500V N-Channel MOSFET
RCD5N50

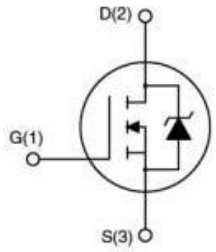
Description

The Power MOSFET is fabricated using the advanced planar VDMOS technology.
The resulting device has low conduction resistance, superior switching performance and high avalance energy.

V_{DSS}	500	V
I_D	5	A
$R_{DS(on),max}$	1.6	Ω
$Q_{g,typ}$	13.2	nC

Features

- ► Low RDS(on)
- ► Low gate charge (typ. Qg = 13.2 nC)
- ► 100% UIS tested
- ► RoHS compliant



TO-252

Applications

►Power faction correction.
►Switched mode power supplies.
►LED driver.

Ordering Information

Part Number	Package	Brand
RCD5N50	TO-252	RC

Absolute Maximum Ratings (TC=25℃unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	500	V
Continuous drain current [1] (T_C = 25°C)	I_D	5	A
(T_C = 100°C)		3	A
Pulsed drain current [2]	I_{DM}	20	A
Gate-Source voltage	V_{GSS}	±30	V
Avalanche energy, single pulse [3]	E_{AS}	211	mJ
Power Dissipation	P_D	80	W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C
Continuous diode forward current	I_S	5	A
Diode pulse current	$I_{S,pulse}$	50	A

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Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.57	°C/W
Thermal Resistance, Junction-to-Ambient [4]	$R_{\theta JA}$	96.05	°C/W
Soldering temperature, wavesoldering only allowed at leads. (1.6mm from case for 10s)	T_{sold}	260	°C

Electrical Characteristics (TJ=25℃ unless otherwise specified)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0 V, I_D=250 uA	500	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250 uA	2	-	4	V
Drain cut-off current	I_{DSS}	V_{DS}=500 V, V_{GS}=0 V, T_j = 25°C T_j = 125°C	- -	-	1 100	μA
Gate leakage current, Forward	I_{GSSF}	V_{GS}=20 V, V_{DS}=0 V	-	-	100	nA
Gate leakage current, Reverse	I_{GSSR}	V_{GS}=-20 V, V_{DS}=0 V	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=2.5 A T_j = 25°C T_j = 150°C	-	1.38 3.17	1.6	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 250kHz	-	549.83	-	pF
Output capacitance	C_{oss}		-	56.73	-	
Reverse transfer capacitance	C_{rss}		-	2.93	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 250V, I_D =5 A R_G = 10 Ω, V_{GS}=10 V	-	37.9	-	ns
Rise time	t_r		-	7.2	-	
Turn-off delay time	$t_{d(off)}$		-	18.0	-	
Fall time	t_f		-	8.1	-	
Gate charge characteristics						

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Gate to source charge	Q_{gs}	V_{DD}=400 V, I_D=2.5A, V_{GS}=0 to 10 V	-	2.6	-	nC
Gate to drain charge	Q_{gd}		-	5.8	-	
Gate charge total	Q_g		-	13.2	-	
Gate plateau voltage	$V_{plateau}$		-	4.7	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=5 A	-		1.3	V
Reverse recovery time	t_{rr}	V_R=250 V, I_F=2.5A, dI_F/dt=100 A/μs	-	201.4	-	ns
Reverse recovery charge	Q_{rr}		-	832.8	-	μC
Peak reverse recovery current	I_{rrm}		-	6.89	-	A

Notes:

1. Drain current limited by maximum junction temperature.
2. Repetitive Rating: Pulse width limited by maximum junction temperature.
3. I_{AS}=6.5A, L=10mH, V_{DD}=60V, Starting T_j= 25 。C.
4. The value of R_{thJA} is measured by placing the device in a still air box which is one cubic foot.

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Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

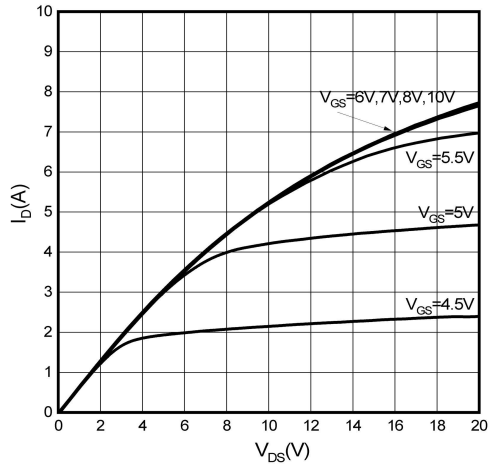

Figure 2. Transfer Characteristics

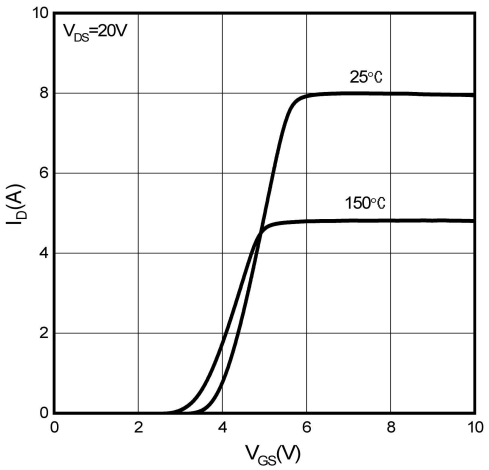

Figure 3. On-Resistance vs. Drain Current

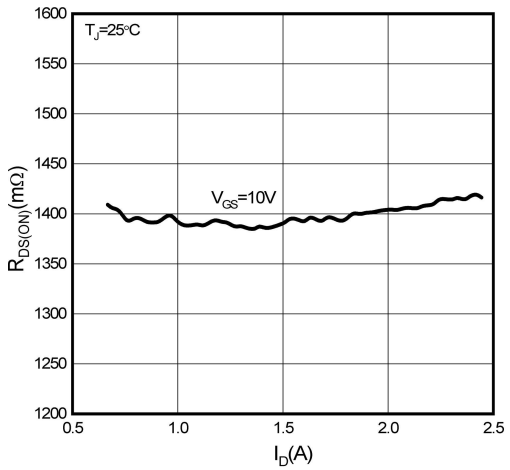

Figure 4.On-Resistance vs.Temperature

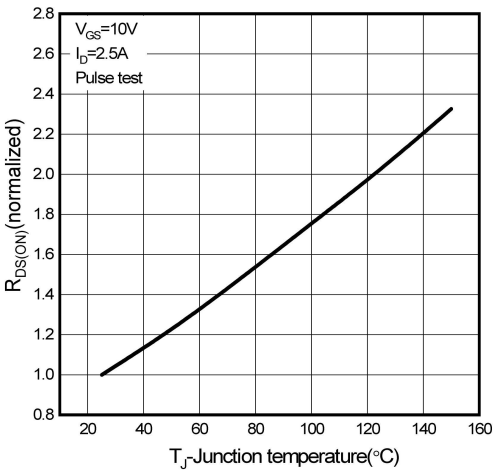

Figure 5.Breakdown Voltage vs.Temperature

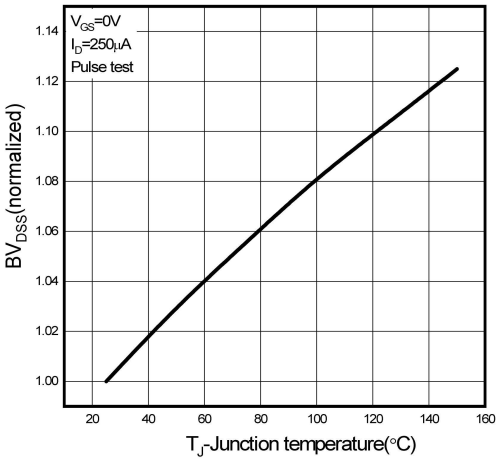

Figure 6.Threshold Voltage vs.Temperature

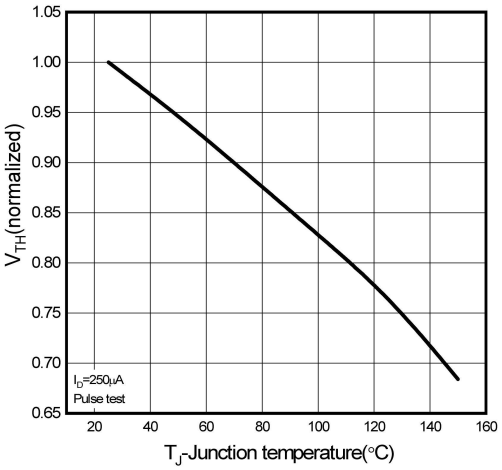

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Figure 7.Rds(on) vs. Gate Voltage

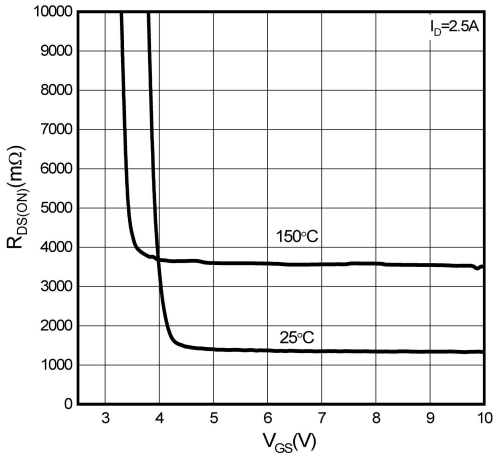

Figure 8.Body-Diode Characteristics

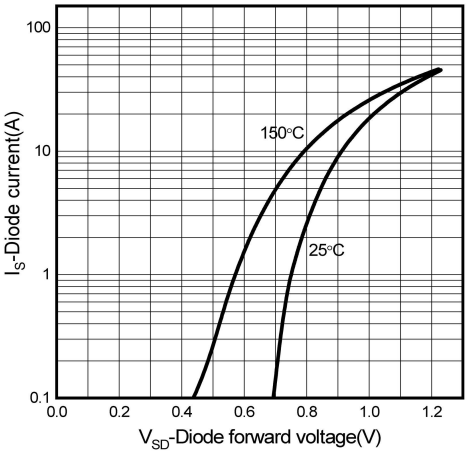

Figure 9.Capacitance Characteristics

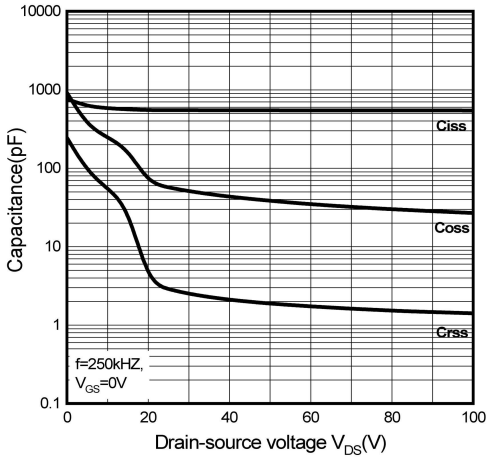

Figure 10.Gate Charge Characteristics

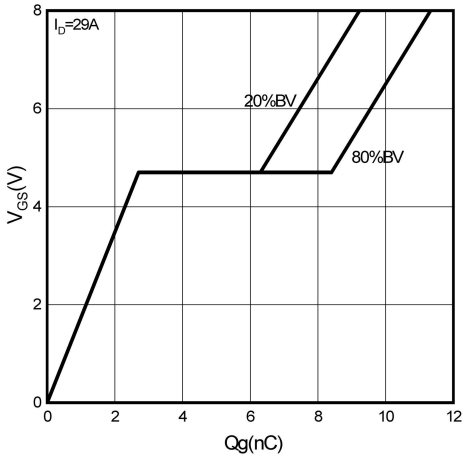

Figure 11.Drain Current Derating

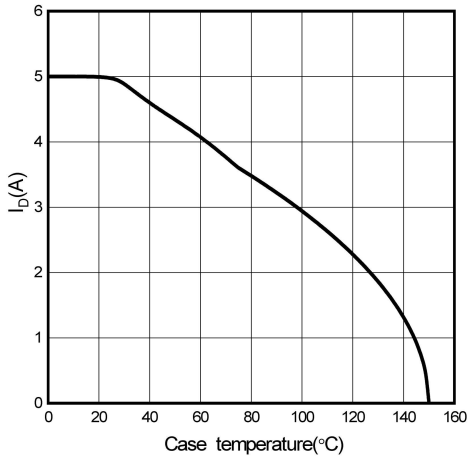

Figure 12.Power Dissipation vs.Temperature

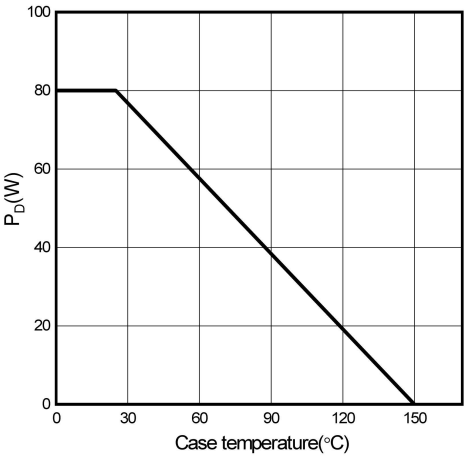

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Figure 13. Safe Operating Area

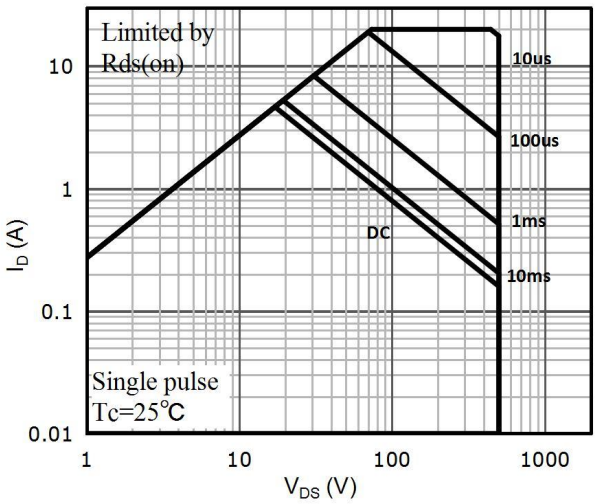
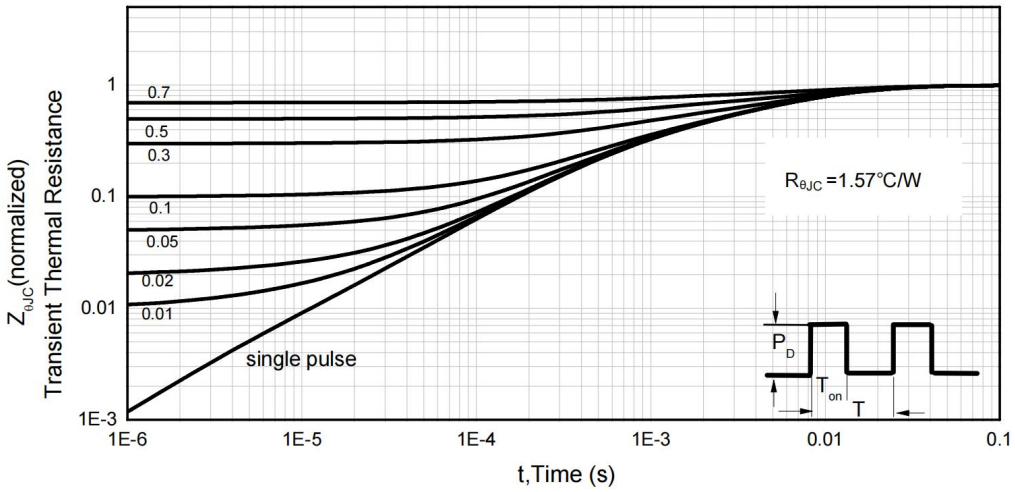


Figure 14. Normalized Maximum Transient Thermal Impedance (R_{thJC})



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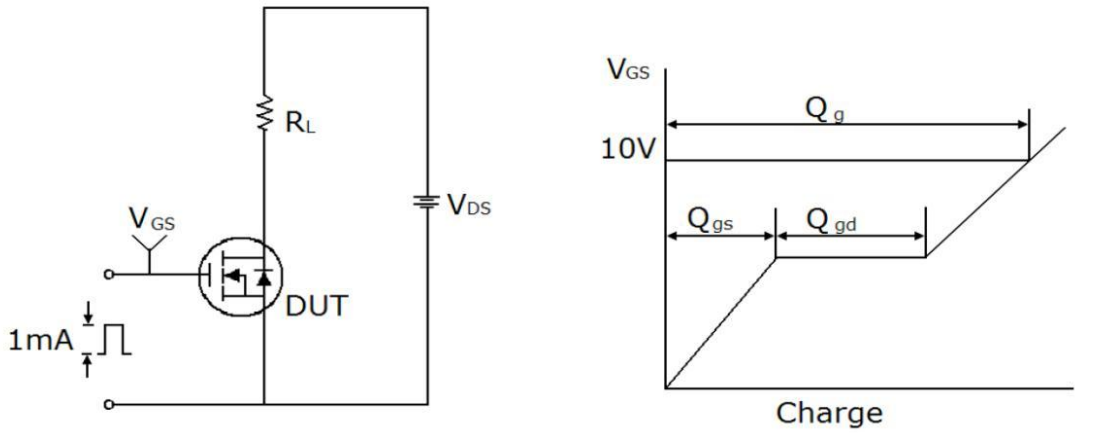
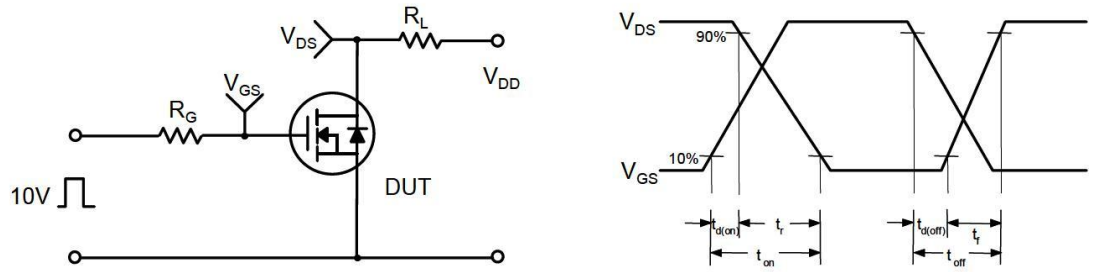
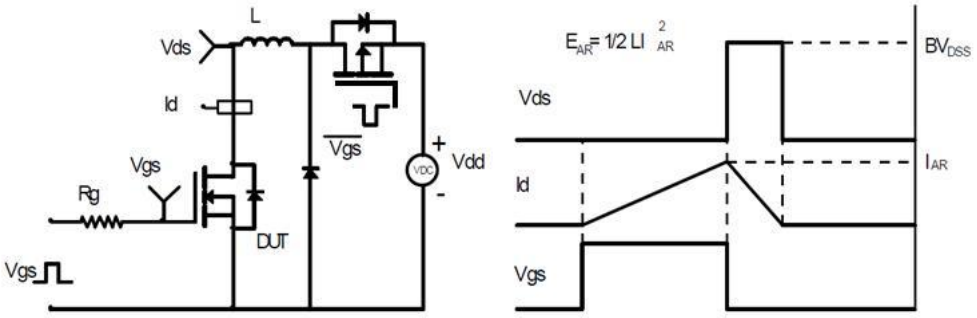
Gate Charge Test Circuit & Waveform



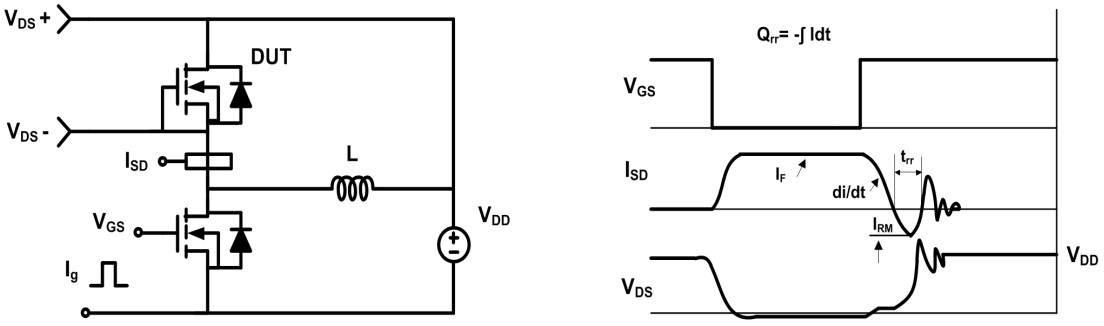
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveform



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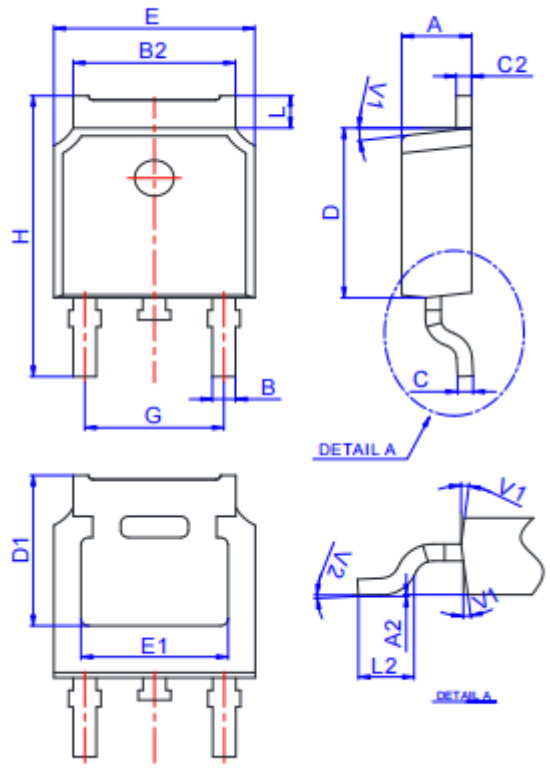
TO-252 Package outline



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°