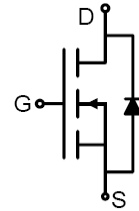


N-Channel Trench Power MOSFET

General Description

The RDB9P5N04U1 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a wide variety of applications.

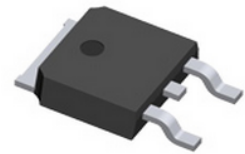


Features

- $V_{DS} = 40V, I_D = 60A$
 $R_{DS(ON)} < 9.5 m\Omega @ V_{GS} = 10V$
 $R_{DS(ON)} < 16 m\Omega @ V_{GS} = 4.5V$
- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package



RoHS
COMPLIANT



TO-252(DPAK) top view

Application

- PWM applications
- Load switch
- Power management

Table 1. Absolute Maximum Ratings ($T_A=25^\circ C$)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage ($V_{GS}=0V$)	40	V
V_{GS}	Gate-Source Voltage ($V_{DS}=0V$)	± 20	V
I_D	Drain Current-Continuous($T_C=25^\circ C$)	60	A
	Drain Current-Continuous($T_C=100^\circ C$)	42	A
$I_{DM (pluse)}$	Drain Current-Continuous@ Current-Pulsed ^(Note 1)	240	A
P_D	Maximum Power Dissipation($T_C=25^\circ C$)	75	W
	Maximum Power Dissipation($T_C=100^\circ C$)	38	
E_{AS}	Avalanche energy ^(Note 2)	196	mJ
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 175	$^\circ C$

Table 2. Thermal Characteristic

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	-	2	$^\circ C/W$

Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)

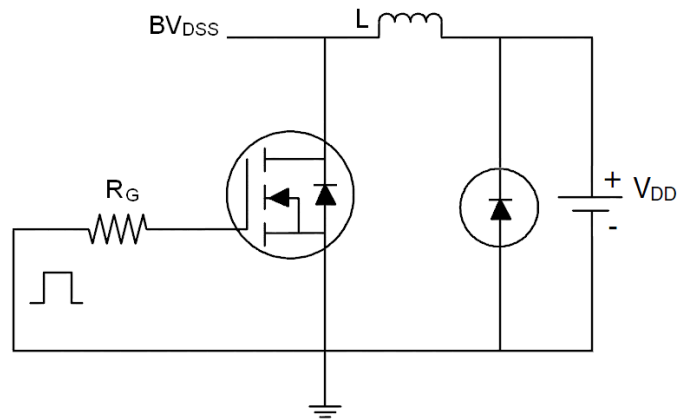
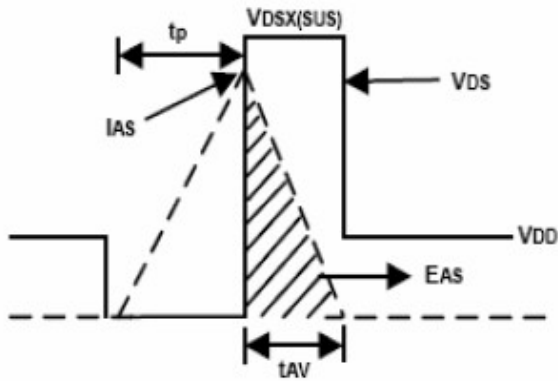
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
On/Off States						
B _V DSS	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	40	45		V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =40V, V _{GS} =0V			1	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±20V, V _{DS} =0V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1	1.5	2.5	V
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =15A		24		S
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =10V, I _D =20A		7	9.5	mΩ
		V _{GS} =4.5V, I _D =20A		10	16	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =25V, V _{GS} =0V, f=1.0MHz		2080		pF
C _{oss}	Output Capacitance			160		pF
C _{rss}	Reverse Transfer Capacitance			130		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1.0MHz		1.5		Ω
Switching Times						
t _{d(on)}	Turn-on Delay Time	V _{GS} =10V, V _{DS} =20V, R _L =1Ω, R _{GEN} =3Ω		13		nS
t _r	Turn-on Rise Time			37		nS
t _{d(off)}	Turn-Off Delay Time			50		nS
t _f	Turn-Off Fall Time			12		nS
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =25V, I _D =14A		48		nC
Q _{gs}	Gate-Source Charge			5.8		nC
Q _{gd}	Gate-Drain Charge			12.8		nC
Source-Drain Diode Characteristics						
I _{SD}	Source-Drain Current(Body Diode)				60	A
V _{SD}	Forward on Voltage	V _{GS} =0V, I _S =20A			1.2	V
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, dI/dt=100A/μs		13		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, dI/dt=100A/μs		5.2		nC

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

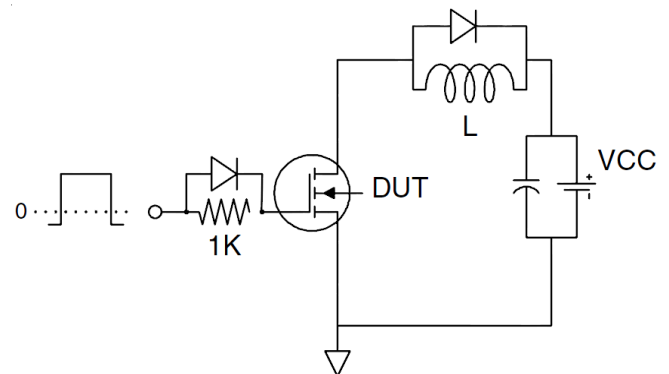
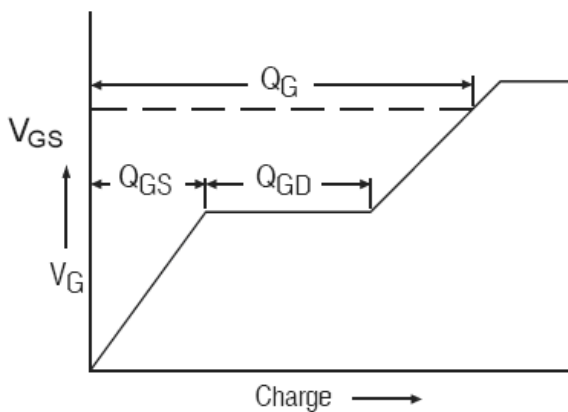
 Notes 2.EAS condition: T_J=25°C, V_{DD}=30V, V_G=10V, R_G=25Ω

Test Circuit

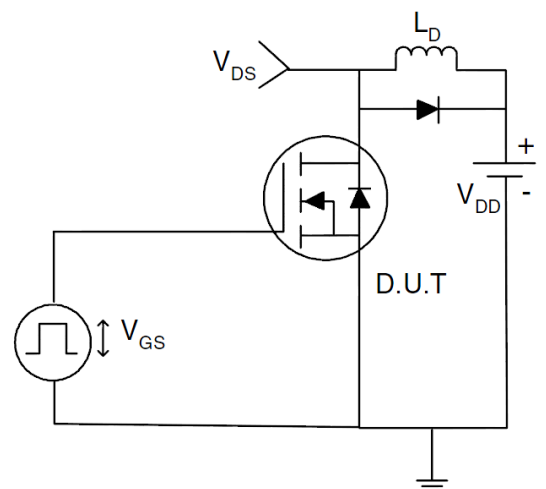
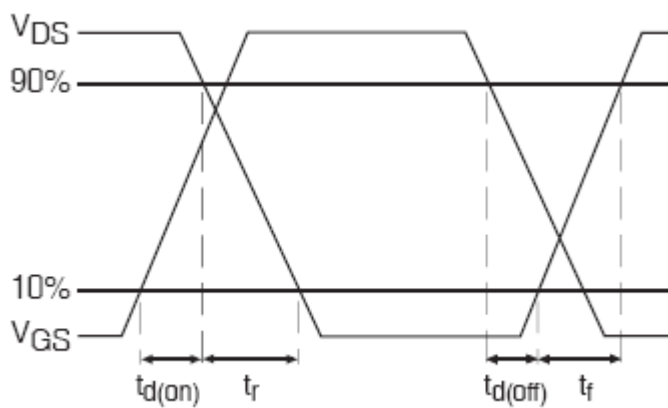
1) E_{AS} Test Circuits



2) Gate Charge Test Circuit:



3) Switch Time Test Circuit:



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (Curves)

Figure 1. Output Characteristics

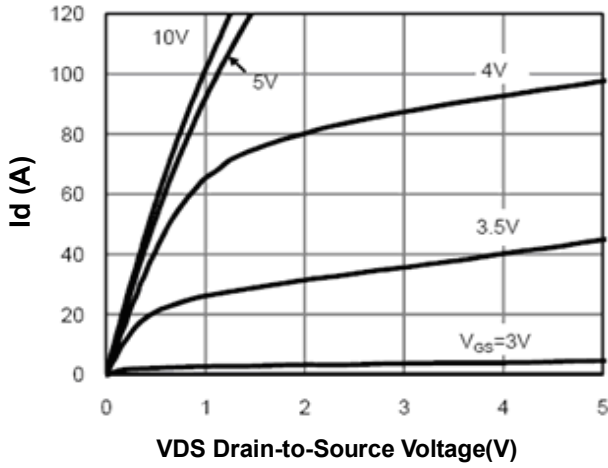


Figure 2. Transfer Characteristics

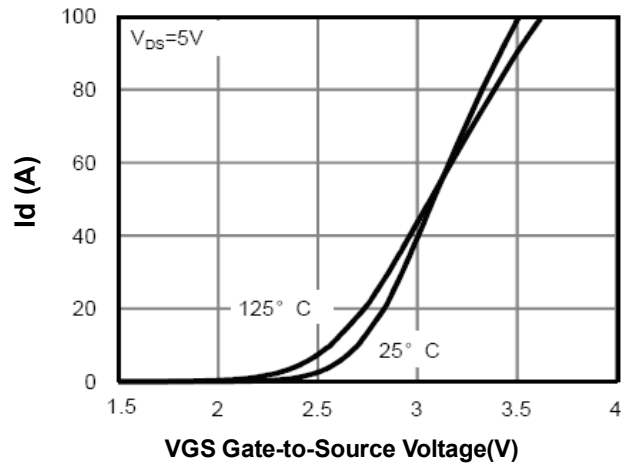


Figure 3. Max BV_{DSS} vs Junction Temperature

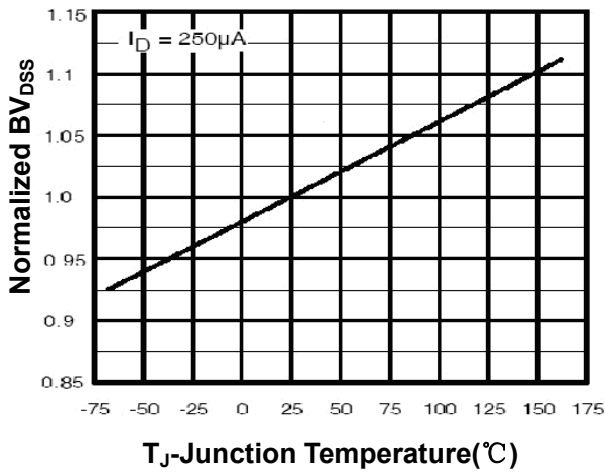


Figure 4. Drain Current

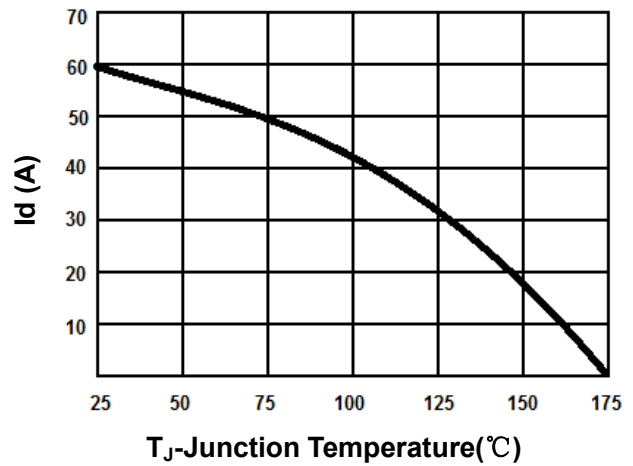


Figure 5. $V_{GS(th)}$ vs Junction Temperature

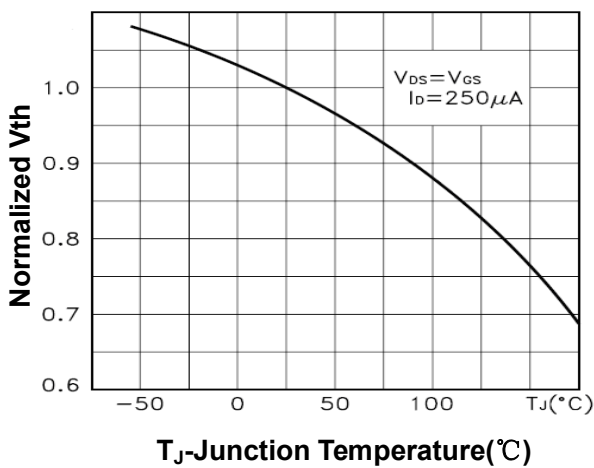


Figure 6. $R_{DS(on)}$ vs Junction Temperature

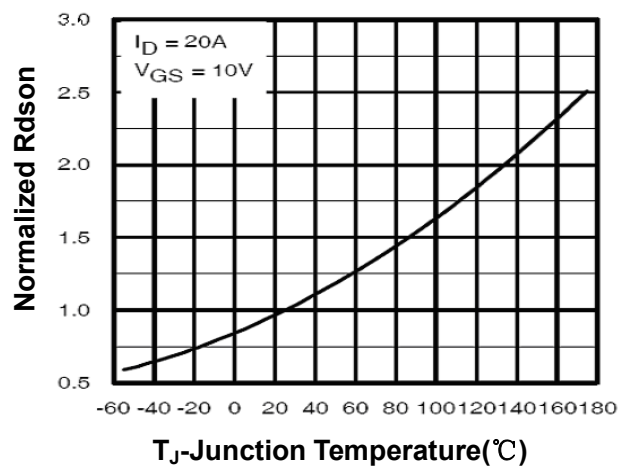


Figure 7. Gate Charge Waveforms

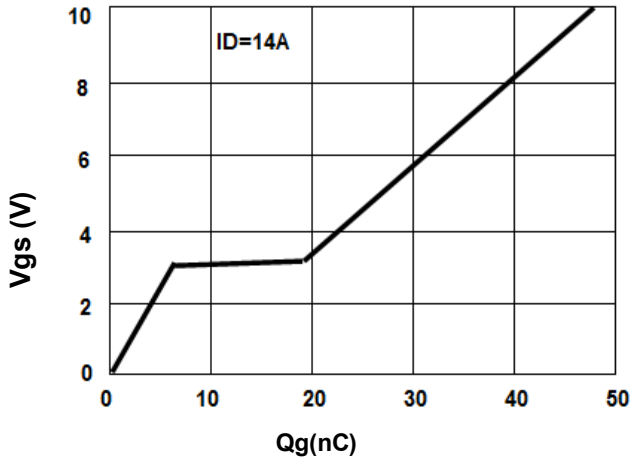


Figure 8. Capacitance

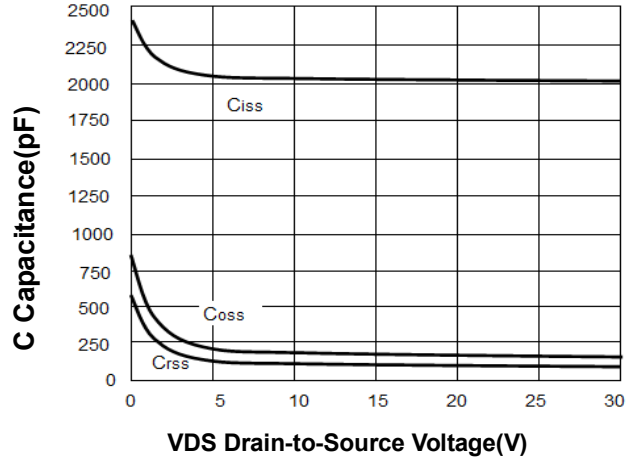


Figure 9. Body-Diode Characteristics

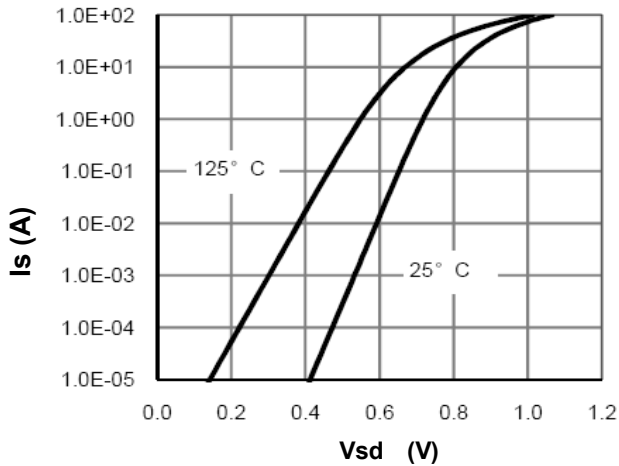


Figure 10. Maximum Safe Operating Area

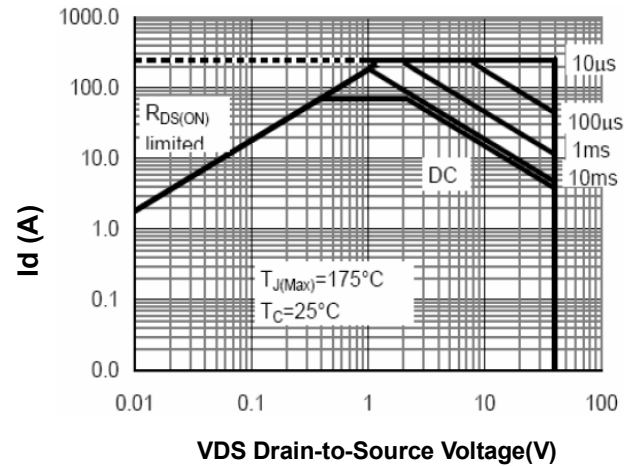
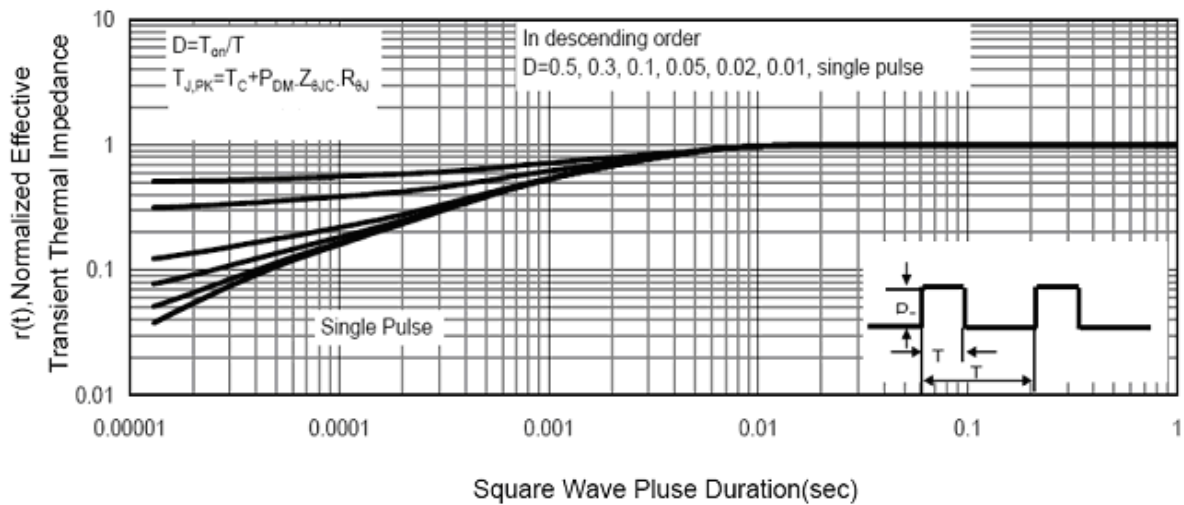
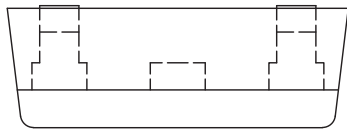
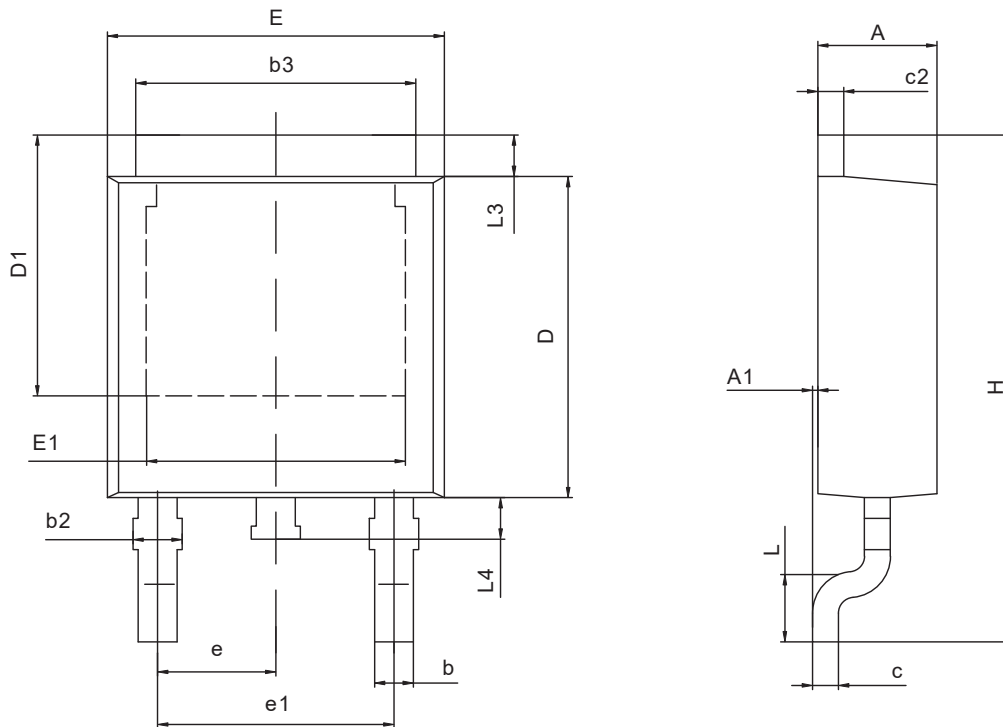


Figure 11. Normalized Maximum Transient Thermal Impedance



Package Outlines



Dimension	Millimeters	
	Min.	Max.
A	2.16	2.41
A1	0.00	0.15
b	0.64	0.89
b2	0.65	1.15
b3	4.95	5.50
c	0.46	0.61
c2	0.40	0.98
D	5.97	6.22
D1	5.02	5.84
E	6.35	6.73
E1	4.32	5.50
e	2.29 (BSC)	
e1	4.57	
H	9.40	10.48
L	1.18	1.78
L3	0.89	1.27
L4	0.51	1.02

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
RDB9P5N04U	RDB9P5N04U	TO-252	325mm	16mm	2500

Revision history

Date	Revision	Changes
28-May-2020	1.0	Initial release

CAUTION / WARNING

Information in this document is believed to be accurate and reliable. However, RDSEMI does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

Users should independently evaluate the suitability of and test each product selected for their own applications, and RDSEMI assumes no liability what's ever relating to the choice, selection or use of the RDSEMI products and services described herein.

RDSEMI reserves the right to change or update, without notice, any information contained in this publication; to change, without notice, the design, construction, processing, or specification of any product; and to discontinue or limit production or distribution of any product.

Information in this document supersedes and replaces all information previously supplied.

Products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or malfunction of an RDSEMI product can reasonably be expected to result in personal injury, death or severe property or environmental damage. RDSEMI accepts no liability for inclusion and/or use of RDSEMI products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from national authorities.

Resale of RDSEMI products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by RDSEMI for the RDSEMI product or service described herein and shall not create or extend in any manner whatsoever, any liability of RDSEMI.

RDSEMI expressly disclaims all implied warranties regarding the information contained herein, including, but not limited to, any implied warranties of merchantability or fitness for a particular purpose. RDSEMI only obligations are those in the RDSEMI Standard Terms and Conditions of Sale and in no case will RDSEMI be liable for any incidental, indirect, or consequential damages arising from the sale, resale, use, or misuse of its products.

Specifications are subject to change without notice
© Copyright 2020, DaJing Semiconductor
All rights reserved