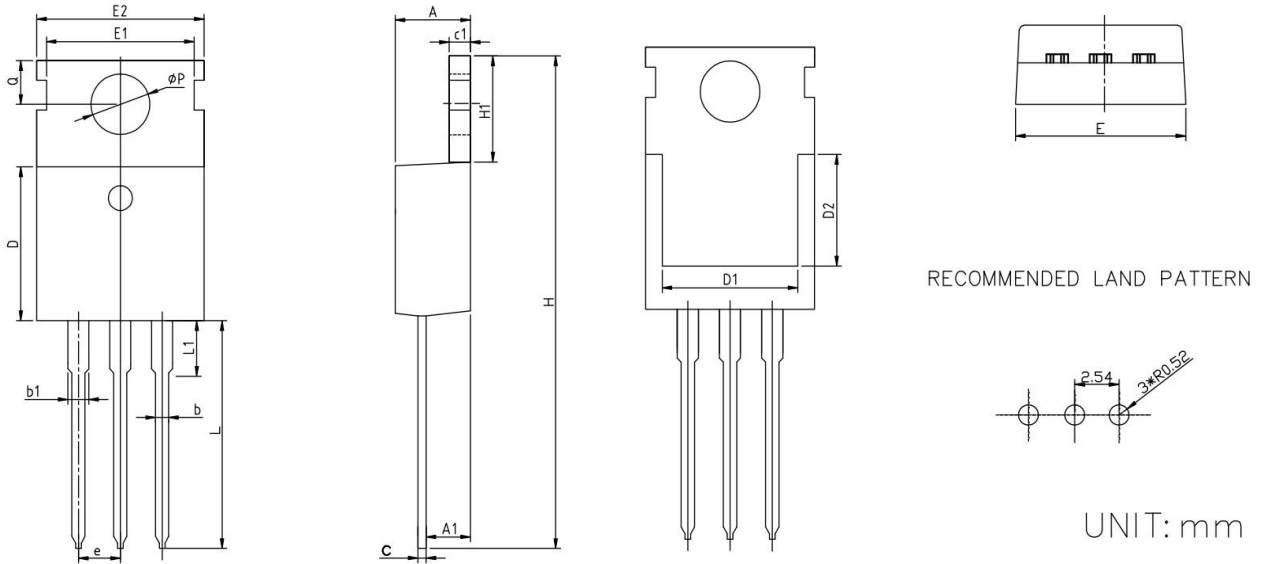
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Package Outline: TO-220CB-3L



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.40	4.80	0.173	0.189
A1	2.25	2.55	0.089	0.100
b	0.72	0.92	0.028	0.036
b1	1.12	1.42	0.044	0.056
c	0.40	0.60	0.016	0.024
c1	1.20	1.40	0.047	0.055
D	8.80	9.40	0.346	0.370
D1	7.75	8.15	0.305	0.321
D2	6.55	6.95	0.258	0.274
e	2.54		0.100	
E	9.65	10.35	0.380	0.407
E1	8.70		0.343	
E2	9.70	10.30	0.382	0.406
H	28.70	29.70	1.130	1.169
H1	6.25	6.85	0.246	0.270
L	13.20	13.80	0.520	0.543
L1	2.80	3.40	0.110	0.134
Q	2.60	3.00	0.102	0.118
φP	3.45	3.75	0.136	0.148





## Revision History

Revision	Date	Major changes
1.0	2022/8/22	Release of Foraml Version.

## Disclaimer

Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.

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