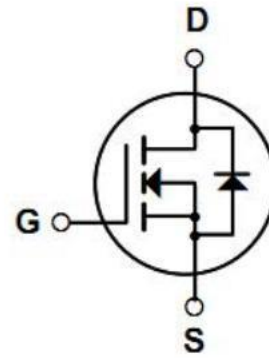


Description

This N-Channel MOSFET uses advanced trench technology and design to provide excellent $R_{DS(on)}$ with low gate charge. It can be used in a wide variety of applications.

Features

- 1) $V_{DS}=20V, I_D=4A, R_{DS(on)}<45m\ \Omega$ @ $V_{GS}=4.5V$. $R_{DS(on)}<59m\ \Omega$ @ $V_{GS}=2.5V$.
- 2) Low gate charge.
- 3) Green device available.
- 4) Advanced high cell density trench technology for ultra $R_{DS(on)}$.
- 5) Excellent package for good heat dissipation.



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

Symbol	Parameter	Ratings	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-Source Voltage	± 12	V
I_D	Continuous Drain Current-	4	A
	Continuous Drain Current- $T_c=100^\circ\text{C}$	-	
	Pulsed Drain Current ¹	-	
E_{AS}	Single Pulse Avalanche Energy	--	mJ
P_D	Power Dissipation	1	W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	-	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	125	

Package Marking and Ordering Information

Part NO.	Marking	Package
RYN20A4S	20A4S	SOT-23

Electrical Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\ \mu\text{A}$	20	22		V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS}=0V, V_{DS}=24V$	-	-	-	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 12V, V_{DS}=0A$	-	-	± 100	nA
On Characteristics³						
$V_{GS(th)}$	GATE-Source Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\ \mu\text{A}$	0.5	0.85	1.2	V
$R_{DS(ON)}$	Drain-Source On Resistance	$V_{GS}=2.5V, I_D=2.5A$	-	37	59	$m\Omega$
		$V_{GS}=4.5V, I_D=2.9A$	-	30	45	
G_{FS}	Forward Transconductance	$V_{DS}=5V, I_D=2.9A$	--	8	-	S
Dynamic Characteristics⁴						
C_{iss}	Input Capacitance	$V_{DS}=10V,$ $V_{GS}=0V, f=1\text{MHz}$	-	300	---	pF
C_{oss}	Output Capacitance		-	120	-	
C_{rss}	Reverse Transfer Capacitance		-	80	--	
R_g	Gate Resistance	$f=1\text{MHz}$	-	-	-	Ω
Switching Characteristics⁴						
$t_{d(on)}$	Turn-On Delay Time	$V_{GS}=10V, I_D=2.9A$ $V_{DS}=4.5V, R_{GEN}=6\ \Omega$	-	10	15	ns
t_r	Rise Time		-	50	85	ns
$t_{d(off)}$	Turn-Off Delay Time		-	17	45	ns
t_f	Fall Time		-	10	20	ns
Q_g	Total Gate Charge	$V_{GS}=4.5V, V_{DS}=10V,$ $I_D=2.9A$	-	4	10	nC
Q_{gs}	Gate-Source Charge		-	0.65	-	nC
Q_{gd}	Gate-Drain "Miller" Charge		-	1.2	-	nC
Drain-Source Diode Characteristics						
V_{SD}	Source-Drain Diode Forward Voltage ³	$V_{GS}=0V, I_S=2.9A$	-	0.75	1.2	V
t_{rr}	Reverse Recovery Time	$I_F=15A, di/dt=10A/\mu\text{S}$	-	-	-	ns
Q_{rr}	Reverse Recovery Charge		-	-	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics

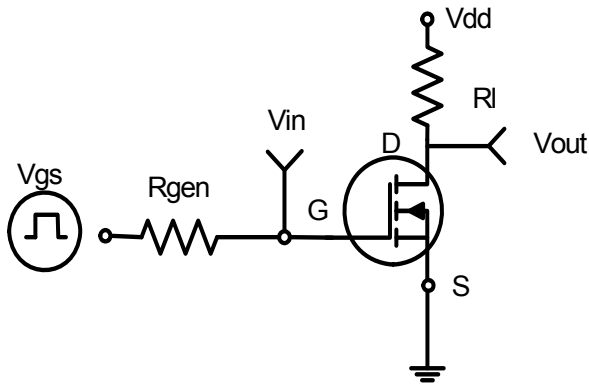


Figure 1: Switching Test Circuit

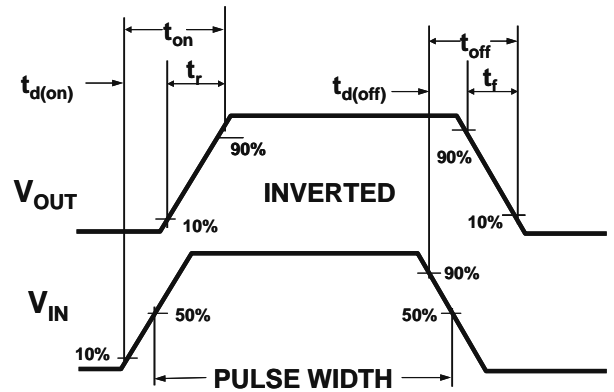


Figure 2: Switching Waveforms

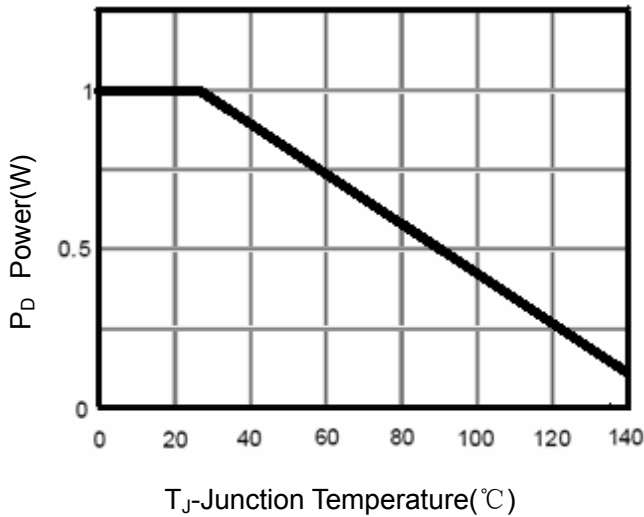


Figure 3 Power Dissipation

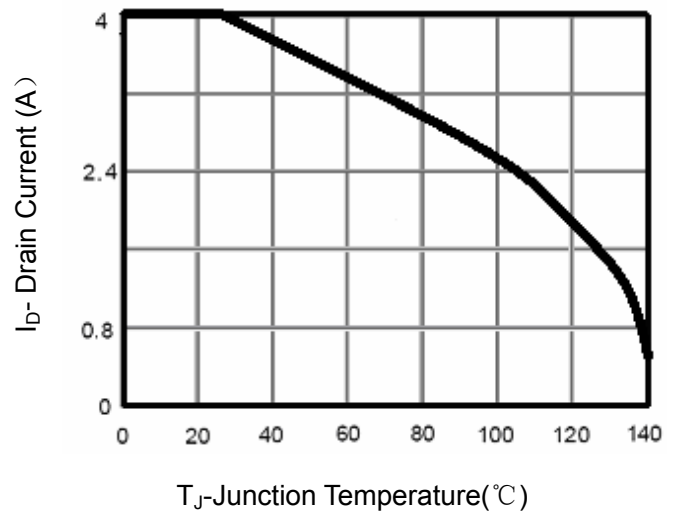


Figure 4 Drain Current

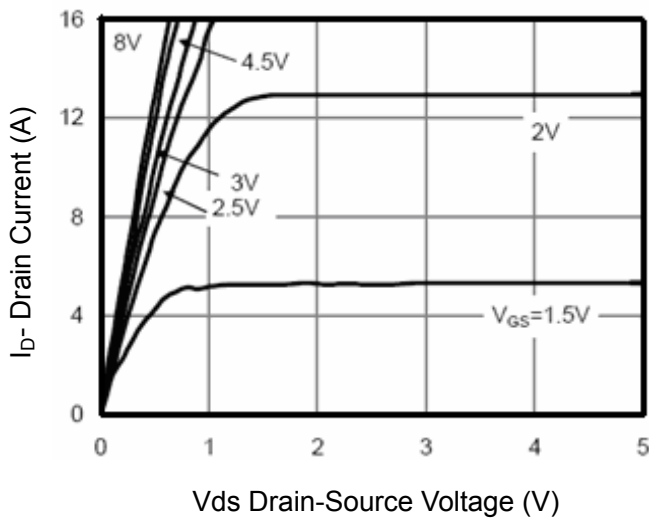


Figure 5 Output Characteristics

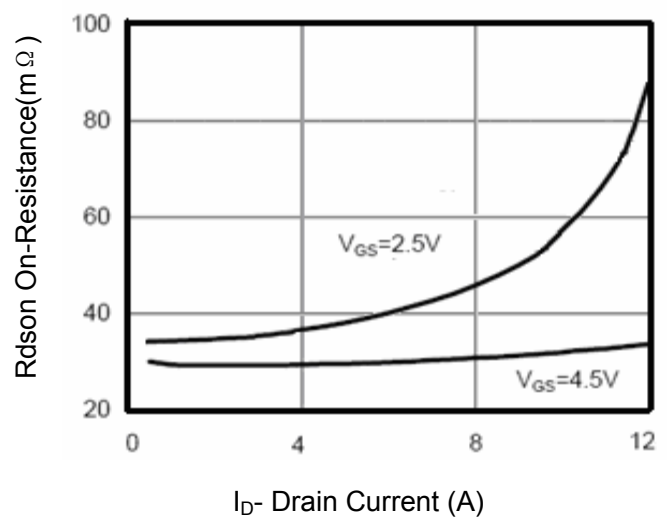
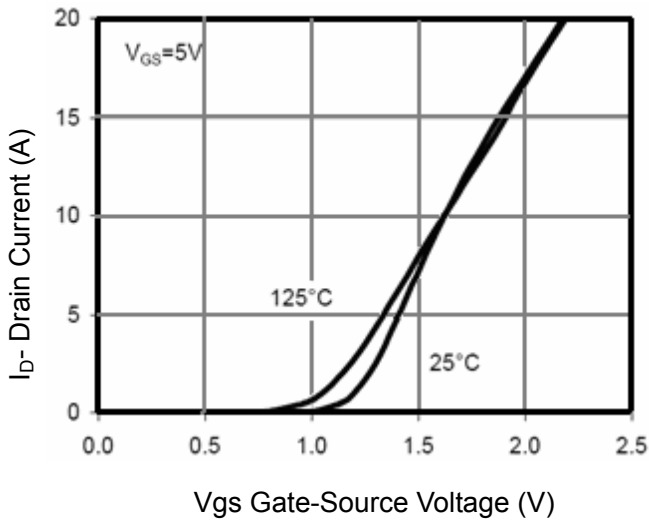
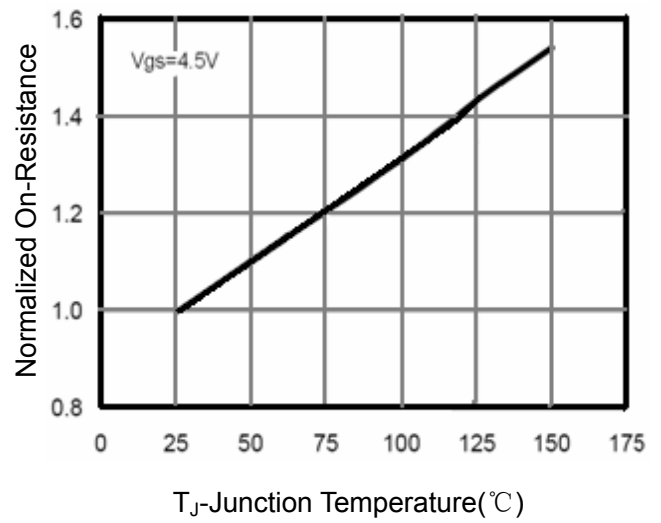


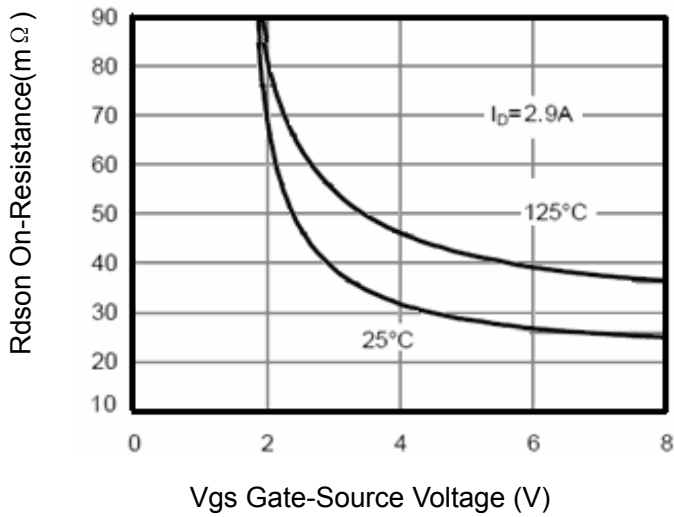
Figure 6 Drain-Source On-Resistance



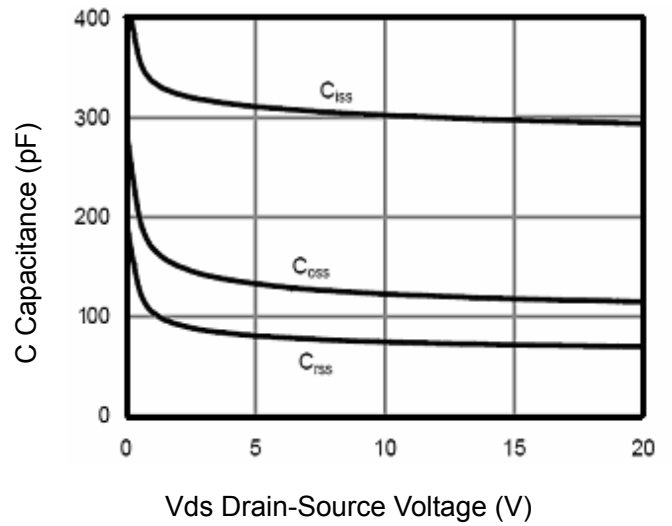
Vgs Gate-Source Voltage (V)
Figure 7 Transfer Characteristics



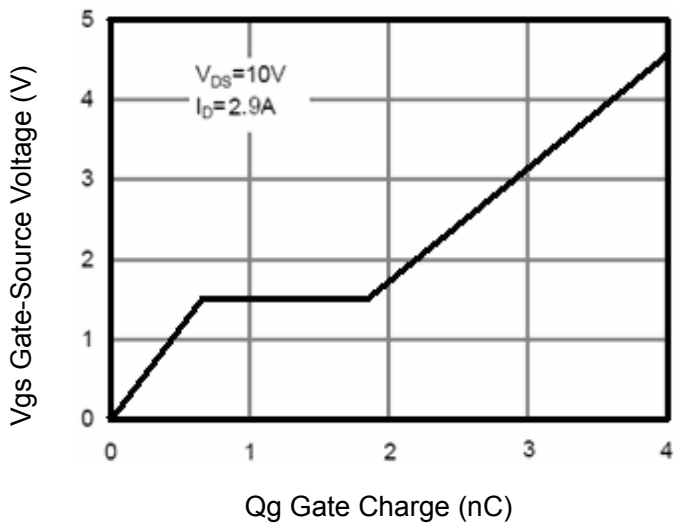
T_J-Junction Temperature(°C)
Figure 8 Drain-Source On-Resistance



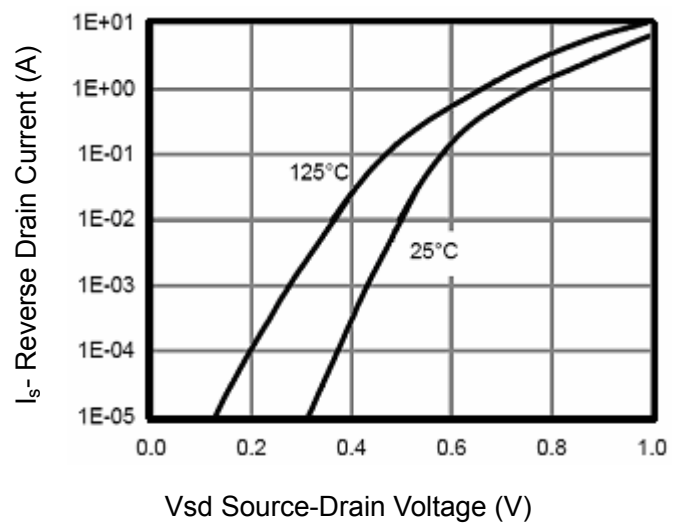
Vgs Gate-Source Voltage (V)
Figure 9 Rdson vs Vgs



Vds Drain-Source Voltage (V)
Figure 10 Capacitance vs Vds



Qg Gate Charge (nC)
Figure 11 Gate Charge



Vsd Source-Drain Voltage (V)
Figure 12 Source- Drain Diode Forward

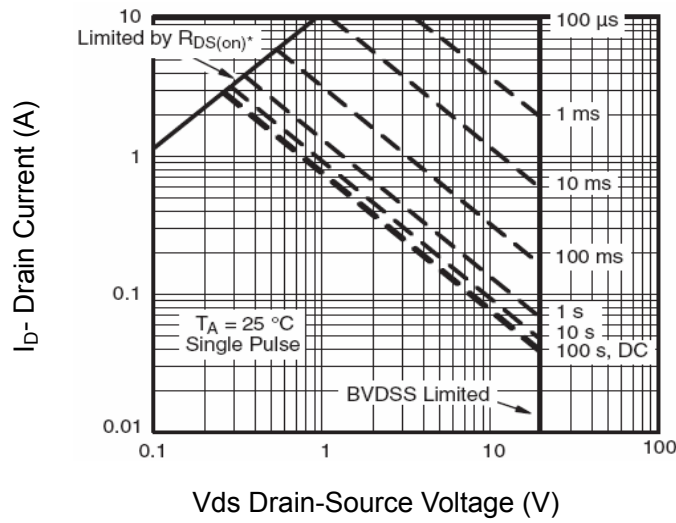


Figure 13 Safe Operation Area

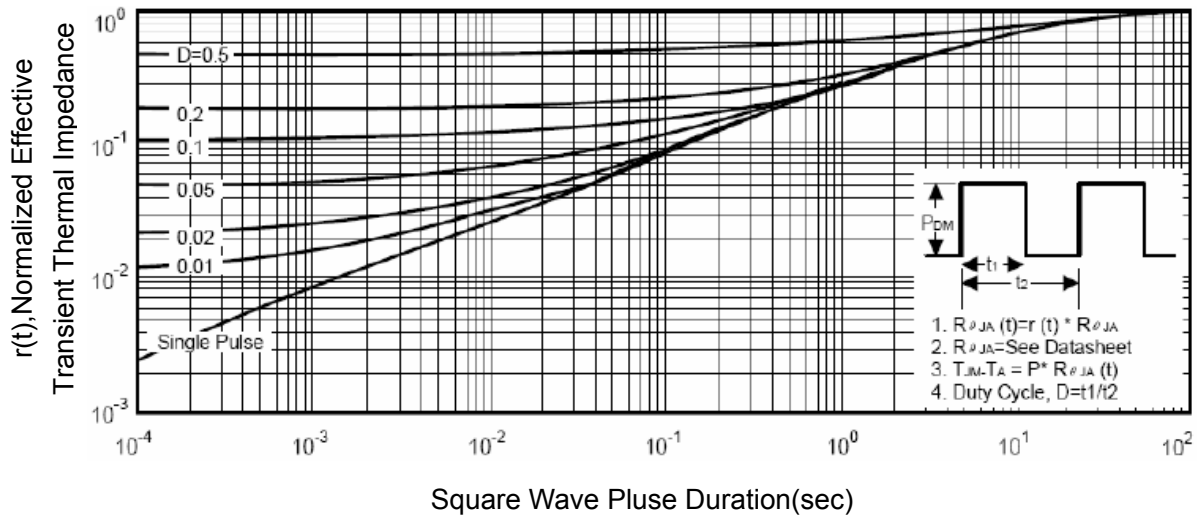


Figure 14 Normalized Maximum Transient Thermal Impedance