MOSFET - Power, Single N-Channel, SO-8 FL

60 V, 22 mΩ, 25 A

NVMFS024N06C

Features

- Small Footprint (5x6 mm) for Compact Design
- Low R_{DS(on)} to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- NVMFWS024N06C Wettable Flank Option for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Power Tools, Battery Operated Vacuums
- UAV/Drones, Material Handling
- BMS/Storage, Home Automation

MAXIMUM RATINGS (T_J = 25° C unless otherwise stated)

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V _{DSS}	60	V
Gate-to-Source Volta	ige		V _{GS}	±20	V
Continuous Drain	Steady	T _C = 25°C	Ι _D	25	А
Current R _{θJC} (Notes 1, 3)	State	T _C = 100°C	1	17	
Power Dissipation	Steady	T _C = 25°C	PD	28	W
R _{0JC} (Note 1)	State	$T_{C} = 100^{\circ}C$		14	
Continuous Drain Current R _{0.1A}	Steady	T _A = 25°C	۱ _D	8	А
(Notes 1, 2, 3)	State	T _A = 100°C		6	
Power Dissipation	Steady	$T_A = 25^{\circ}C$	PD	3.4	W
R _{θJA} (Notes 1, 2)	State	T _A = 100°C		1.7	
Pulsed Drain Current	$T_A = 25^{\circ}C, t_p = 10 \ \mu s$		I _{DM}	158	А
Operating Junction and Storage Temperature Range			T _J , T _{STG}	–55 to +175	°C
Source Current (Body Diode)			ا _S	23	Α
Single Pulse Drain-to-Source Avalanche Energy (I _L = 5.3 A_{pk})			E _{AS}	14	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			ΤL	260	°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.

- 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. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.

Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

THERMAL RESISTANCE MAXIMUM RATINGS

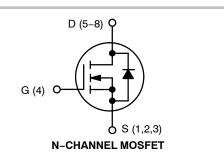
Parameter	Symbol	Value	Unit
Junction-to-Case - Steady State (Note 1)	R_{\thetaJC}	5.3	°C/W
Junction-to-Ambient - Steady State (Note 1)	R_{\thetaJA}	43.4	

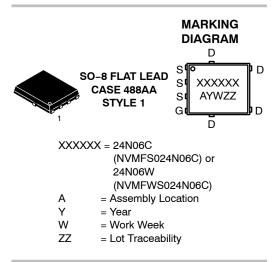


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V _{(BR)DSS}	R _{DS(ON)} MAX	I _D MAX
60 V	$22~m\Omega$ @ 10 V	25 A





ORDERING INFORMATION

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

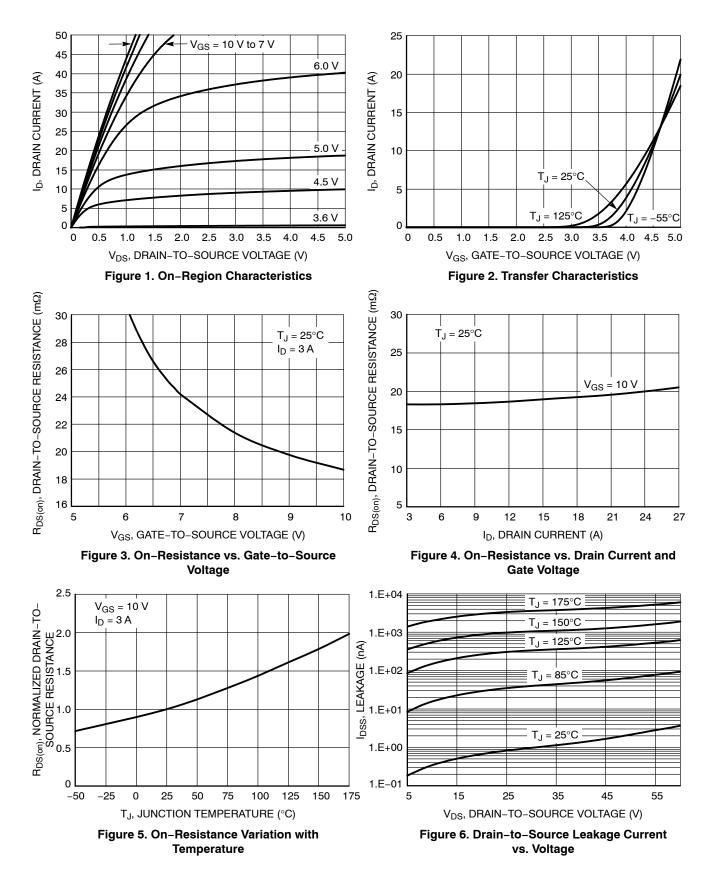
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ELECTRICAL CHARACTERISTICS (T_J = 25° C unless otherwise specified)

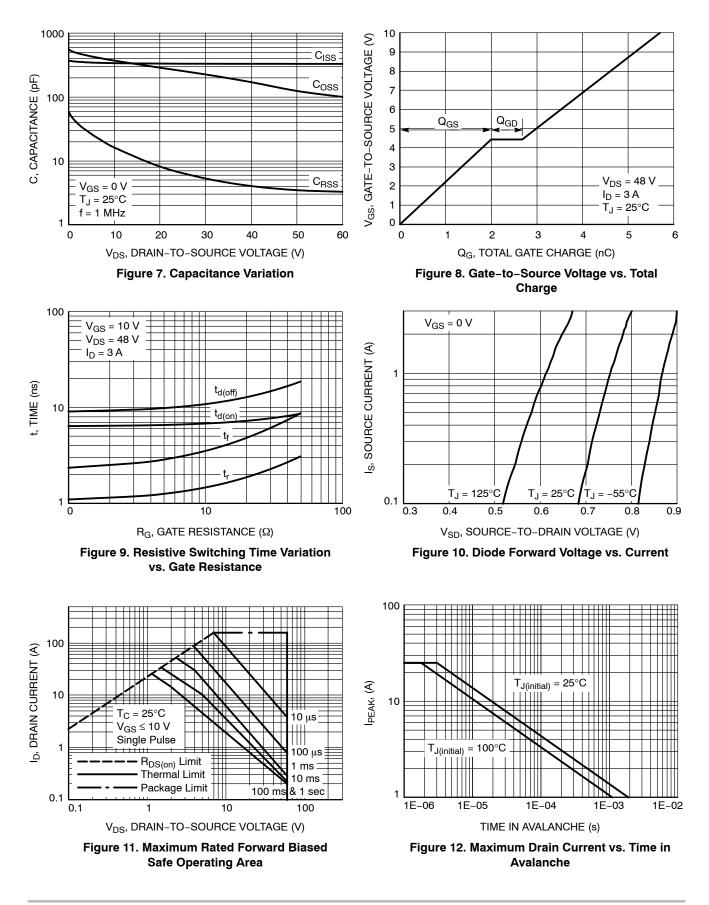
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Parameter	Symbol	Test Condition		Min	Тур	Max	Unit
$\begin{array}{ c c c c c c c } \hline Drain-to-Source Breakdown Voltage Temperature Coefficient $$V$ (BB)DSS' $$I_{J}$ $$I_{D}$ = 250 $$\mu$A, ref to $25^{\circ}C$$ $$I_{D}$ = 250 $$L_{D}$ = 25^{\circ}C$$ $$I_{D}$ = 250 $$L_{D}$ = 250 $$L_{D}$ $$I_{J}$ = 125^{\circ}C$$ $$I_{D}$ $$I_{J}$ = 148,3$$I_{J}$ = 18,3$$I_{J}$ $$I_{J}$ = 10^{\circ}C$$ $$I_{D}$ = 3A$$ $$I_{J}$ = 3A$$$ $$I_{J}$ = 3A$$$$I_{J}$ = 3A$$$$$I_{J}$ = 3A$$$$$I_{J}$ = 3A$$$$$I_{J}$$	OFF CHARACTERISTICS							
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V_{GS} = 0 V, I_D = 250 μ A		60			V
$\begin{tabular}{ c c c c c } \hline V_{DS} = 60 V & \hline T_J = 125^\circ C & & & 250 \\ \hline T_J = 125^\circ C & & & & 100 & nA \\ \hline \end{tabular} \\ \hline t$		V _{(BR)DSS} / T _J	$I_D = 250 \ \mu\text{A}$, ref to 25°C			27		mV/°C
$ \begin{array}{ c c c c c c c } \hline I_J = 125^{\circ}C & 250 & 1 \\ \hline I_J = 125^{\circ}C & 1 & 250 & 1 \\ \hline Gate - Lo-Source Leakage Current & _{GSS} & V_{DS} = 0 V, V_{DS} = 20 V & 100 & nA \\ \hline ON CHARACTERISTICS (Note 4) & \\ \hline Gate Threshold Voltage & V_{GS}(TH) & V_{GS} = V_{DS}, I_D = 20 \mu A & 2.0 & 4.0 & V \\ \hline Negative Threshold Temperature Coefficient & V_{GS}(TH)/T_J & I_D = 17 \mu A, ref to 25^{\circ}C & -7.8 & mV/C \\ \hline Drain-to-Source On Resistance & R_{DS}(m) & V_{GS} = 10 V & I_D = 3 A & 18.3 & 22 & m\Omega \\ \hline Forward Transconductance & g_{FS} & V_{DS} = 5 V, I_D = 3 A & 10 & S \\ \hline Gate Resistance & R_G & T_A = 25^{\circ}C & 0.8 & 0 \\ \hline CHARGES AND CAPACITANCES & & & & & \\ Input Capacitance & C_{ISS} & & & & & & \\ \hline Input Capacitance & C_{GSS} & & & & & & & \\ \hline Cutqu Capacitance & C_{GSS} & & & & & & & \\ \hline Total Gate Charge & Q_G(TOT) & & & & & & & \\ \hline Threshold Gate Charge & Q_GS & & & & & & \\ \hline Threshold Gate Charge & Q_GGD & & & & & & \\ \hline SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 5) & & & & & \\ \hline Turm-On Delay Time & t_{d(ON)} \\ \hline Fall Time & t_t & & & \\ \hline Turm-Off Delay Time & t_{d(OFF)} & & & \\ \hline Fall Time & t_t & & & \\ \hline DRAIN-SOURCE DIODE CHARACTERISTICS & V_{SD} & V_{GS} = 0 V, dIS/dt = 100 A/\muS, \\ \hline Forward Diode Voltage & V_{SD} & V_{GS} = 0 V, dIS/dt = 100 A/\muS, \\ \hline New Set Discharge Time & t_a \\ \hline Discharge Time & t_b & & \\ \hline \end{array}$	Zero Gate Voltage Drain Current	I _{DSS}					10	
			V _{DS} = 60 V	T _J = 125°C			250	μΑ
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = 20 V				100	nA
$\begin{array}{ c c c c c c } \hline \begin{tabular}{ c c c c c c } \hline \begin{tabular}{ c c c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c c } \hline \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	ON CHARACTERISTICS (Note 4)							
$\begin{array}{ c c c c c } \hline \text{Drain-to-Source On Resistance} & R_{DS(on)} & V_{GS} = 10 \ V & I_D = 3 \ A & 18.3 & 22 \ m\Omega \\ \hline \text{Forward Transconductance} & g_{FS} & V_{DS} = 5 \ V, I_D = 3 \ A & 10 & S \\ \hline \text{Gate Resistance} & R_G & T_A = 25^{\circ}\text{C} & 0.8 & \Omega \\ \hline \text{CHARGES AND CAPACITANCES} & & & & & & & & & & & & & & & & & & &$	Gate Threshold Voltage	V _{GS(TH)}	$V_{GS} = V_{DS}, I_D = 20 \ \mu A$		2.0		4.0	V
$ \begin{array}{ c c c c } \hline Forward Transconductance & g_{FS} & V_{DS} = 5 V, I_{D} = 3 A & 10 & S \\ \hline Gate Resistance & R_{G} & T_{A} = 25^{\circ}C & 0.8 & \Omega \\ \hline Gate Resistance & C_{ISS} & & & & & & & & & & & & & & & & & & $	Negative Threshold Temperature Coefficient	V _{GS(TH)} /T _J	I _D = 17 μA, ref	to 25°C		-7.8		mV/°C
$ \begin{array}{ c c c } \hline Gate Resistance & R_G & T_A = 25^\circ C & 0.8 & \Omega \\ \hline CHARGES AND CAPACITANCES \\ \hline Input Capacitance & C_{ISS} & & & & & & & & & & & & & & & & & & $	Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V I _D = 3 A			18.3	22	mΩ
$\begin{tabular}{ c c c c c c } \hline CHARGES AND CAPACITANCES & & & & & & & & & & & & & & & & & & &$	Forward Transconductance	9 _{FS}	V _{DS} = 5 V, I _D = 3 A			10		S
$ \begin{array}{ c c c c c c } \hline Input Capacitance & C_{ISS} \\ \hline Output Capacitance & C_{OSS} \\ \hline Output Capacitance & C_{OSS} \\ \hline Reverse Transfer Capacitance & C_{RSS} \\ \hline Total Gate Charge & Q_{G(TOT)} \\ \hline Threshold Gate Charge & Q_{G(TOT)} \\ \hline Threshold Gate Charge & Q_{GS} \\ \hline Gate-to-Source Charge & Q_{GS} \\ \hline Gate-to-Drain Charge & Q_{GD} \\ \hline SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 5) \\ \hline Turn-On Delay Time & t_{d(ON)} \\ \hline Rise Time & t_r \\ \hline Turn-Off Delay Time & t_{d(OFF)} \\ \hline Fall Time & t_f \\ \hline Inime & t_f \\ \hline Drandbb{r} \\ \hline Forward Diode Voltage \\ \hline Forward Diode Voltage \\ \hline V_{SD} & V_{GS} = 0 V, \ I_{S} = 3 A \\ \hline V_{GS} = 0 V, dIS/dt = 100 A/\mus, \\ V_{GS} = 0 V, dIS/dt = 100 A/\mus, \\ V_{DS} = 30 V, I_{S} = 3 A \\ \hline Init \\ \hline $	Gate Resistance	R _G	T _A = 25°C			0.8		Ω
$\begin{array}{ c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	CHARGES AND CAPACITANCES					-		-
$ \begin{array}{ c c c c c } \hline \mbox{Reverse Transfer Capacitance} & C_{RSS} \\ \hline \mbox{Total Gate Charge} & Q_{G(TOT)} \\ \hline \mbox{Threshold Gate Charge} & Q_{G(TH)} \\ \hline \mbox{Gate-to-Source Charge} & Q_{GS} \\ \hline \mbox{Gate-to-Drain Charge} & Q_{GD} \\ \hline \mbox{Gate-to-Drain Charge} & Q_{GD} \\ \hline \mbox{SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 5) \\ \hline \mbox{Turn-On Delay Time} & t_{d(ON)} \\ \hline \mbox{Rise Time} & t_{f} \\ \hline \mbox{Turn-Off Delay Time} & t_{d(OFF)} \\ \hline \mbox{Fall Time} & t_{f} \\ \hline \mbox{Draine} & t_{RR} \\ \hline \mbox{Charge Time} & t_{RR} \\ \hline \mbox{Charge Time} & t_{h} \\ \hline \mbox{Discharge Time} & t_{h} \\ \hline D$	Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 30 V			333		pF
$ \begin{array}{ c c c c c c } \hline Total Gate Charge & Q_G(TOT) \\ \hline Threshold Gate Charge & Q_G(TH) \\ \hline Gate-to-Source Charge & Q_GS \\ \hline Gate-to-Drain Charge & Q_GD \\ \hline Gate-to-Drain Charge & Q_GD \\ \hline Gate-to-Drain Charge & Q_GD \\ \hline SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 5) \\ \hline Turn-On Delay Time & t_{d(ON)} \\ \hline Rise Time & t_r \\ \hline Turn-Off Delay Time & t_{d(OFF)} \\ \hline Fall Time & t_f \\ \hline Inme & t_f \\ \hline DRAIN-SOURCE DIODE CHARACTERISTICS \\ \hline Forward Diode Voltage & V_{SD} \\ \hline Reverse Recovery Time & t_{RR} \\ \hline Charge Time & t_b \\ \hline Discharge Time & t_b \\ \hline \end{array} \begin{array}{ c c c c c c c c } \hline V_{GS} = 0 V, dIS/dt = 100 A/\mus, \\ V_{GS} = 0 V, dIS/dt = 100 A/\mus, \\ V_{GS} = 0 V, dIS/dt = 100 A/\mus, \\ V_{GS} = 0 V, dIS/dt = 100 A/\mus, \\ \hline 111 & 0 \\ \hline 12 & 0 \\ \hline \end{array} \begin{array}{ c c c } \hline Partical Partic$	Output Capacitance	C _{OSS}				225		
$ \begin{array}{ c c c c c c c } \hline Threshold Gate Charge & Q_G(TH) \\ \hline Gate-to-Source Charge & Q_GS \\ \hline Gate-to-Drain Charge & Q_GD \\ \hline SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 5) \\ \hline Turn-On Delay Time & t_{d(ON)} \\ \hline Rise Time & t_r & V_{GS} = 10 V, V_{DS} = 48 V, \\ I_D = 3 A, R_G = 6.0 \Omega \\ \hline 10 & 10 \\ \hline 10 $	Reverse Transfer Capacitance	C _{RSS}				5.05		
$ \begin{array}{ c c c c c c } \hline Gate-to-Source Charge & Q_{GS} \\ \hline Gate-to-Drain Charge & Q_{GD} \\ \hline Gate-to-Drain Charge & Q_{GD} \\ \hline Gate-to-Drain Charge & Q_{GD} \\ \hline & Q_{GD} \\ \hline \\ $	Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 48 V; I _D = 3 A			5.7		nC
$ \begin{array}{c c c c c c c c c } \hline Gate-to-Source Charge & Q_{GS} & & & & & & & & & & & & & & & & & & &$	Threshold Gate Charge	Q _{G(TH)}				1.3		
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Gate-to-Source Charge	Q _{GS}				2.0		
$\begin{array}{ c c c c c c c c c } \hline Turn-On Delay Time & t_{d(ON)} \\ \hline Rise Time & t_r & & & & & & & & & & & & & & & & & & &$	Gate-to-Drain Charge	Q _{GD}				0.68		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	SWITCHING CHARACTERISTICS, $V_{GS} = 10$	V (Note 5)				-		-
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Turn–On Delay Time	t _{d(ON)}	V_{GS} = 10 V, V_{DS} = 48 V, I_{D} = 3 A, R_{G} = 6.0 Ω			6.6		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Rise Time					1.3		ns
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Turn–Off Delay Time	t _{d(OFF)}				10		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Fall Time	t _f				3.0		
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	DRAIN-SOURCE DIODE CHARACTERISTIC	s	-		-	-	-	-
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Forward Diode Voltage	V _{SD}	VGS = 0 V,	$T_J = 25^{\circ}C$		0.8	1.2	
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$					0.66			
Discharge Time t_b $V_{DS} = 30 \text{ V}, I_S = 3 \text{ A}$ 12	Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dIS/dt = 100 A/μs, V _{DS} = 30 V, I _S = 3 A			23		
Discharge Time t_b $V_{DS} = 30 \text{ V}, \text{ I}_S = 3 \text{ A}$ 12	Charge Time					11		ns
Reverse Recovery Charge Q _{RR} 11 nC	Discharge Time	t _b				12		
	Reverse Recovery Charge	Q _{RR}				11		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. 4. Pulse Test: pulse width $\leq 300 \ \mu$ s, duty cycle $\leq 2\%$. 5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



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TYPICAL CHARACTERISTICS

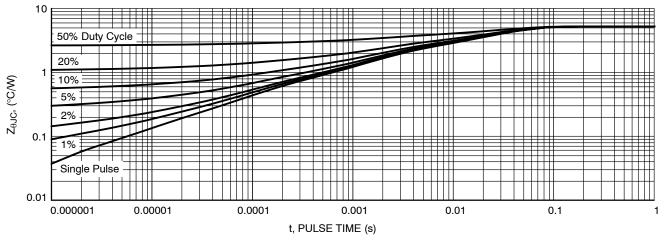


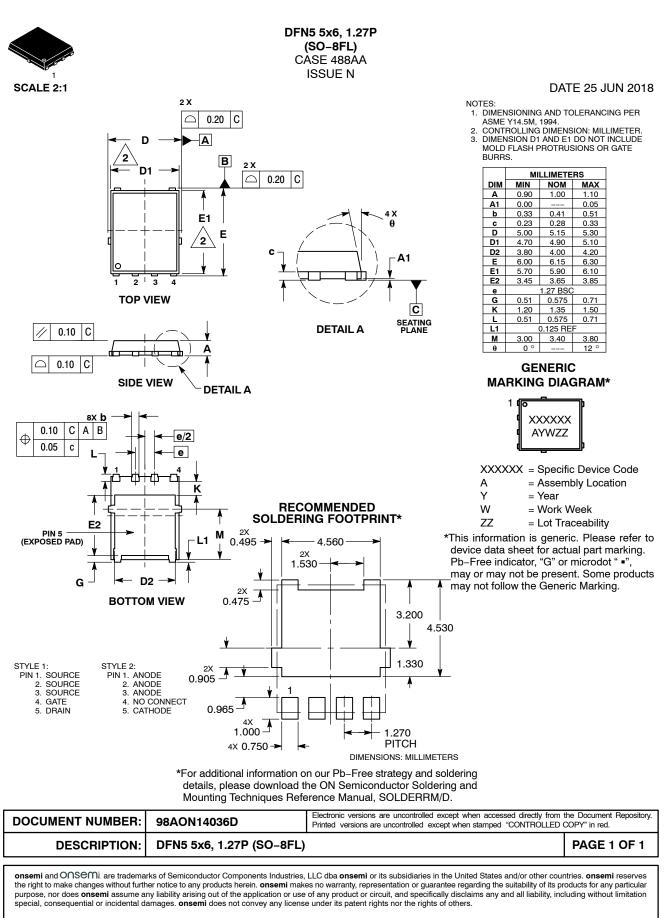
Figure 13. Thermal Response

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NVMFS024N06CT1G	24N06C	DFN5 (Pb–Free)	1500 / Tape & Reel
NVMFWS024N06CT1G	24N06W	DFN5 (Pb-Free, Wettable Flanks)	1500 / 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.

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