

N-Channel MOSFET

RCP02N12

Features

- Extremely low on-resistance $R_{DS(on)}$
- Excellent $Q_g \times R_{DS(on)}$ product(FOM)
- Qualified according to JEDEC criteria

Product Summary

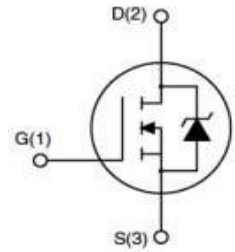
V_{DS}	200V
$R_{DS(on).typ}$	8.1m Ω
I_D	125A

Applications

- Motor control and drive
- Battery management System
- UPS (Uninterruptible Power Supplies)



TO-220



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	200	V
Continuous drain current $T_C = 25^\circ\text{C}$ (Silicon limit) $T_C = 25^\circ\text{C}$ (Package limit) $T_C = 100^\circ\text{C}$ (Silicon limit)	I_D	125 290 79	A
Pulsed drain current ($T_C = 25^\circ\text{C}$, t_p limited by T_{jmax})	$I_{D \text{ pulse}}$	500	A
Avalanche energy, single pulse ($I_D = 68\text{A}$, $R_g=25\Omega$) ^[1]	E_{AS}	1140	mJ
Gate-Source voltage	V_{GS}	± 20	V
Power dissipation ($T_C = 25^\circ\text{C}$)	P_{tot}	268	W
Operating junction and storage temperature	T_j, T_{stg}	-55...+150	$^\circ\text{C}$

※. Notes:

1.EAS is tested at starting $T_j = 25^\circ\text{C}$, $L = 0.5\text{mH}$, $I_{AS} = 68\text{A}$, $V_{GS} = 10\text{V}$.

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Thermal Resistance

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case.	R_{thJC}	0.46	°C/W
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	62	

Electrical Characteristic (at $T_j = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	BV _{DSS}	200	-	-	V	V _{GS} =0V, I _D =250uA
		200	-	-	V	V _{GS} =0V, I _D =1mA
Gate threshold voltage	V _{GS(th)}	2.0	3.0	4.0	V	V _{DS} =V _{GS} ,I _D =250uA
Zero gate voltage drain current	I _{DSS}	- -	- -	1 100	μA	V _{DS} =200V,V _{GS} =0V T _j =25°C T _j =125°C
Gate-source leakage current	I _{GSS}	-	-	±100	nA	V _{GS} =±20V,V _{DS} =0V
Drain-source on-state resistance	R _{DS(on)}	-	8.1	10	mΩ	VGS=10V, ID=40A
Transconductance	g _{fs}	-	104.7	-	S	V _{DS} =5V, I _D =50A
Dynamic Characteristic						
Input Capacitance	C _{iss}	-	4900	-	pF	V _{GS} =0V, V _{DS} =100V, f=1MHz
Output Capacitance	C _{oss}	-	410	-		
Reverse Transfer Capacitance	C _{rss}	-	20	-		
Gate Total Charge	Q _G	-	75.8	-	nC	V _{GS} =10V, V _{DS} =100V, I _D =50A
Gate-Source charge	Q _{gs}	-	27.7	-		
Gate-Drain charge	Q _{gd}	-	16.6	-		
Turn-on delay time	t _{d(on)}	-	22.9	-	ns	V _{GS} =10V, V _{DD} =100V, R _{G_ext} =2.7Ω
Rise time	t _r	-	46.3	-		
Turn-off delay time	t _{d(off)}	-	62.5	-		
Fall time	t _f	-	20.2	-		
Gate resistance	R _G	-	3.6	-	Ω	V _{GS} =0V, V _{DS} =0V, f=1MHz

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Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	0.83	1.4	V	$V_{GS}=0V, I_{SD}=50A$
Body Diode Reverse Recovery Time	t_{rr}	-	129.2	-	ns	$I_F=50A, dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	-	673.0	-	nC	

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Typical Performance Characteristics

Fig 1: Output Characteristics

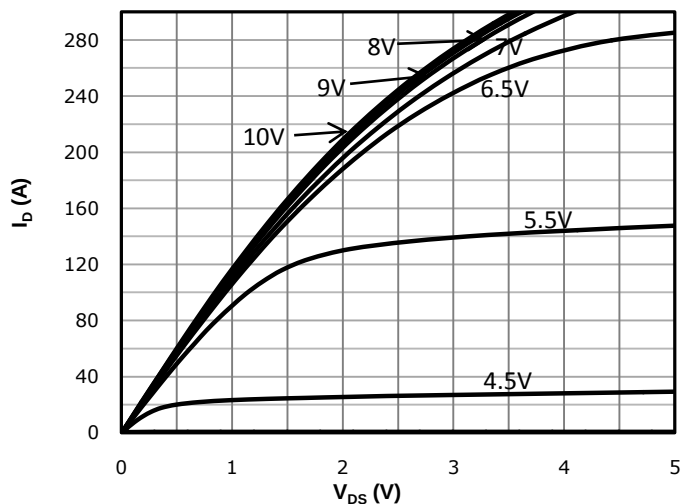


Fig 2: Transfer Characteristics

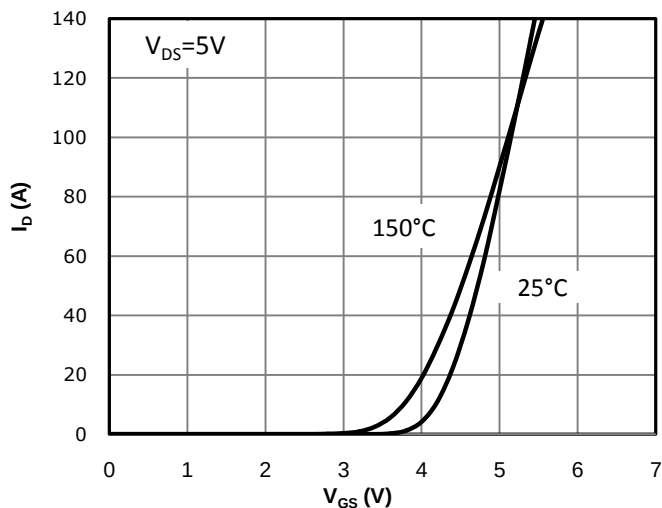


Fig 3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

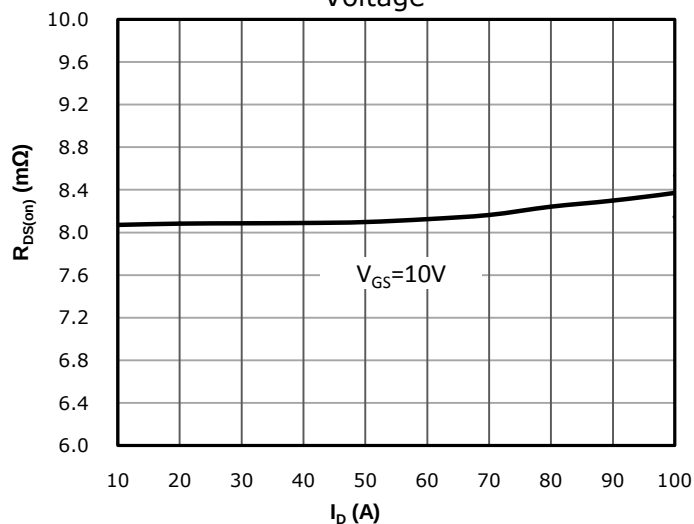


Fig 4: $R_{DS(on)}$ vs Gate Voltage

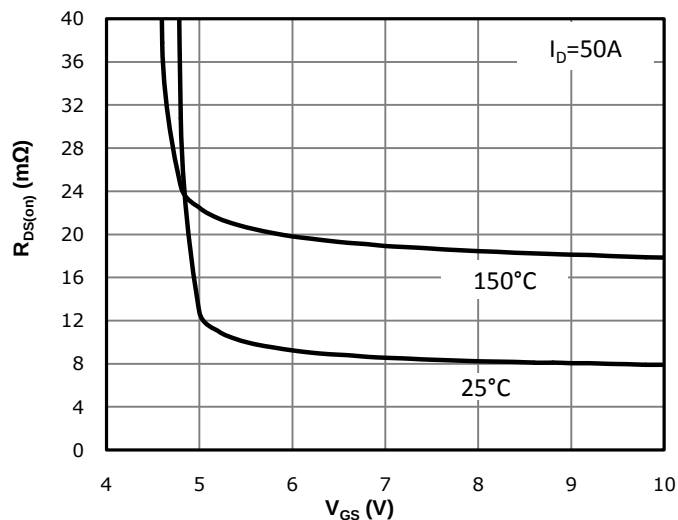


Fig 5: $R_{DS(on)}$ vs. Temperature

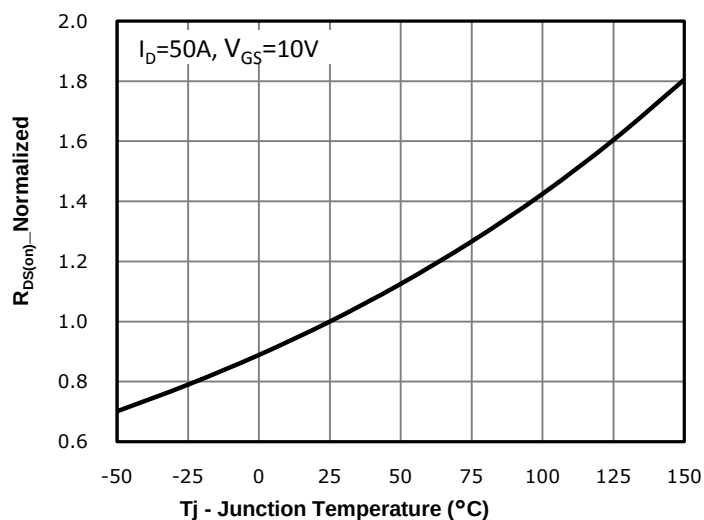
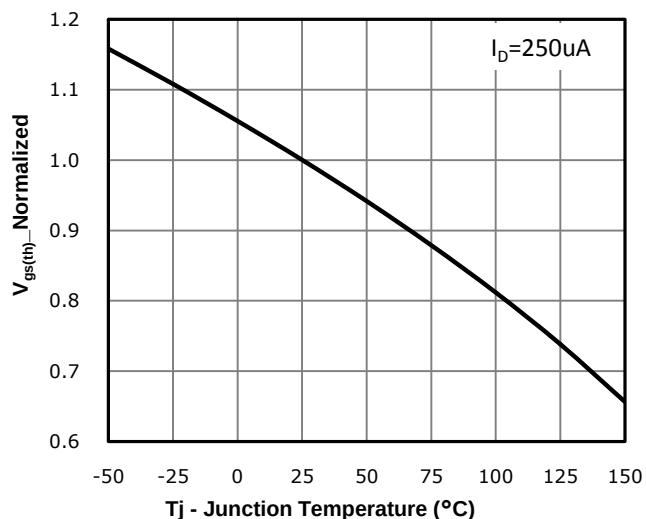


Fig 6: $V_{GS(th)}$ vs. Temperature



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Fig 7: BVdss vs. Temperature

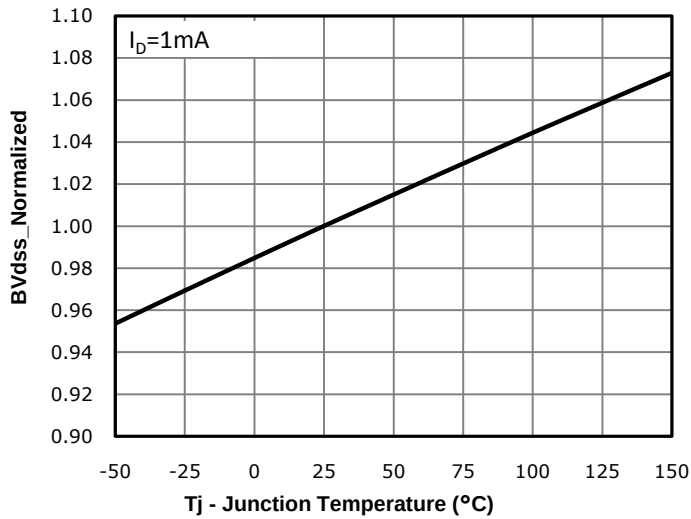


Fig 8: Capacitance Characteristics

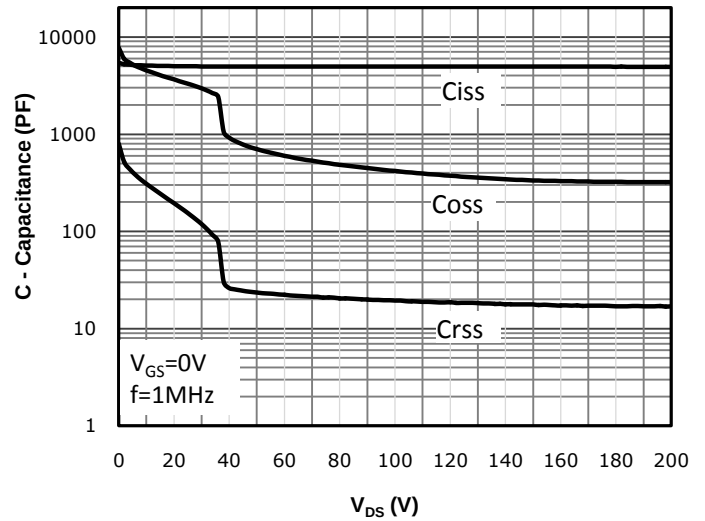


Fig 9: Gate Charge Characteristics

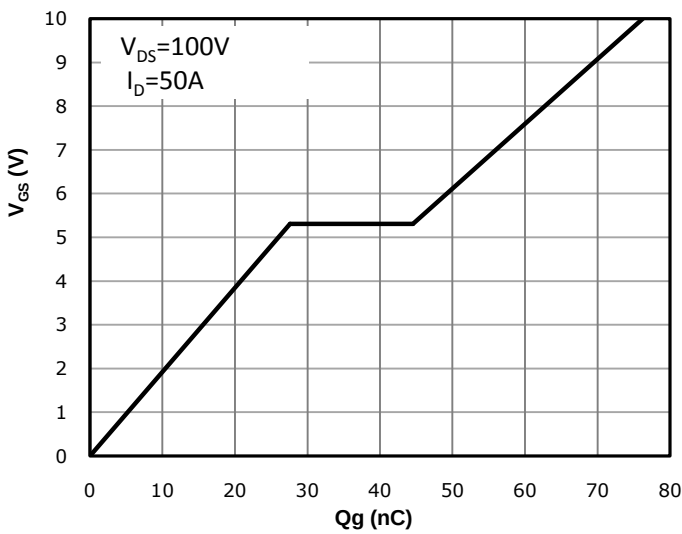


Fig 10: Body-diode Forward Characteristics

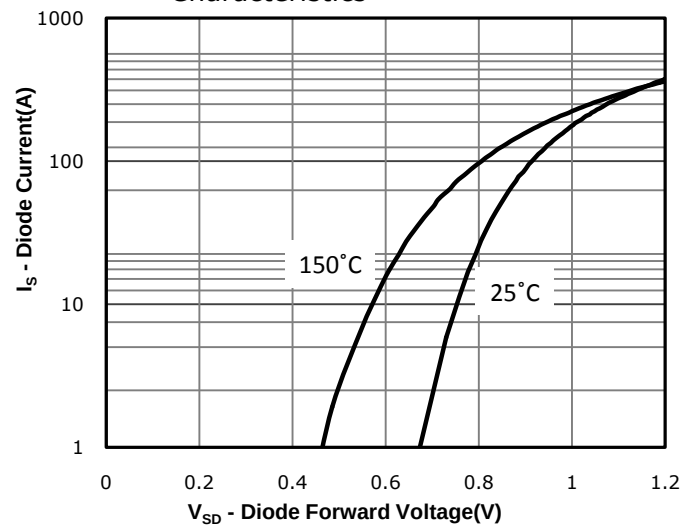


Fig 11: Power Dissipation

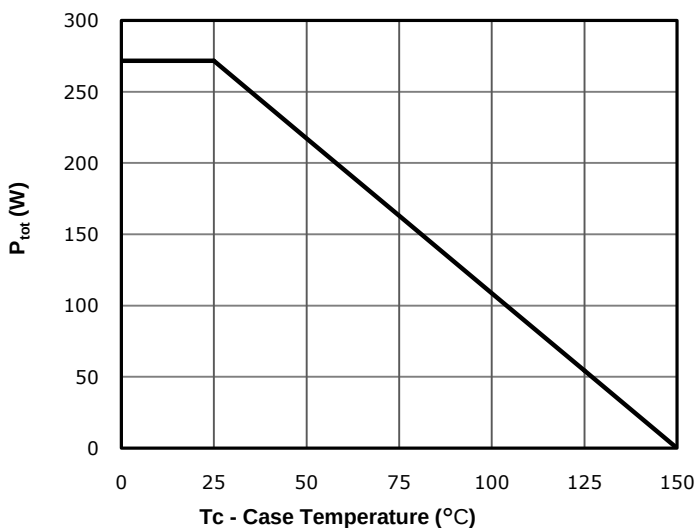
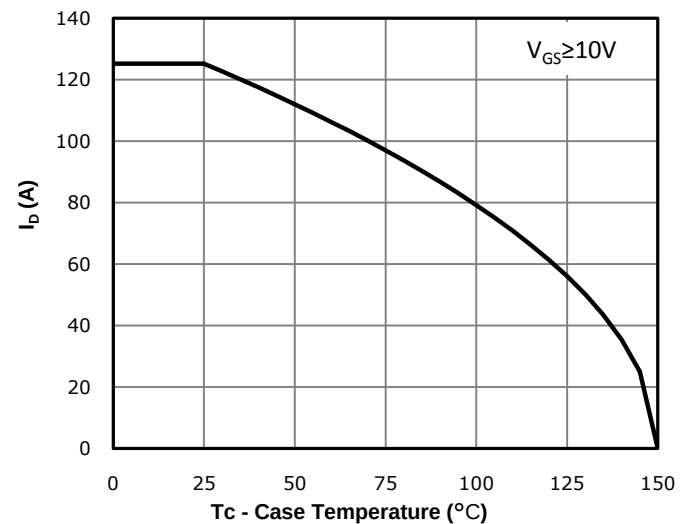


Fig 12: Drain Current Derating



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Fig 13: Safe Operating Area

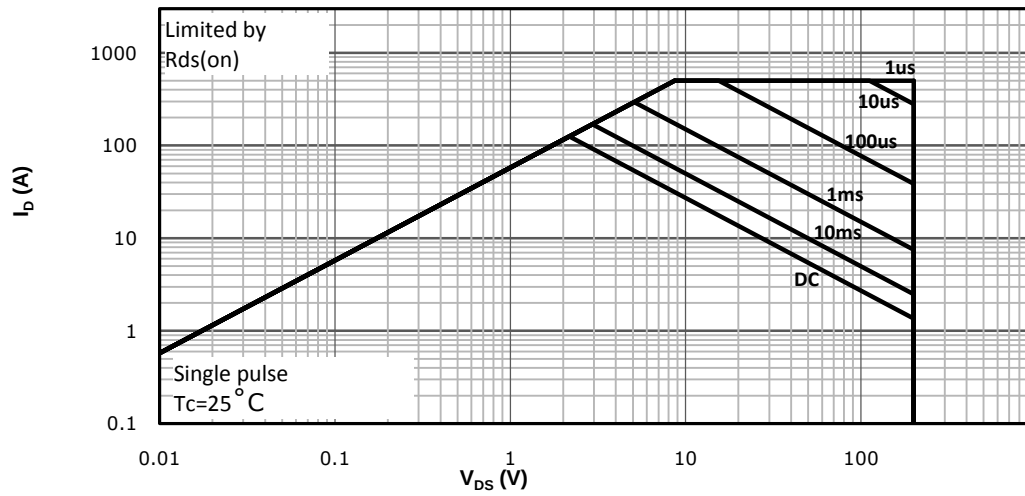
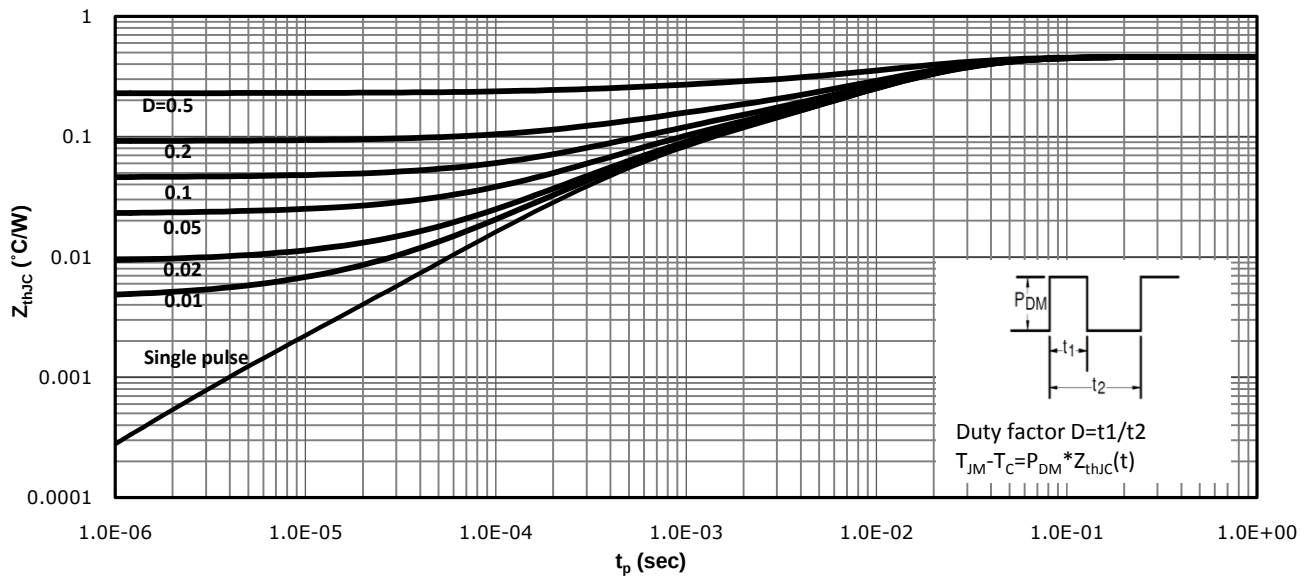


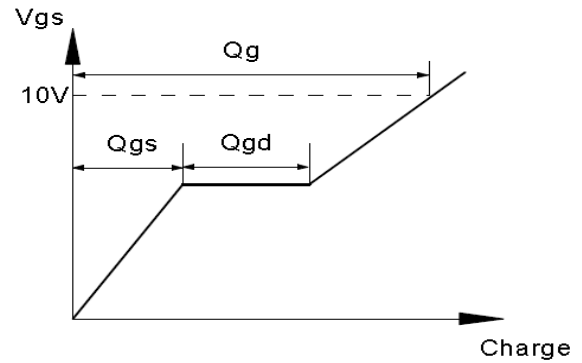
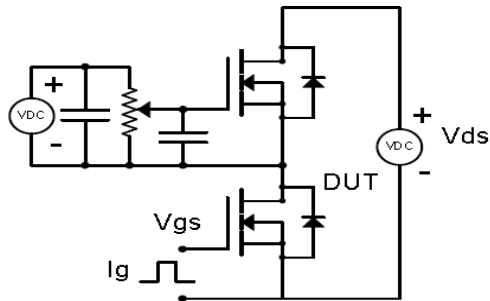
Fig 14: Max. Transient Thermal Impedance



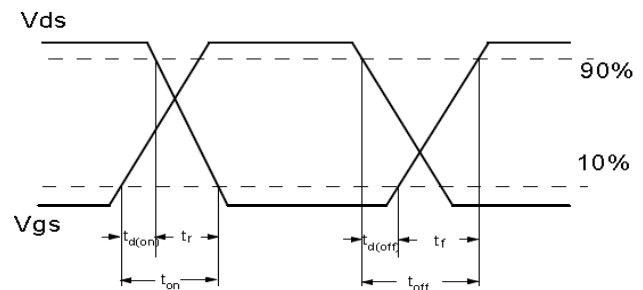
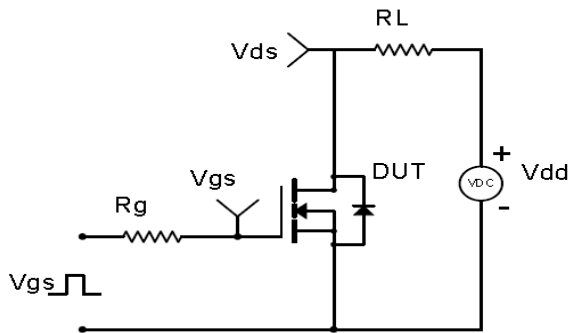
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Test Circuit & Waveform

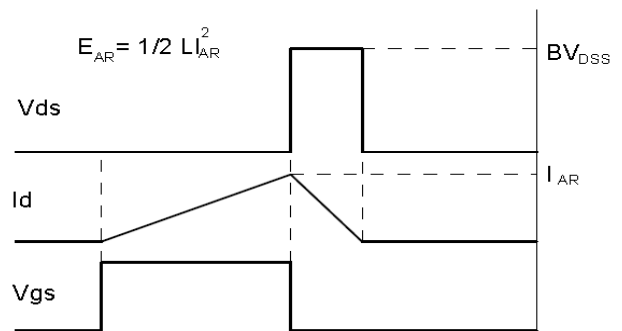
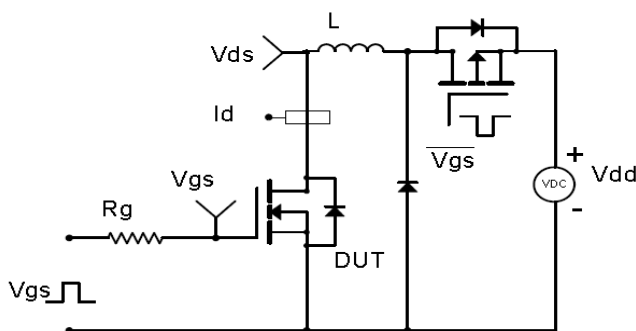
Gate Charge Test Circuit & Waveform



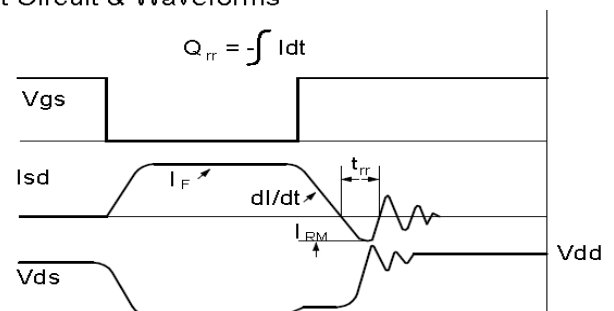
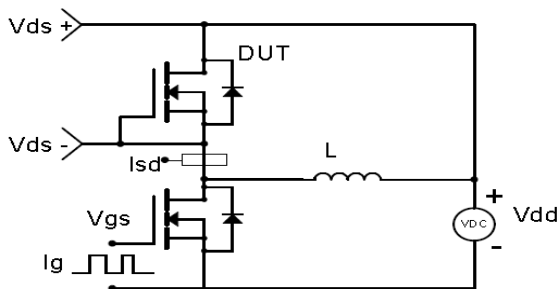
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

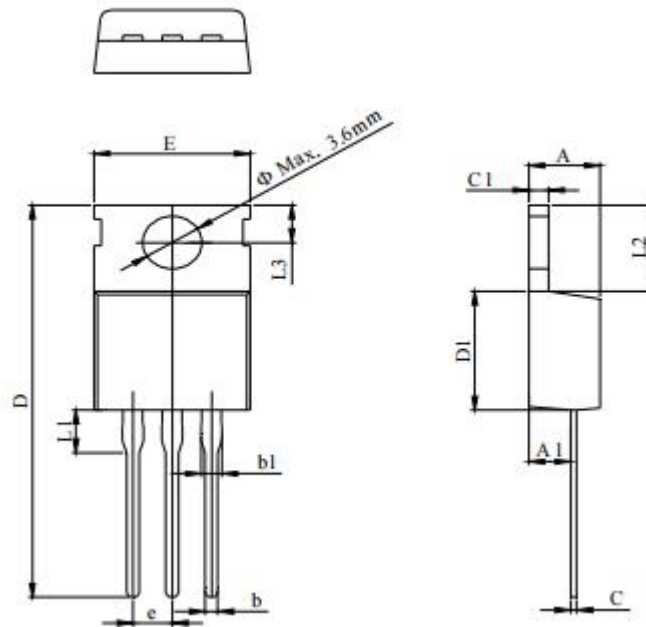


Diode Recovery Test Circuit & Waveforms



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TO-220-3L Package Information



DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	4.24		4.70
A1	2.20		3.00
b	0.70		0.95
b1	1.14		1.70
C	0.40		0.60
C1	1.15		1.40
D	28.00		29.80
D1	8.80		9.90
E	9.70		10.50
L1			3.80
L2	6.25		6.90
L3	2.40		3.00
e		2.54 BSC	