

P-Channel Enhancement Mode Power MOSFET

RC50P03D5

■Features

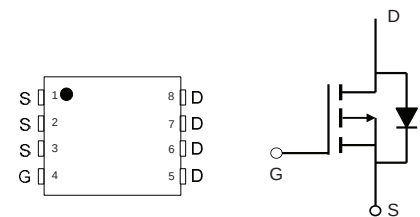
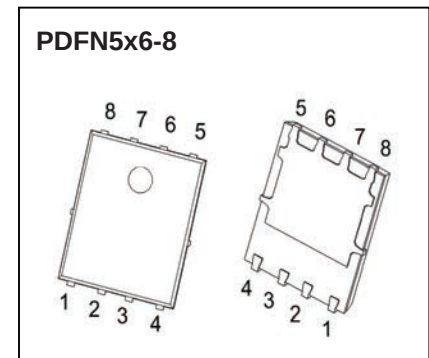
- $V_{DS} = -30V$, $I_D = -50A$
- $R_{DS(ON)}$ Typ $8m\Omega$ @ $V_{GS} = -10V$
- $R_{DS(ON)}$ Typ $12m\Omega$ @ $V_{GS} = -4.5V$
- Advanced Trench Technology
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Lead free product is acquired

■Application

- PWM Applications
- Load Switch
- Power Management

■Marking

Marking	**** RC50P03D5
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■Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise specified)

Symbol	Parameter		Max.	Units
V_{DSS}	Drain-Source Voltage		-30	V
V_{GSS}	Gate-Source Voltage		± 20	V
I_D	Continuous Drain Current	$T_C = 25^\circ C$	-50	A
		$T_C = 100^\circ C$	-23	A
I_{DM}	Pulsed Drain Current ^{note1}		-200	A
E_{AS}	Single Pulsed Avalanche Energy ^{note2}		121	mJ
P_D	Power Dissipation	$T_C = 25^\circ C$	52	W
$R_{\theta JC}$	Thermal Resistance, Junction to Case		2.9	$^\circ C/W$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	$^\circ C$

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■ Electrical Characteristics (T_J=25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D = -250μA	-30	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -30V, V _{GS} =0V,	-	-	-1	μA
I _{GSS}	Gate to Body Leakage Current	V _{DS} =0V, V _{GS} = ±20V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D = -250μA	-1.0	-1.5	-2.5	V
R _{DS(on)}	Static Drain-Source on-Resistance note3	V _{GS} = -10V, I _D = -30A	-	8	10.5	mΩ
		V _{GS} = -4.5V, I _D = -20A	-	12	16	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = -15V, V _{GS} =0V, f=1.0MHz	-	1950	-	pF
C _{oss}	Output Capacitance		-	255	-	pF
C _{rss}	Reverse Transfer Capacitance		-	170	-	pF
Q _g	Total Gate Charge	V _{DS} = -15V, I _D = -20A, V _{GS} = -10V	-	37	-	nC
Q _{gs}	Gate-Source Charge		-	6.5	-	nC
Q _{gd}	Gate-Drain(“Miller”) Charge		-	9.4	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} = -15V, I _D = -30A, V _{GS} = -10V, R _{GEN} =2.5Ω	-	16	-	ns
t _r	Turn-on Rise Time		-	21	-	ns
t _{d(off)}	Turn-off Delay Time		-	68	-	ns
t _f	Turn-off Fall Time		-	52	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-50	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-200	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} =0V, I _S = -30A	-	-0.8	-1.2	V

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. E_{AS} condition: T_J=25°C, V_{DD}= -15V, V_G= -10V, R_G=25Ω, L=0.5mH, I_{AS}= -22A

3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

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Typical Performance Characteristics

Figure 1: Output Characteristics

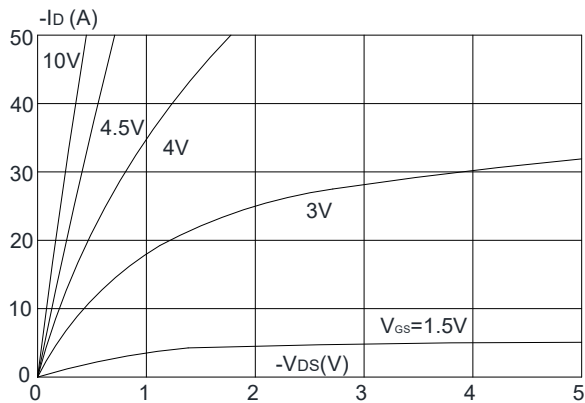


Figure 2: Typical Transfer Characteristics

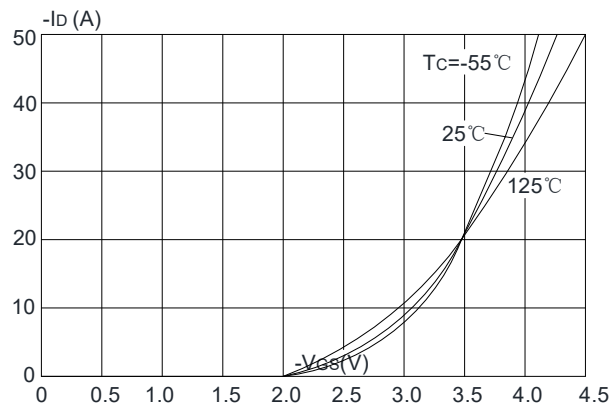


Figure 3: On-resistance vs. Drain Current

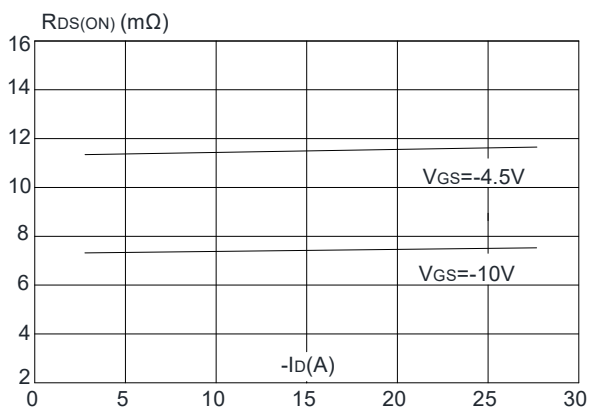


Figure 4: Body Diode Characteristics

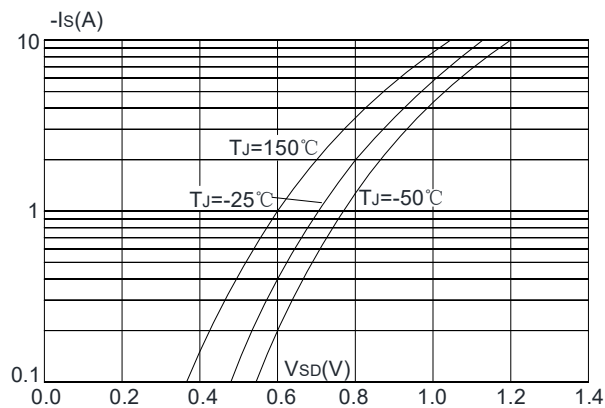


Figure 5: Gate Charge Characteristics

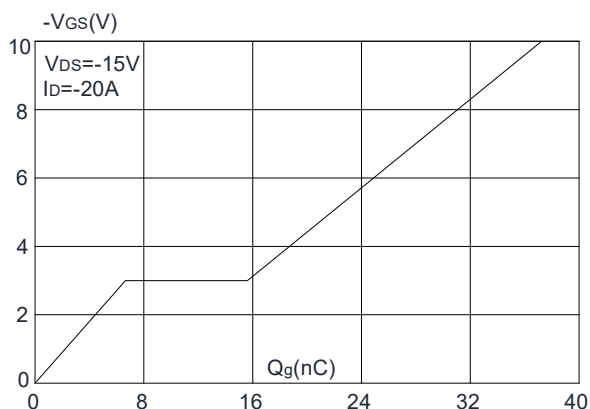
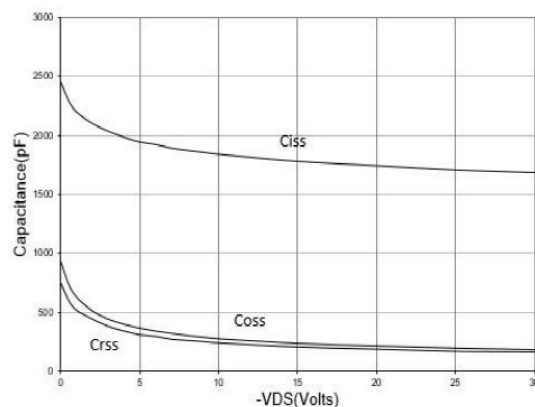


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

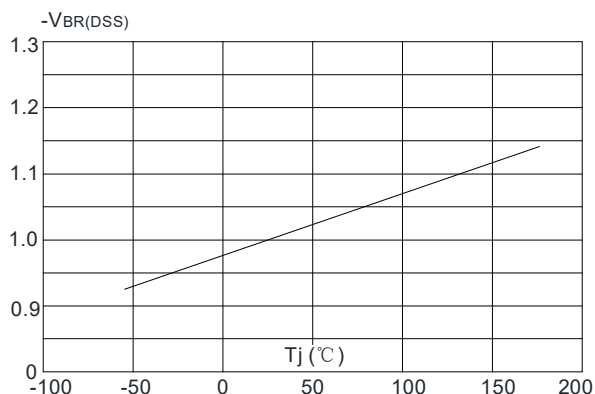


Figure 8: Normalized on Resistance vs. Junction Temperature

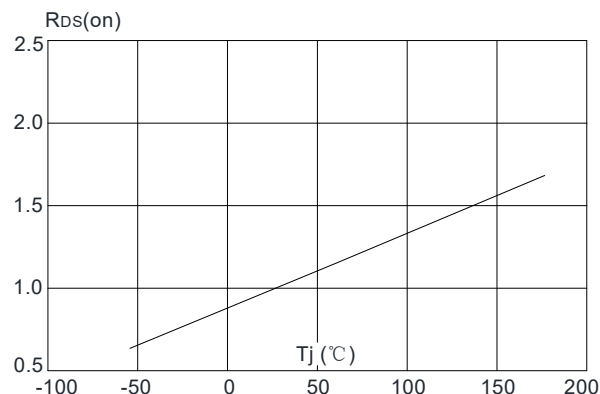


Figure 9: Maximum Safe Operating Area

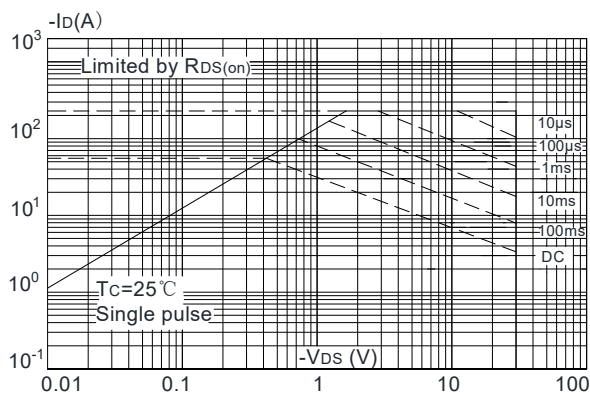


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

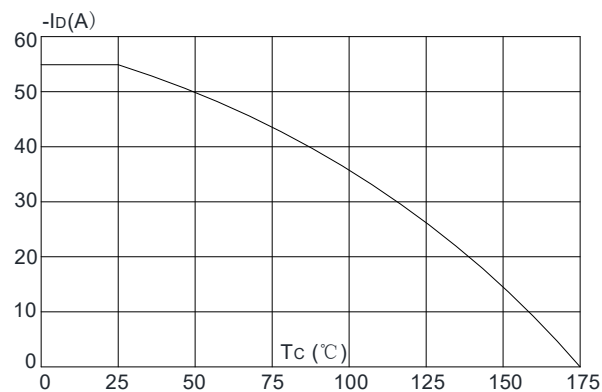
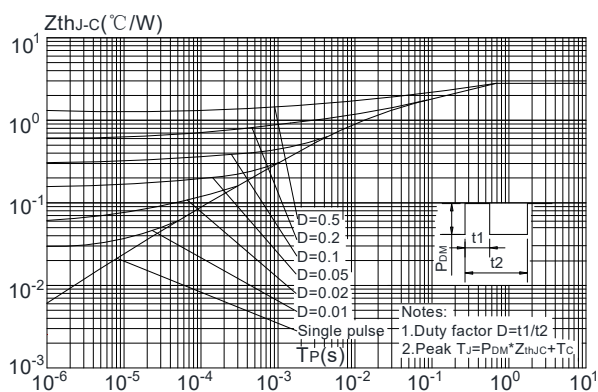


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

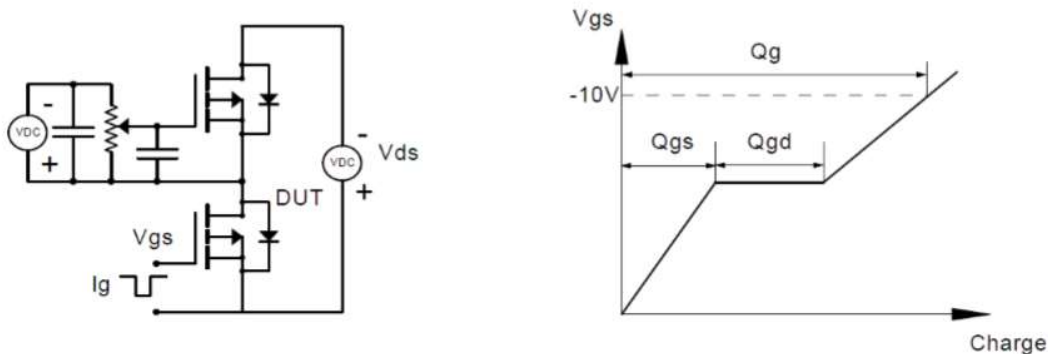


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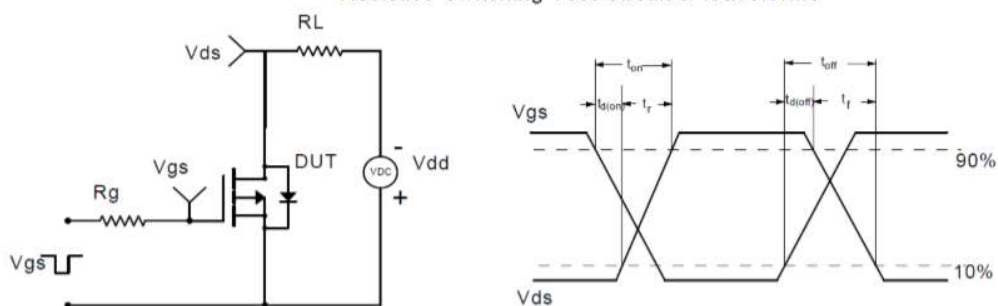
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Test Circuit

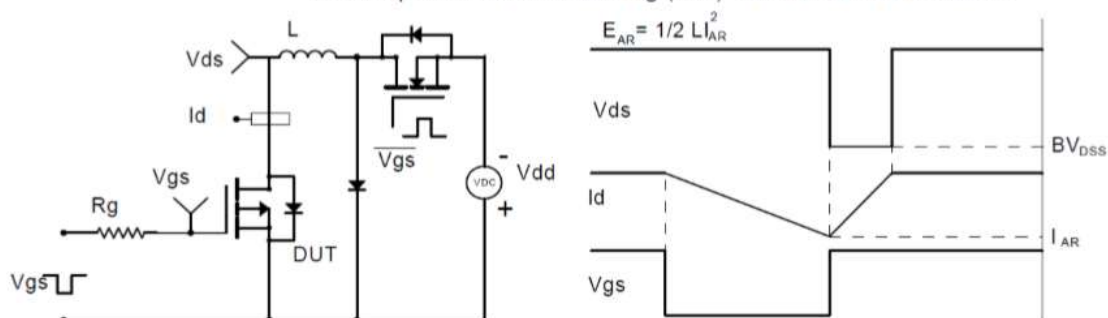
Gate Charge Test Circuit & Waveform



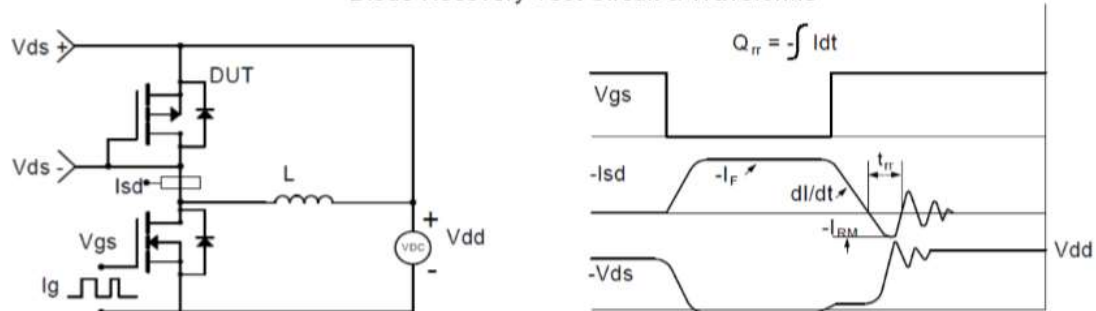
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



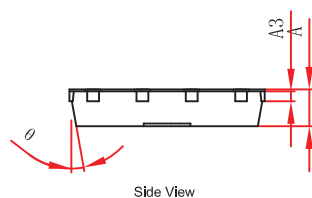
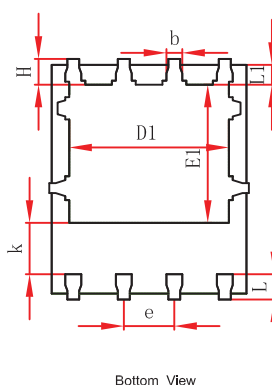
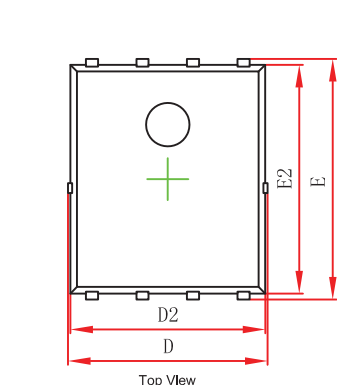
Diode Recovery Test Circuit & Waveforms



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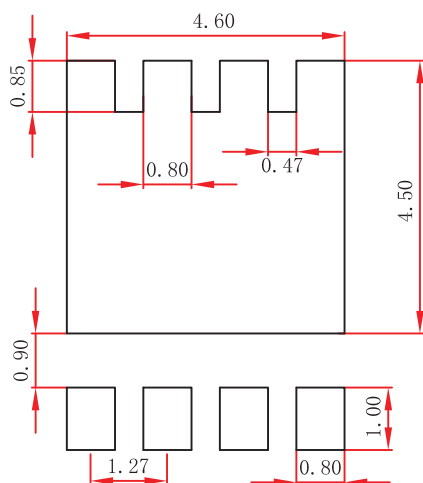
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PDFN5x6-8 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	3.910	4.110	0.154	0.162
E1	3.375	3.575	0.133	0.141
D2	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	10°	12°	10°	12°

PDFN5x6-8 Suggested Pad Layout



Note:

1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.