

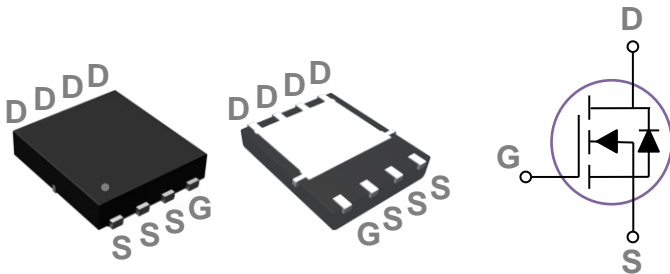
30V N-Channel MOSFETS

RCQ5304

General Description

These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

PPAK5X6 Pin Configuration



BVDSS	RDSON	ID
30V	4.5mΩ	90A

Features

- 30V, 90A, $R_{DS(ON)} = 4.5m\Omega @ V_{GS} = 10V$
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available

Applications

- MB / VGA / Vcore
- POL Applications
- SMPS 2nd SR

Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current – Continuous ($T_c=25^\circ\text{C}$)	90	A
	Drain Current – Continuous ($T_c=100^\circ\text{C}$)	57	A
I_{DM}	Drain Current – Pulsed ¹	360	A
EAS	Single Pulse Avalanche Energy ²	125	mJ
IAS	Single Pulse Avalanche Current ²	50	A
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	115	W
	Power Dissipation – Derate above 25°C	0.77	W/ $^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to 175	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	62	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	1.3	$^\circ\text{C}/\text{W}$

30V N-Channel MOSFETS RCQ5304

Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Static State Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	30	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =1mA	---	0.04	---	V/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =30V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =24V, V _{GS} =0V, T _J =125°C	---	---	10	uA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
R _{DS(ON)}	Static Drain-Source On-Resistance ³	V _{GS} =10V, I _D =20A	---	4.5	5.5	mΩ
		V _{GS} =4.5V, I _D =10A	---	6.5	7.5	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1	1.6	2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	-4	---	mV/°C
g _{fs}	Forward Transconductance	V _{DS} =10V, I _D =12A	---	20	---	S

Dynamic Characteristics

Q _g	Total Gate Charge ^{3, 4}	V _{DS} =15V, V _{GS} =4.5V, I _D =20A	---	24	36	nC
			---	47	90	
Q _{gs}	Gate-Source Charge ^{3, 4}	V _{DS} =15V, V _{GS} =10V, I _D =20A	---	5.8	10	
Q _{gd}	Gate-Drain Charge ^{3, 4}		---	10	20	
T _{d(on)}	Turn-On Delay Time ^{3, 4}	V _{DD} =15V, V _{GS} =10V, R _G =3.3Ω I _D =15A	---	12.6	---	ns
T _r	Rise Time ^{3, 4}		---	19.5	---	
T _{d(off)}	Turn-Off Delay Time ^{3, 4}		---	42.8	---	
T _f	Fall Time ^{3, 4}		---	13.2	---	
C _{iss}	Input Capacitance	V _{DS} =25V, V _{GS} =0V, F=1MHz	---	2200	---	pF
C _{oss}	Output Capacitance		---	475	---	
C _{rss}	Reverse Transfer Capacitance		---	340	---	
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	---	2	---	Ω

Guaranteed Avalanche Energy

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy	V _{DD} =25V, L=0.1mH, I _{AS} =25A	31	---	---	mJ

Drain-Source Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current	V _G =V _D =0V, Force Current	---	---	90	A
I _{SM}	Pulsed Source Current ³		---	---	360	A
V _{SD}	Diode Forward Voltage ³	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1	V
t _{rr}	Reverse Recovery Time	V _{GS} =30V, I _S =1A, di/dt=100A/μs T _J =25°C	---	258	---	ns
Q _{rr}	Reverse Recovery Charge		---	324	---	nC

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=50A, R_G=25Ω, Starting T_J=25°C.
3. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
4. Essentially independent of operating temperature.

30V N-Channel MOSFETS RCQ5304

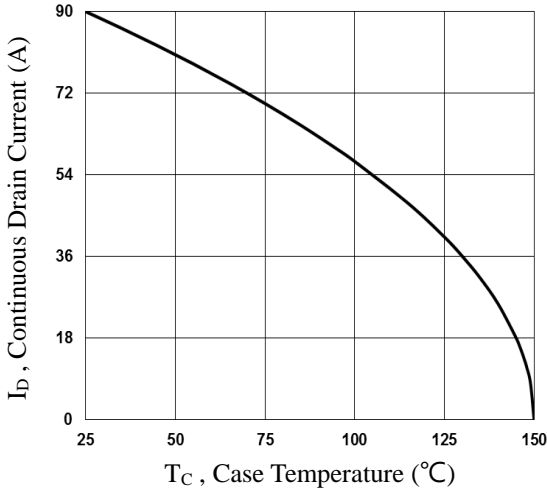


Fig.1 Continuous Drain Current vs. T_c

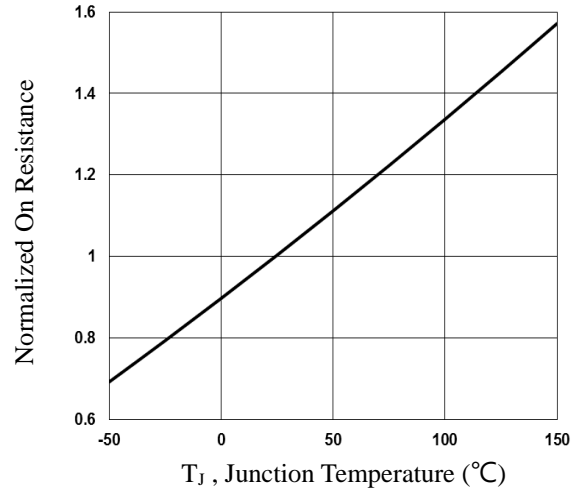


Fig.2 Normalized $R_{DS(on)}$ vs. T_j

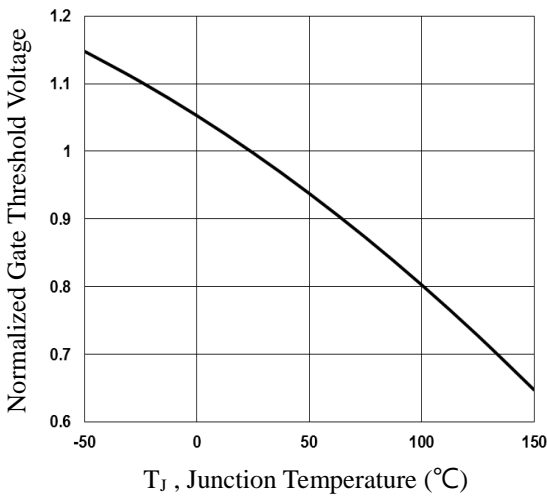


Fig.3 Normalized V_{th} vs. T_j

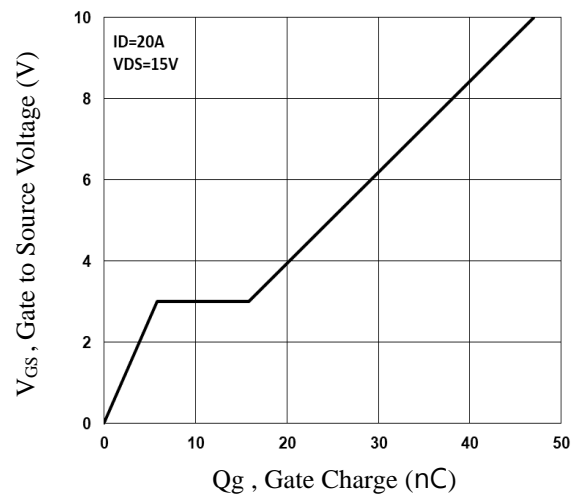


Fig.4 Gate Charge Waveform

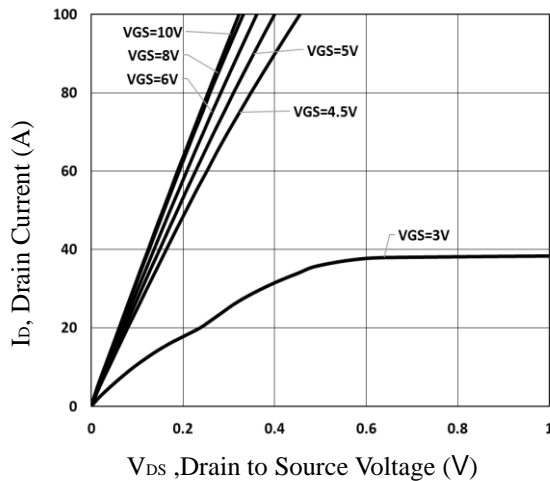


Fig.5 Typical Output Characteristics

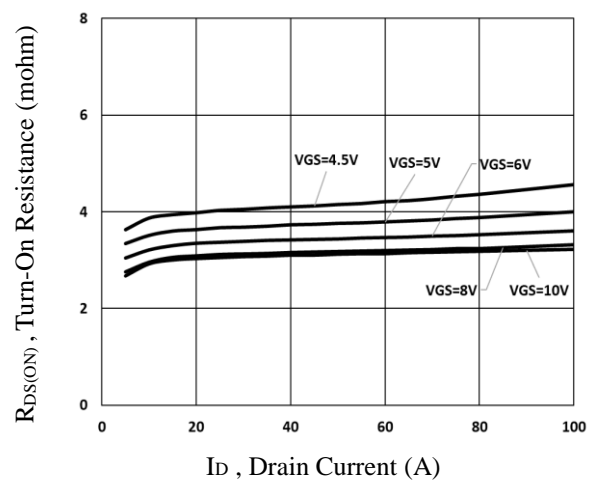


Fig.6 Turn-On Resistance vs. I_D

30V N-Channel MOSFETS RCQ5304

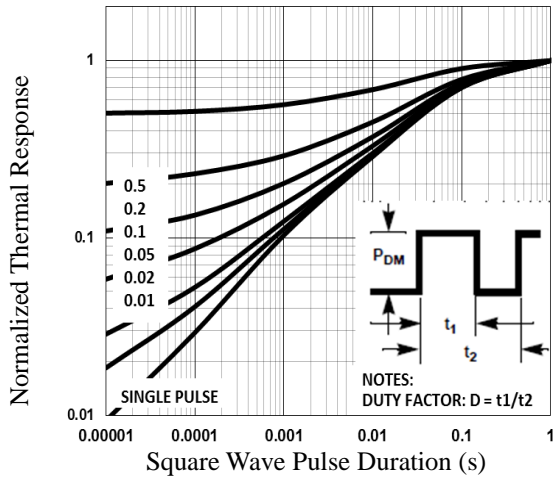


Fig.7 Normalized Transient Impedance

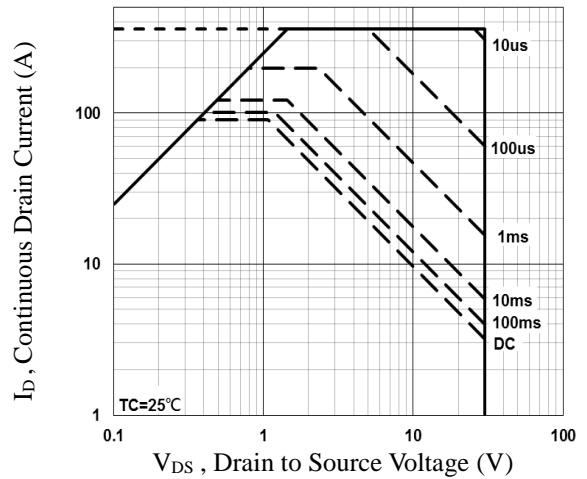


Fig.8 Maximum Safe Operation Area

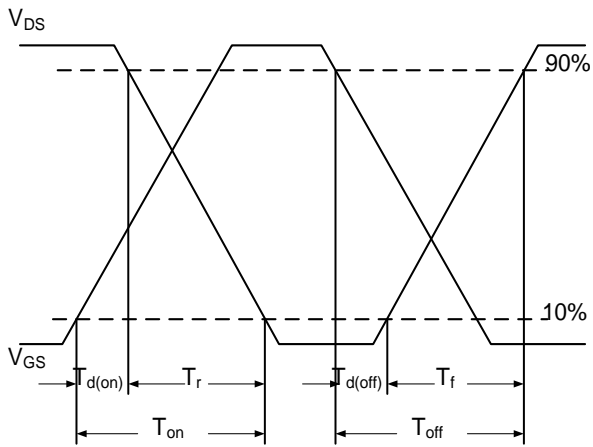


Fig.9 Switching Time Waveform

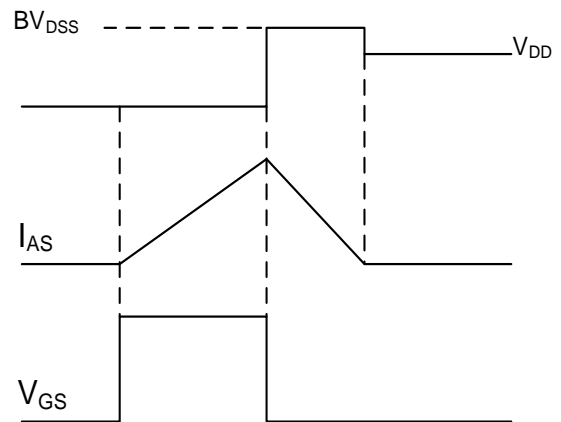
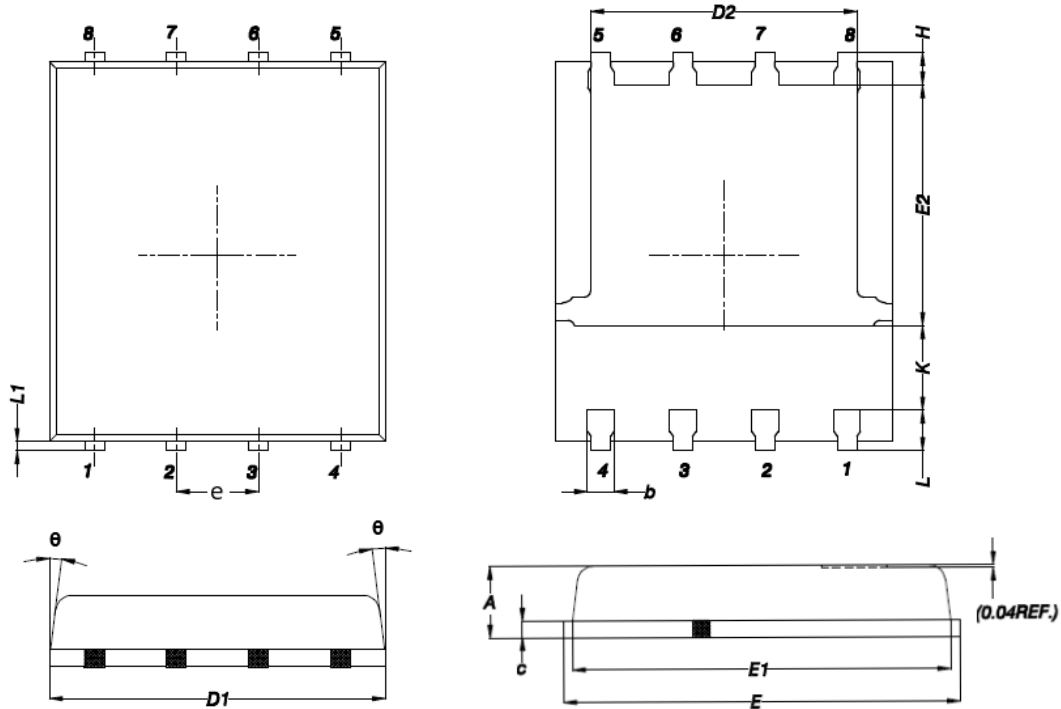


Fig.10 EAS Waveform

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PPAK5x6 PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	1.200	0.850	0.047	0.031
b	0.510	0.300	0.020	0.012
C	0.300	0.200	0.012	0.008
D1	5.400	4.800	0.212	0.189
D2	4.310	3.610	0.170	0.142
E	6.300	5.850	0.248	0.230
E1	5.960	5.450	0.235	0.215
E2	3.920	3.300	0.154	0.130
e	1.27BSC		0.05BSC	
H	0.650	0.380	0.026	0.015
K	---	1.100	---	0.043
L	0.710	0.380	0.028	0.015
L1	0.250	0.050	0.009	0.002
θ	12°	0°	12°	0°