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NSR05F40QNXT5G

Schottky Diode Optimized for High Frequency Switching Power Supplies

These Schottky barrier diodes are optimized for low forward voltage drop and low leakage current and are offered in a Chip Scale Package (CSP) to reduce board space. The low thermal resistance enables designers to meet the challenging task of achieving higher efficiency and meeting reduced space requirements.

Features

- Low Forward Voltage Drop – 420 mV @ 500 mA
- Low Reverse Current – 15 μ A @ 10 V VR
- 500 mA of Continuous Forward Current
- ESD Rating – Human Body Model: Class 3B
– Machine Model: Class C
- High Switching Speed
- Equivalent Processing and Electrical Performance as NSR05F40NXT5G
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- LCD and Keypad Backlighting
- Camera Photo Flash
- Buck and Boost dc-dc Converters
- Reverse Voltage and Current Protection
- Clamping and Protection

Markets

- Mobile Handsets
- MP3 Players
- Digital Camera and Camcorders
- Notebook PCs & PDAs
- GPS

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Reverse Voltage	V_R	40	V
Forward Current (DC)	I_F	500	mA
Forward Surge Current (60 Hz @ 1 cycle)	I_{FSM}	10	A
Repetitive Peak Forward Current (Pulse Wave = 1 sec, Duty Cycle = 66%)	I_{FRM}	4.0	A
ESD Rating: Human Body Model Machine Model	ESD	> 8 > 400	kV V

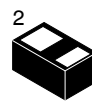
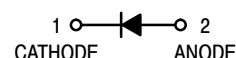
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



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40 V SCHOTTKY BARRIER DIODE



DSN2
(0402)
CASE 152AC

MARKING DIAGRAMS

PIN 1



05F40 = Specific Device Code
YYY = Year Code

PIN 1



AC = Specific Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping†
NSR05F40QNXT5G	DSN2 (Pb-Free)	5000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

NSR05F40QNXT5G

THERMAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
Thermal Resistance Junction-to-Ambient (Note 1) Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$R_{\theta JA}$ P_D			240 521	$^\circ\text{C/W}$ mW
Thermal Resistance Junction-to-Ambient (Note 2) Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$R_{\theta JA}$ P_D			94 1.3	$^\circ\text{C/W}$ W
Storage Temperature Range	T_{stg}			-40 to +125	$^\circ\text{C}$
Junction Temperature	T_J			+150	$^\circ\text{C}$

1. Mounted onto a 4 in square FR-4 board 50 mm sq. 1 oz. Cu 0.06" thick single sided. Operating to steady state.
2. Mounted onto a 4 in square FR-4 board 1 in sq. 1 oz. Cu 0.06" thick single sided. Operating to steady state.

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Reverse Leakage ($V_R = 10\text{ V}$) ($V_R = 40\text{ V}$)	I_R			15 75	μA
Forward Voltage ($I_F = 100\text{ mA}$) ($I_F = 500\text{ mA}$)	V_F		0.340 0.420	0.360 0.460	V

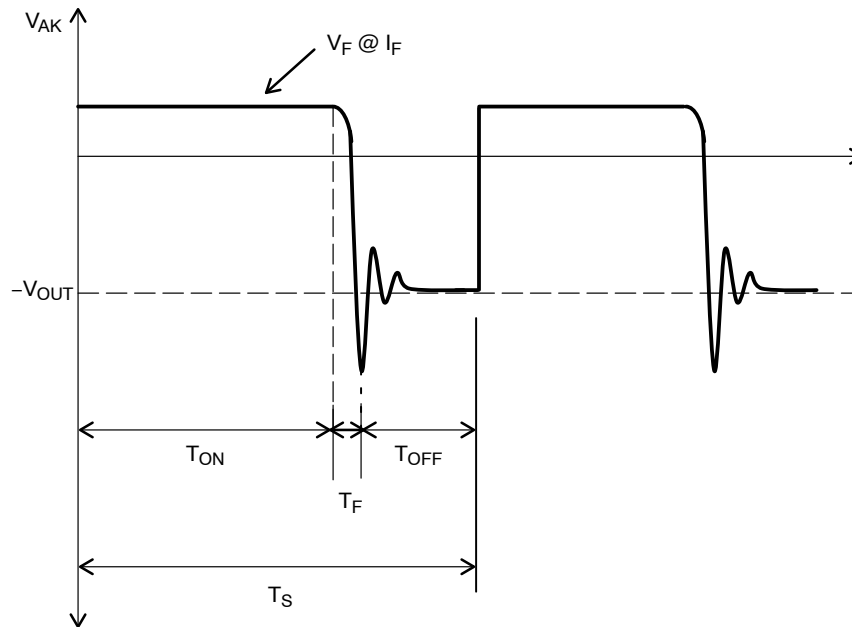


Figure 1. Voltage Waveform of Schottky Diode in Boost Application

NSR05F40QNX5G

TYPICAL CHARACTERISTICS

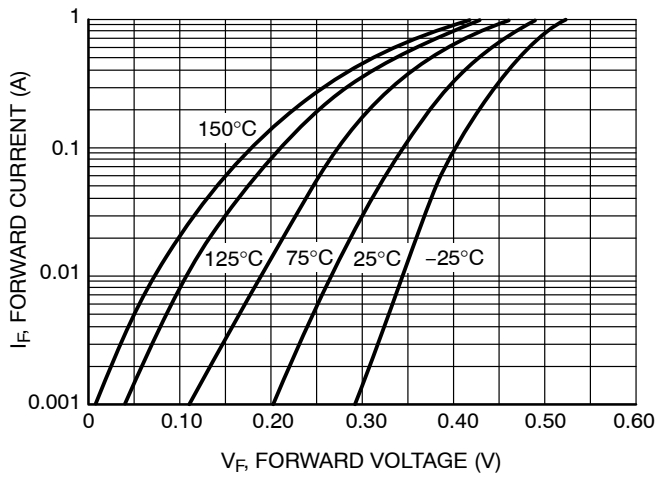


Figure 2. Forward Voltage

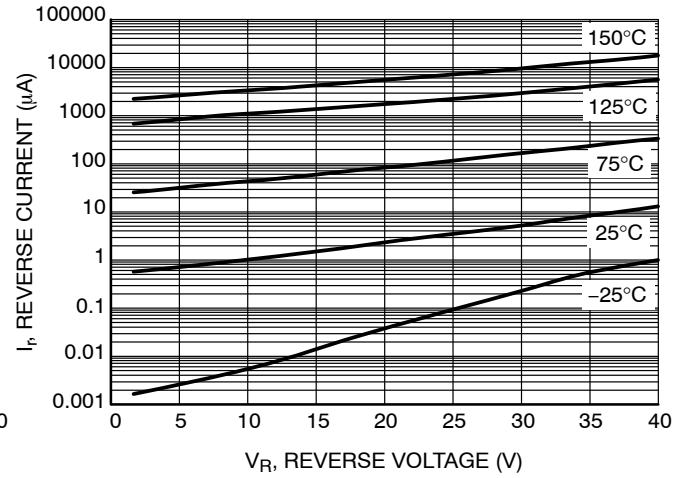


Figure 3. Leakage Current

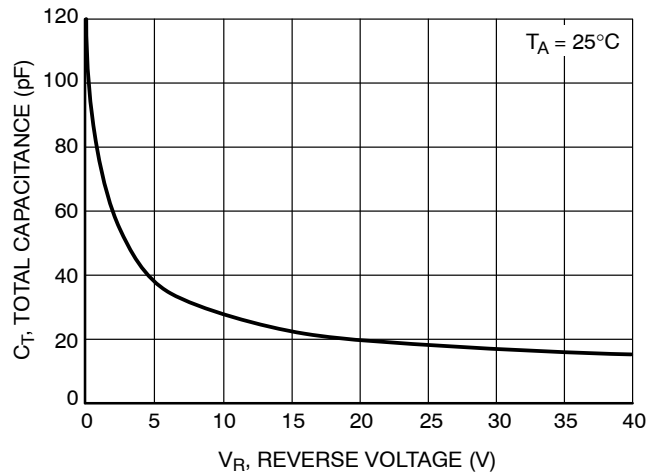


Figure 4. Total Capacitance

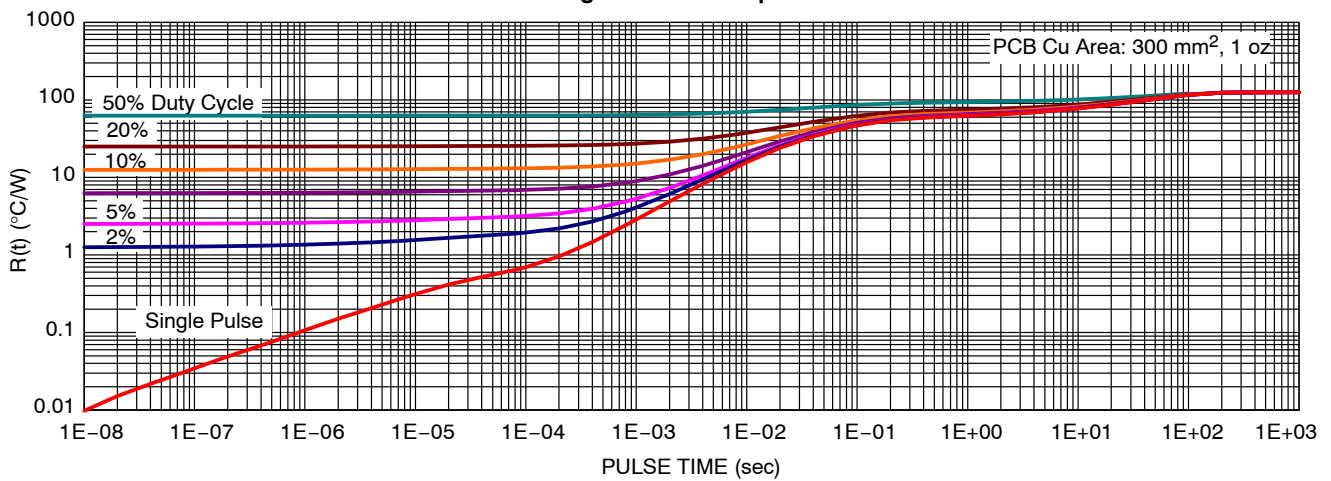


Figure 5. Thermal Resistance

An example of a single string inductive boost circuit is shown in Figure 6. Typically, a very small voltage is measured over a precision resistor in series with the LEDs to feedback the output operation condition to the controller. Many of today's controllers integrate the transistors and the diode to save space.



Another method for shrinking the size of an inductive boost application is to increase the switching frequency. When the switching frequency is increased a lower value inductors can be used to keep a constant inductor current

Typically for a 1 A diode with a $R_{\theta JA} = 86^{\circ}\text{C/W}$ a SMA package is used. The SMA package is 5.21 mm x 2.60 mm x 2.10 mm (L x W x H). ON Semiconductor's new optimized Schottky diode line these packages have a $R_{\theta JA} = 85^{\circ}\text{C/W}$ and are only 1.4 mm x 0.6 mm x 0.27 mm (L x W x H). This means that the same power can be dissipated in only 8% of the total space. Not only is there is a thermal conductivity density advantage but there is also a performance improvement with these new optimized Schottky diodes.

After the 48-hour test was completed the diodes were taken back to the characterization lab for a post condition

NSR05F40QNXT5G

analysis. This analysis showed that there was no shift in any of the parameters, forward voltage, reverse leakage current, and capacitance.

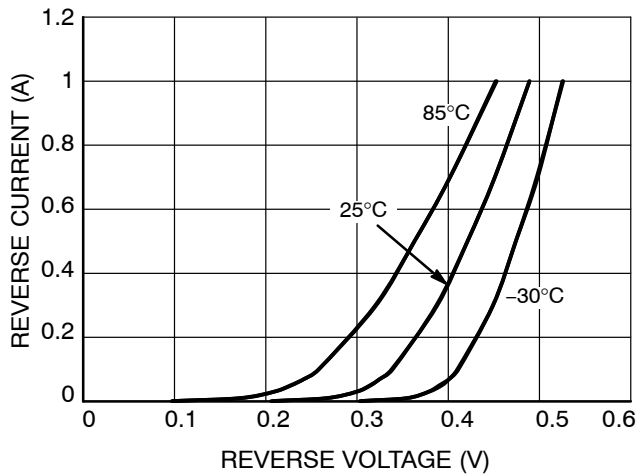


Figure 7. Reverse Leakage Characteristics

Finally these diodes were placed in the same circuit at 25°C for 1 week of continuous operation. The screen shots below in Figures 9 and 10 show the operation on the first day of continuous operation and 5 days respectively.

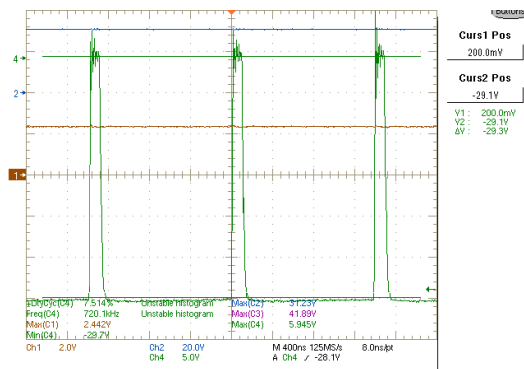


Figure 9. NSR05F40QNXT5G on Day 1 at 25°C

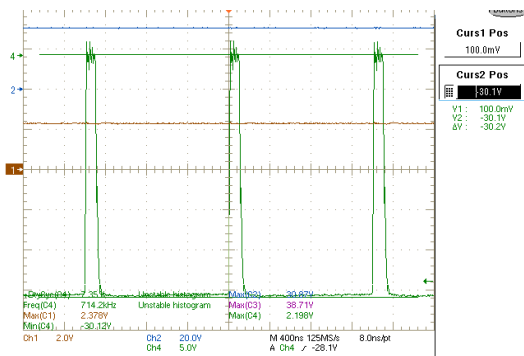


Figure 10. NSR05F40QNXT5G on Day 5 at 25°C

The graphs below shown below demonstrate the Pre and Post-Stress characterization graphs and how that there was no change in the part performance.

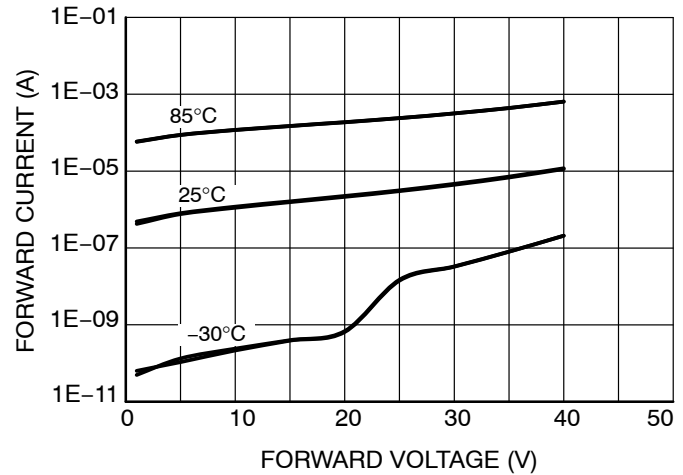


Figure 8. Forward Current Characterization

To further evaluate the performance, a thermal camera was used to take pictures of the NSR05F40QNXT5G during heavy load operation and 25°C. As seen in Figure 11 the case only got to 29.2°C. This translates to less than 20 mW of total power dissipation.

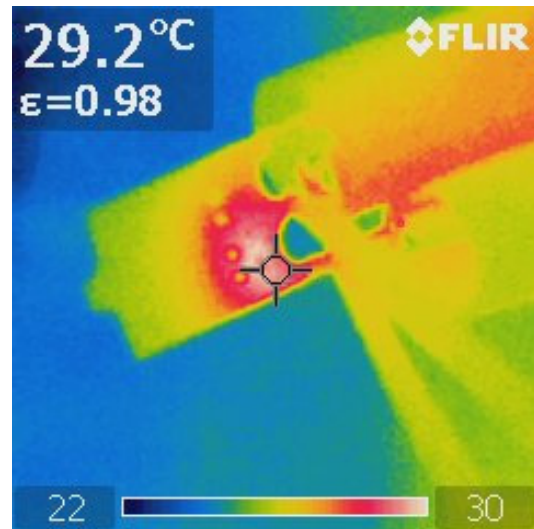


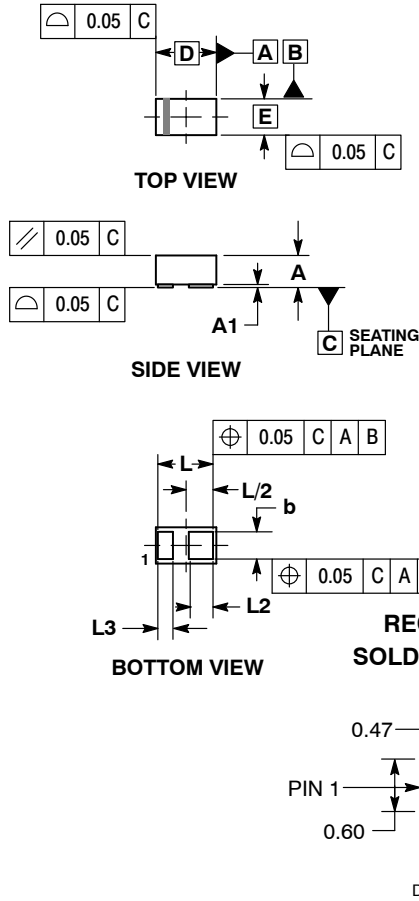
Figure 11. Case Temperature of NSR05F40QNXT5G in Operation at 25°C, 150 mA 34 V Output

With a heavy load condition (up to 1.2 A) through the NSR05F40QNXT5G on a minimum pad size the ambient temperature can rise up to 145°C and not degrade the performance. Using ON Semiconductor's new ultra low profile Wireless Boost Application Optimized Schottky diodes will increase the overall efficiency and battery life while reducing board size and cost associated with thermal pads.

NSR05F40QNXT5G

PACKAGE DIMENSIONS

DSN2, 1.0x0.6, 0.575P, (0402)
CASE 152AC
ISSUE D

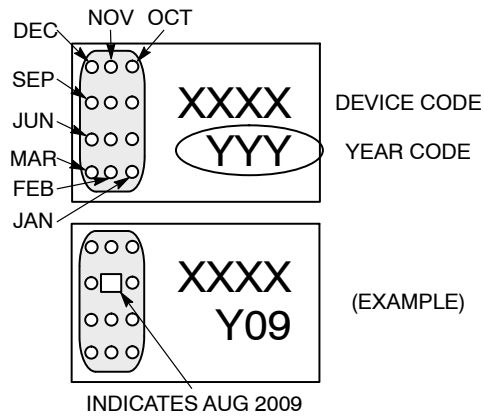


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.

MILLIMETERS		
DIM	MIN	MAX
A	0.25	0.31
A1	---	0.05
b	0.45	0.55
D	1.00 BSC	
E	0.60 BSC	
L	0.85	0.95
L2	0.35	0.45
L3	0.20	0.30

CATHODE BAND MONTH CODING



See Application Note AND8464/D for more mounting details

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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