

ON Semiconductor

Is Now



To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and onsemi. and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using onsemi products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by onsemi. "Typical" parameters which may be provided in onsemi data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. onsemi does not convey any license under any of its intellectual property rights nor the rights of others. onsemi products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use onsemi products for any such unintended or unauthorized application, Buyer shall indemnify and hold onsemi and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that onsemi was negligent regarding the design or manufacture of the part. onsemi is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner. Other names and brands may be claimed as the property of others.

MOSFET - Power, Single P-Channel

-40 V, 23 mΩ, -34.6 A

NVMFS025P04M8L

Features

- NVMFWS025P04M8L – Wettable Flanks Product
- Small Footprint for Compact Design 5 x 6 mm
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Parameter | | | Symbol | Value | Unit |
|--|--|-----------------------------|-------------------|-------------|--------------------|
| Drain-to-Source Voltage | | | V_{DSS} | -40 | V |
| Gate-to-Source Voltage | | | V_{GS} | ± 20 | V |
| Continuous Drain Current $R_{\theta JC}$ (Notes 1, 2, 3, 4) | Steady State | $T_C = 25^{\circ}\text{C}$ | I_D | -34.6 | A |
| | | $T_C = 100^{\circ}\text{C}$ | | -24.5 | |
| Power Dissipation $R_{\theta JC}$ (Notes 1, 2, 3) | | $T_C = 25^{\circ}\text{C}$ | P_D | 44.1 | W |
| | | $T_C = 100^{\circ}\text{C}$ | | 22.1 | |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3, 4) | Steady State | $T_A = 25^{\circ}\text{C}$ | I_D | -9.4 | A |
| | | $T_A = 100^{\circ}\text{C}$ | | -6.6 | |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 3) | | $T_A = 25^{\circ}\text{C}$ | P_D | 3.5 | W |
| | | $T_A = 100^{\circ}\text{C}$ | | 1.8 | |
| Pulsed Drain Current | $T_A = 25^{\circ}\text{C}$, $t_p = 10\text{ }\mu\text{s}$ | | I_{DM} | 204 | A |
| Operating Junction and Storage Temperature Range | | | T_J , T_{stg} | -55 to +175 | $^{\circ}\text{C}$ |
| Source Current (Body Diode) | | | I_S | 36.8 | A |
| Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = \text{TBD A}$) | | | E_{AS} | 152 | mJ |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | | T_L | 260 | $^{\circ}\text{C}$ |

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.

THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|--------------------|
| Junction-to-Case – Steady State (Note 3) | $R_{\theta JC}$ | 3.4 | $^\circ\text{C/W}$ |
| Junction-to-Ambient – Steady State (Note 3) | $R_{\theta JA}$ | 42.4 | |

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Psi (Ψ) is used as required per JESD51-12 for packages in which substantially less than 100% of the heat flows to single case surface.
3. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
4. Continuous DC current rating. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

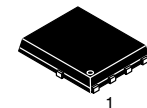
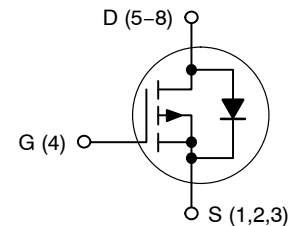


ON Semiconductor®

www.onsemi.com

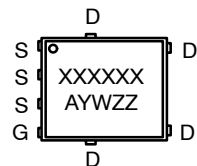
| $V_{(BR)DSS}$ | $R_{DS(on)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|---------------|--------------------------|-------------------|
| -40 V | 23 mΩ @ -10 V | -34.6 A |
| | 37 mΩ @ -4.5 V | |

P-Channel MOSFET



DFN5
(SO-8FL) 5 x 6
CASE 488AA
STYLE 1

MARKING DIAGRAM



XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

NVMFS025P04M8L

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------|--------|----------------|-----|-----|-----|------|
|-----------|--------|----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|---|--------------------------------------|---|------------------------|-------|------|-------|
| Drain-to-Source Breakdown Voltage | V _{(BR)DSS} | V _{GS} = 0 V, I _D = -250 μA | -40 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | V _{(BR)DSS} /T _J | | | 20.40 | | mV/°C |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{GS} = 0 V, V _{DS} = -40 V | T _J = 25°C | | -1 | μA |
| | | | T _J = 125°C | | -100 | |
| Gate-to-Source Leakage Current | I _{GSS} | V _{DS} = 0 V, V _{GS} = ±20 V | | | ±100 | nA |

ON CHARACTERISTICS (Note 5)

| | | | | | | |
|--|-------------------------------------|--|------|------|------|-------|
| Gate Threshold Voltage | V _{GS(TH)} | V _{GS} = V _{DS} , I _D = -255 μA | -1.0 | | -2.4 | V |
| Negative Threshold Temperature Coefficient | V _{GS(TH)} /T _J | | | 4.94 | | mV/°C |
| Drain-to-Source On Resistance | R _{DS(on)} | V _{GS} = -10 V, I _D = -15 A | | 16.6 | 23 | mΩ |
| | | V _{GS} = -4.5 V, I _D = -7.5 A | | 23.6 | 37 | |
| Forward Transconductance | g _{FS} | V _{DS} = -1.5 V, I _D = -15 A | | 30.8 | | S |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|---------------------|---|--|------|--|----|
| Input Capacitance | C _{iss} | V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = -20 V | | 1058 | | pF |
| Output Capacitance | C _{oss} | | | 446 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 19 | | |
| Plateau Voltage | V _{GP} | V _{GS} = -4.5 V, V _{DS} = -20 V, I _D = -7.5 A | | 2.9 | | V |
| Total Gate Charge | Q _{G(TOT)} | | | 7.56 | | nC |
| Threshold Gate Charge | Q _{G(TH)} | | | 1.93 | | nC |
| Gate-to-Source Charge | Q _{GS} | | | 3.4 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 1.55 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = -10 V, V _{DS} = -20 V, I _D = -7.5 A | | 16.3 | | nC |

SWITCHING CHARACTERISTICS (Note 6)

| | | | | | | |
|---------------------|---------------------|---|--|----|--|----|
| Turn-On Delay Time | t _{d(on)} | V _{GS} = -4.5 V, V _{DS} = -20 V, I _D = -7.5 A, R _G = 2.5 Ω | | 16 | | ns |
| Rise Time | t _r | | | 99 | | |
| Turn-Off Delay Time | t _{d(off)} | | | 50 | | |
| Fall Time | t _f | | | 58 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|-----------------|--|------------------------|--|-------|-------|----|
| Forward Diode Voltage | V _{SD} | V _{GS} = 0 V, I _S = -15 A | T _J = 25°C | | -0.86 | -1.20 | V |
| | | | T _J = 125°C | | -0.78 | | |
| Reverse Recovery Time | t _{RR} | V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = -15 A | | | 39 | | ns |
| Charge Time | t _a | | | | 31 | | |
| Discharge Time | t _b | | | | 8 | | |
| Reverse Recovery Charge | Q _{RR} | | | | 35 | | nC |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

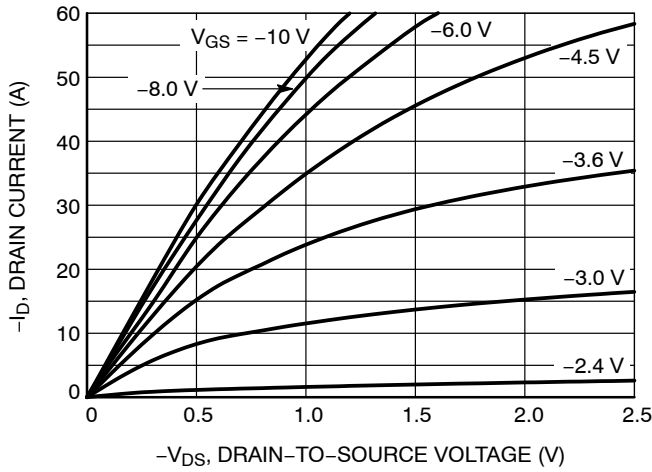


Figure 1. On-Region Characteristics

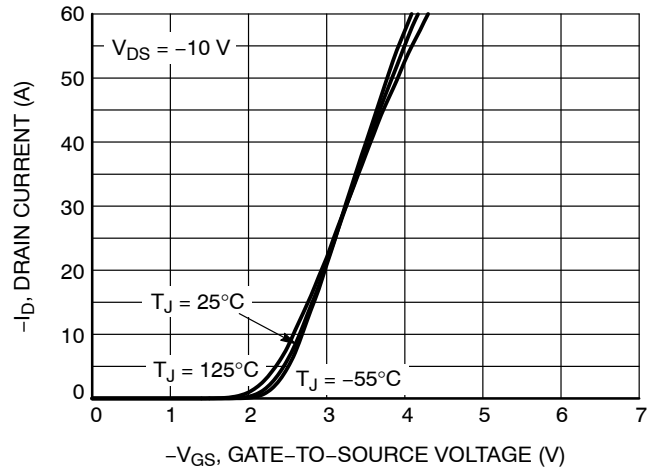


Figure 2. Transfer Characteristics

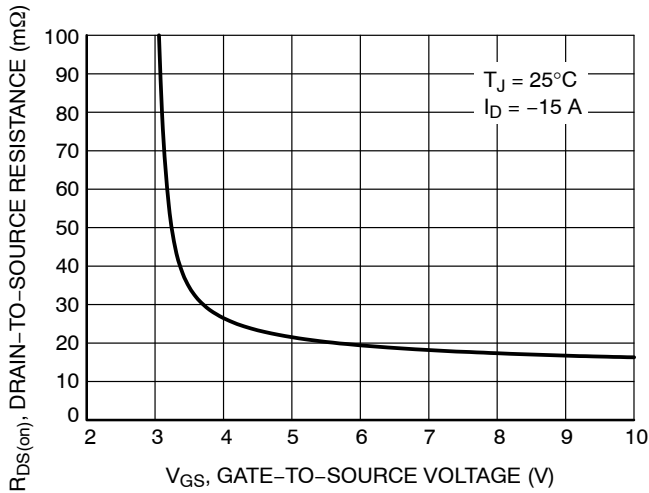


Figure 3. On-Resistance vs. Gate-to-Source Voltage

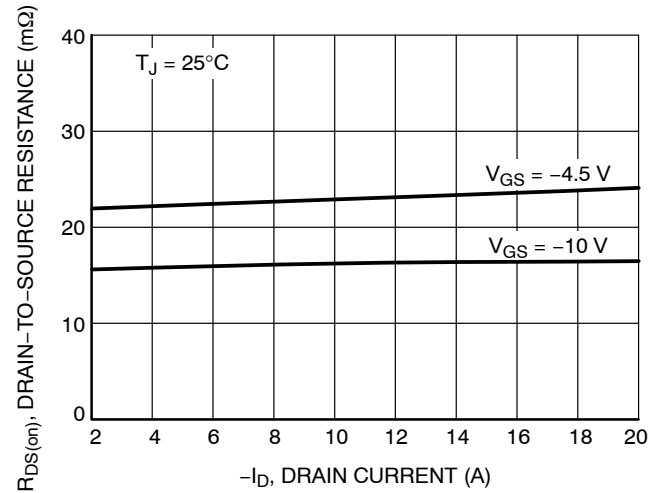


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

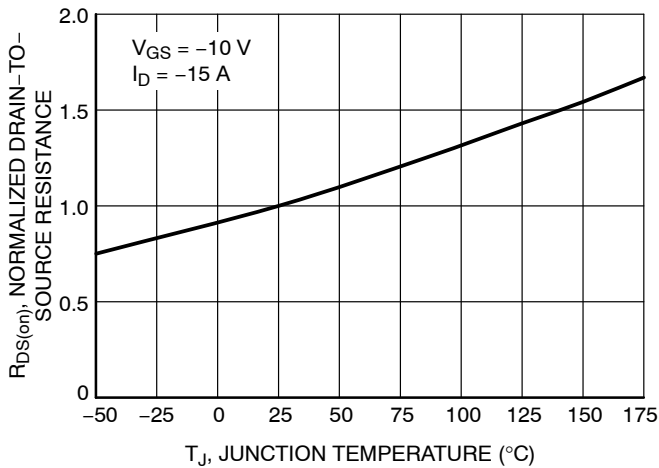


Figure 5. On-Resistance Variation with Temperature

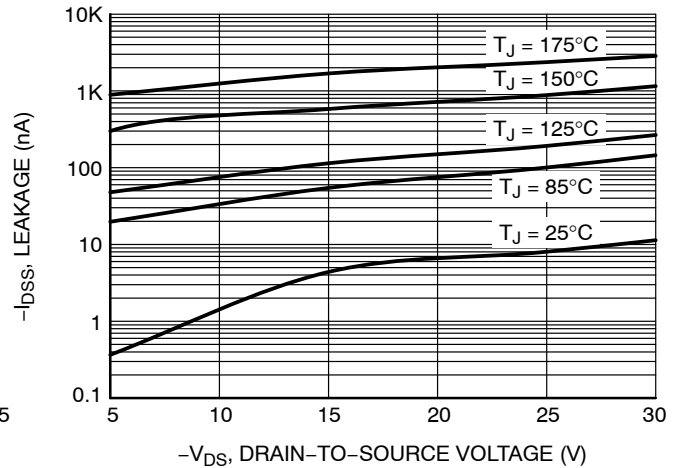


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

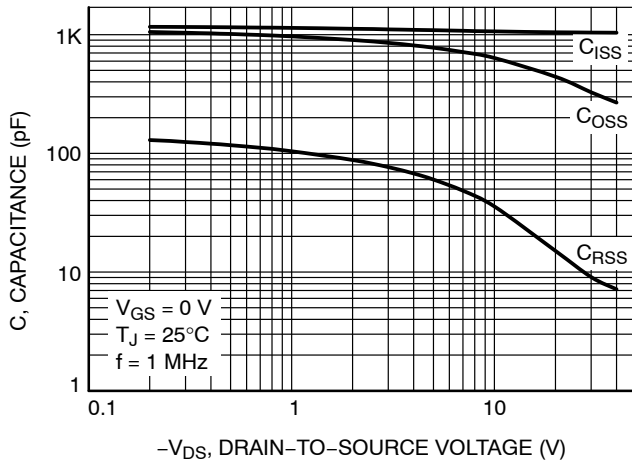


Figure 7. Capacitance Variation

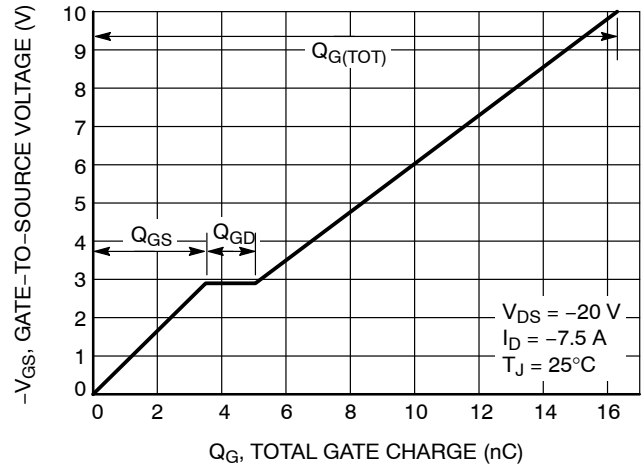


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

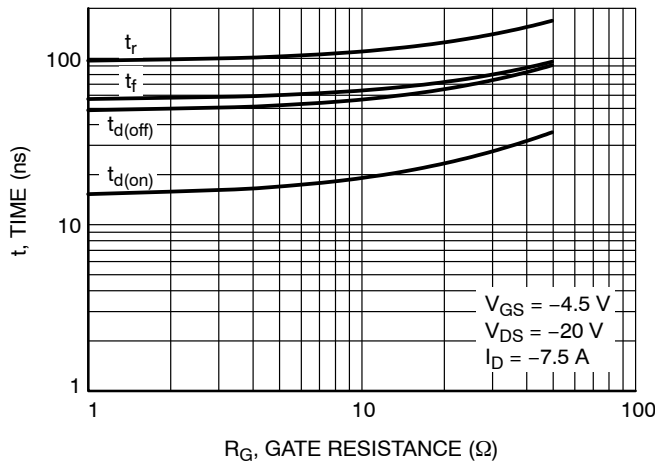


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

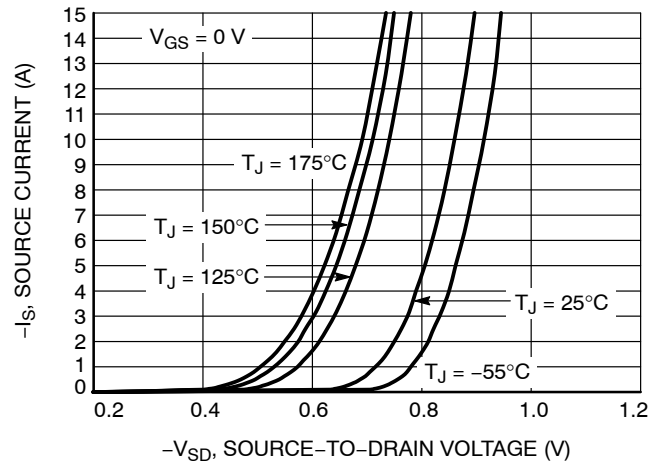


Figure 10. Diode Forward Voltage vs. Current

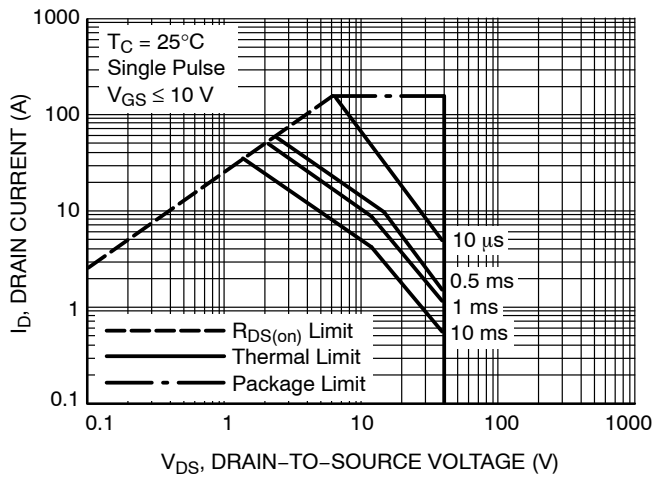


Figure 11. Safe Operating Area

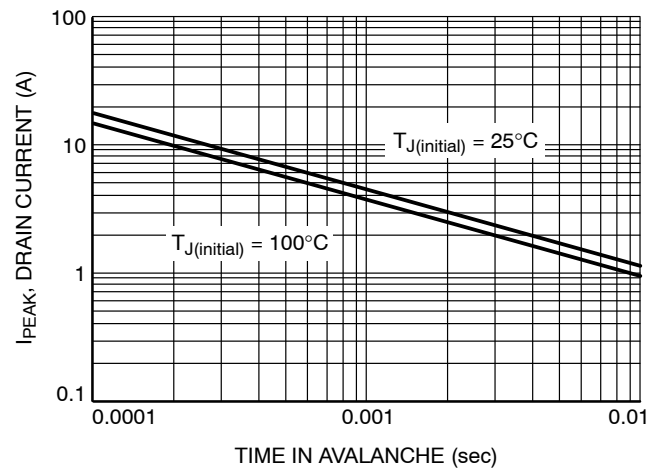


Figure 12. I_{PEAK} vs. Time in Avalanche

NVMFS025P04M8L

TYPICAL CHARACTERISTICS

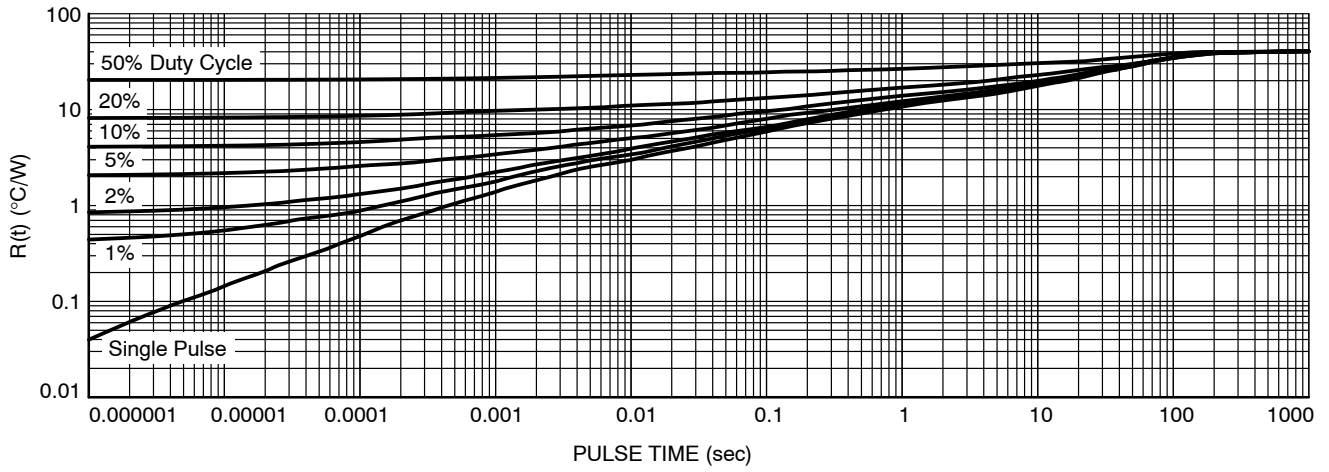


Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

| Device | Marking | Package | Shipping [†] |
|--------------------|---------|--------------------|-----------------------|
| NVMFS025P04M8LT1G | 025P04 | SO8FL (Pb-Free) | 1500 / Tape & Reel |
| NVMFWS025P04M8LT1G | 025P4W | | |

[†]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.

