

ON Semiconductor

Is Now



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MOSFET - Power, Dual N- & P-Channel, SO8FL

100 V, 13.4 mΩ, 60 A,
-100 V, 36 mΩ, -36 A

NTMFC013NP10M5L

Features

- Small Footprint (5 x 6 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- Power Tools, Battery Operated Vacuums
- UAV/Drones, Material Handling
- Motor Drive, Home Automation

MAXIMUM RATINGS (T_J = 25°C, Unless otherwise specified)

Parameter		Symbol	Q1	Q2	Unit
Drain-to-Source Breakdown Voltage		V _{(BR)DSS}	100	-100	V
Gate-to-Source Voltage		V _{GS}	±20	±20	V
Continuous Drain Current R _{θJC} (Note 2)	Steady State	T _C = 25°C	I _D	60	-36
			P _D	102	102
Continuous Drain Current R _{θJA} (Notes 1, 2)	Steady State	T _A = 25°C	I _D	9	-5
			P _D	2.7	2.7
Pulsed Drain Current		T _A = 25°C, t _p = 10 μs	I _{DM}	208	-184
Operating Junction and Storage Temperature Range		T _J , T _{stg}	-55 to +150		°C
Source Current (Body Diode)		I _S	85	85	A
Single Pulse Drain-to-Source Avalanche Energy (I _L = 17.9/18.4 A, L = 1 mH)		E _{AS}	161	169	mJ
Lead Temperature Soldering Reflow for Soldering Purposes (1/8" from case for 10 s)		T _L	260	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.

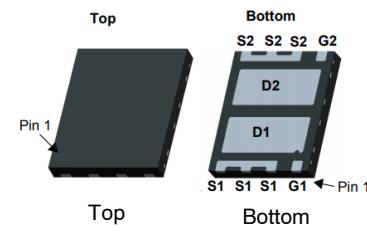
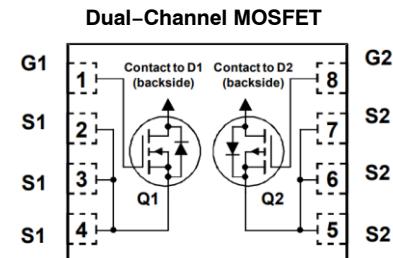
1. Surface-mounted on FR4 board using 1 in² pad size, 1 oz Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.



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V _{(BR)DSS}	R _{DS(ON) MAX}	I _{D MAX}
100 V	13.4 mΩ @ 10 V	60 A
-100 V	36 mΩ @ 10 V	-36 A



WDFN8
CASE 511DC

MARKING DIAGRAM



&Y = ON Semiconductor Logo
&Z = Assembly Plant Code
&2 = Numeric Date Code
&K = Lot Code
13NP10M5L = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 10 of this data sheet.

THERMAL CHARACTERISTICS

Symbol	Parameter	Q1	Q2	Unit
$R_{\theta JC}$	Junction-to-Case – Steady State (Note 3)	1.46	1.46	°C/W
$R_{\theta JA}$	Junction-to-Ambient – Steady State (Note 3)	55	55	

3. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

ELECTRICAL CHARACTERISTICS (Q1, N-CHANNEL) ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$	100			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}} / T_J$	$I_D = 250 \mu\text{A}$, ref to 25°C		60		$\text{mV}/^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 80 \text{ V}$	$T_J = 25^\circ\text{C}$		1	μA
			$T_J = 125^\circ\text{C}$		100	
Gate-to-Source Leakage Current	I_{GSS}	$V_{\text{DS}} = 0 \text{ V}, V_{\text{GS}} = \pm 20 \text{ V}$			± 100	nA

ON CHARACTERISTICS

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}, I_D = 158 \mu\text{A}$	1.0	1.7	3.0	V
Negative Threshold Temperature Coefficient	$V_{\text{GS}(\text{TH})} / T_J$	$I_D = 158 \mu\text{A}$, ref to 25°C		8.85		$\text{mV}/^\circ\text{C}$
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}, I_D = 8.5 \text{ A}$		9.16	13.4	$\text{m}\Omega$
		$V_{\text{GS}} = 4.5 \text{ V}, I_D = 6.8 \text{ A}$		15.2	35.0	
Forward Transconductance	g_{FS}	$V_{\text{DS}} = 5 \text{ V}, I_D = 8.5 \text{ A}$		15.5		S
Gate-Resistance	R_G	$T_A = 25^\circ\text{C}$		1.57		Ω

CHARGES & CAPACITANCES

Input Capacitance	C_{ISS}	$V_{\text{GS}} = 0 \text{ V}, f = 1 \text{ MHz}, V_{\text{DS}} = 50 \text{ V}$		1345		pF
Output Capacitance	C_{OSS}			307		
Reverse Transfer Capacitance	C_{RSS}			17.5		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 4.5 \text{ V}, V_{\text{DS}} = 50 \text{ V}, I_D = 8.5 \text{ A}$		12		nC
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$			2.4		
Gate-to-Source Charge	Q_{GS}			4.7		
Gate-to-Drain Charge	Q_{GD}			5		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$			23		
Plateau Voltage	V_{GP}			3.3		V

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{\text{d}(\text{ON})}$	$V_{\text{GS}} = 10 \text{ V}, V_{\text{DS}} = 50 \text{ V}, I_D = 8.5 \text{ A}, R_G = 6 \Omega$		12		ns
Rise Time	t_r			8		
Turn-Off Delay Time	$t_{\text{d}(\text{OFF})}$			30		
Fall Time	t_f			10		
Turn-On Delay Time	$t_{\text{d}(\text{ON})}$	$V_{\text{GS}} = 4.5 \text{ V}, V_{\text{DS}} = 50 \text{ V}, I_D = 8.5 \text{ A}, R_G = 6 \Omega$		20.1		ns
Rise Time	t_r			40.9		
Turn-Off Delay Time	$t_{\text{d}(\text{OFF})}$			22.7		
Fall Time	t_f			16		

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ELECTRICAL CHARACTERISTICS (Q1, N-CHANNEL) ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	$V_{GS} = 0 \text{ V}$, $I_S = 8.5 \text{ A}$	$T_J = 25^\circ\text{C}$		0.77	1.2	V
			$T_J = 125^\circ\text{C}$		0.63		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0 \text{ V}$, $dI_S/dt = 100 \text{ A}/\mu\text{s}$, $I_S = 4.2 \text{ A}$		39		ns	
Charge Time	t_a			22			
Discharge Time	t_b			17			
Reverse Recovery Charge	Q_{RR}			38			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.

ELECTRICAL CHARACTERISTICS (Q2, P-CHANNEL) ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0 \text{ V}$, $I_D = -250 \mu\text{A}$	$T_J = 25^\circ\text{C}$	-100			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS} / T_J$		$I_D = -250 \mu\text{A}$, ref to 25°C		60		
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0 \text{ V}$, $V_{DS} = -80 \text{ V}$	$T_J = 25^\circ\text{C}$			-1	μA
			$T_J = 125^\circ\text{C}$			-100	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0 \text{ V}$, $V_{GS} = \pm 20 \text{ V}$				± 100	nA

ON CHARACTERISTICS

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$, $I_D = -158 \mu\text{A}$	-2.0	-3.31	-4.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)} / T_J$	$I_D = -158 \mu\text{A}$, ref to 25°C		6.9		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$, $I_D = -8.5 \text{ A}$		28.5	36	$\text{m}\Omega$
		$V_{GS} = -6 \text{ V}$, $I_D = -5.7 \text{ A}$		38.3	50.1	
Forward Transconductance	g_{FS}	$V_{DS} = -5 \text{ V}$, $I_D = -8.5 \text{ A}$		17.7		S
Gate-Resistance	R_G	$T_A = 25^\circ\text{C}$		2.41		Ω

CHARGES & CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$, $V_{DS} = -50 \text{ V}$		2443		pF
Output Capacitance	C_{OSS}			330		
Reverse Transfer Capacitance	C_{RSS}			15		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -10 \text{ V}$, $V_{DS} = -50 \text{ V}$, $I_D = -8.5 \text{ A}$		30		nC
Threshold Gate Charge	$Q_{G(TH)}$			6.9		
Gate-to-Source Charge	Q_{GS}			10.4		
Gate-to-Drain Charge	Q_{GD}			5.1		
Total Gate Charge	$Q_{G(TOT)}$			18.4		
Plateau Voltage	V_{GP}			5		V

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10 \text{ V}$, $V_{DS} = -50 \text{ V}$, $I_D = -8.5 \text{ A}$, $R_G = 6 \Omega$		12.4		ns
Rise Time	t_r			16.1		
Turn-Off Delay Time	$t_{d(OFF)}$			20		
Fall Time	t_f			24		

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ELECTRICAL CHARACTERISTICS (Q2, P-CHANNEL) ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Turn-On Delay Time	$t_{d(\text{ON})}$	$V_{GS} = -6\text{ V}$, $V_{DS} = -50\text{ V}$, $I_D = -8.5\text{ A}$, $R_G = 6\text{ }\Omega$		27		ns
Rise Time	t_r			25		
Turn-Off Delay Time	$t_{d(\text{OFF})}$			22		
Fall Time	t_f			8.5		

OFF CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}$, $I_S = -8.5\text{ A}$	$T_J = 25^\circ\text{C}$		-0.84	-1.2	V
			$T_J = 125^\circ\text{C}$		0.7		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}$, $dI_S/dt = 100\text{ A}/\mu\text{s}$, $I_S = -4.2\text{ A}$			39		ns
Charge Time	t_a				23		
Discharge Time	t_b				16.6		
Reverse Recovery Charge	Q_{RR}				38		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.

TYPICAL CHARACTERISTICS – N-CHANNEL

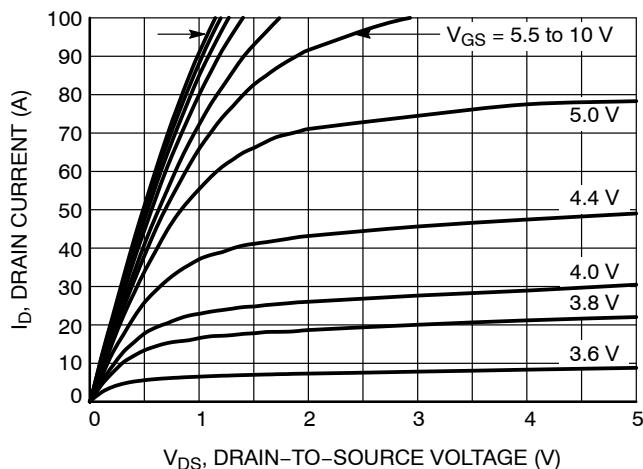


Figure 1. On-Region Characteristics

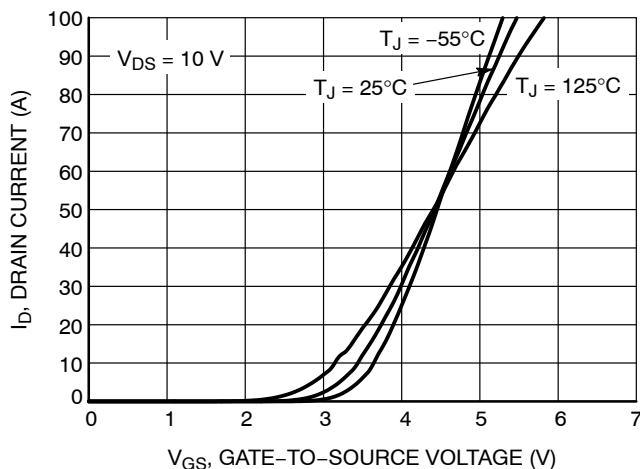


Figure 2. Transfer Characteristics

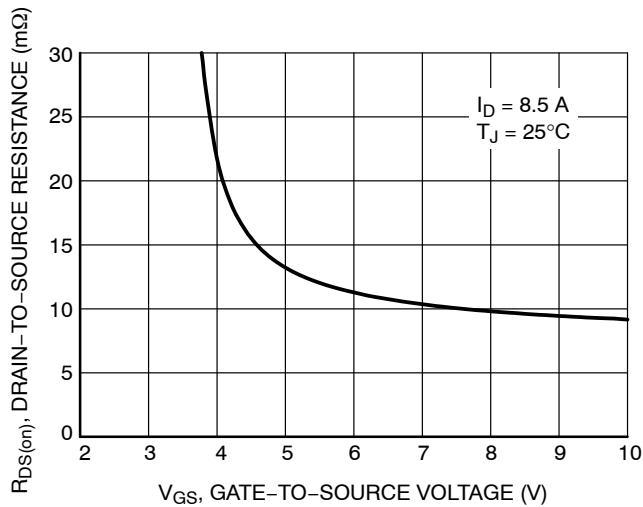


Figure 3. On-Resistance vs. Gate-to-Source Voltage

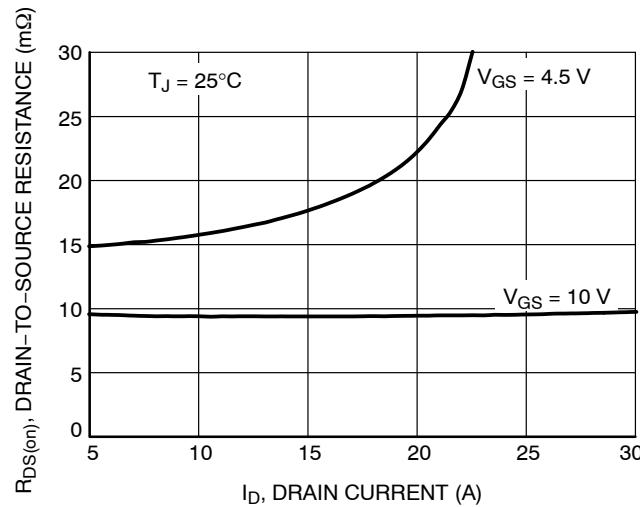


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

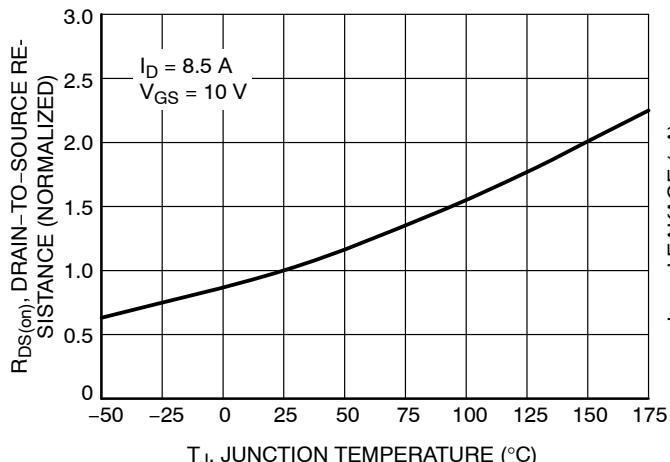


Figure 5. On-Resistance Variation with Temperature

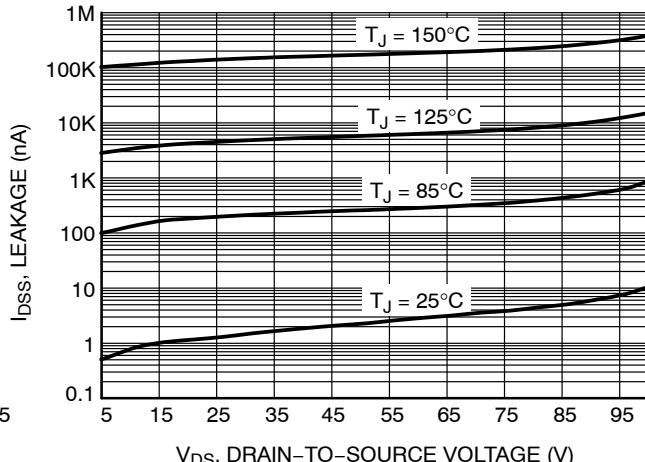


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS – N-CHANNEL

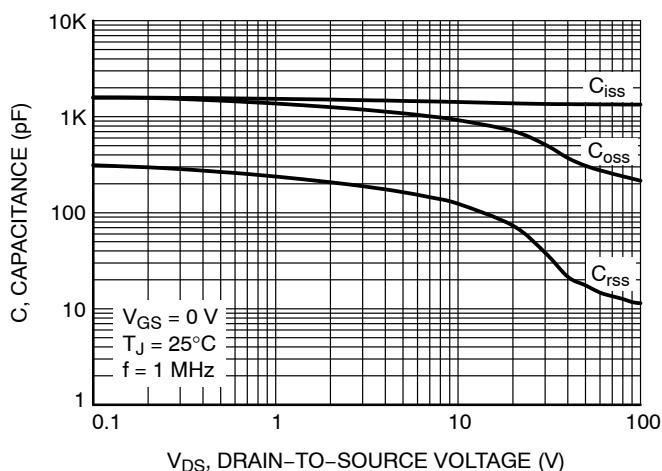


Figure 7. Capacitance Variation

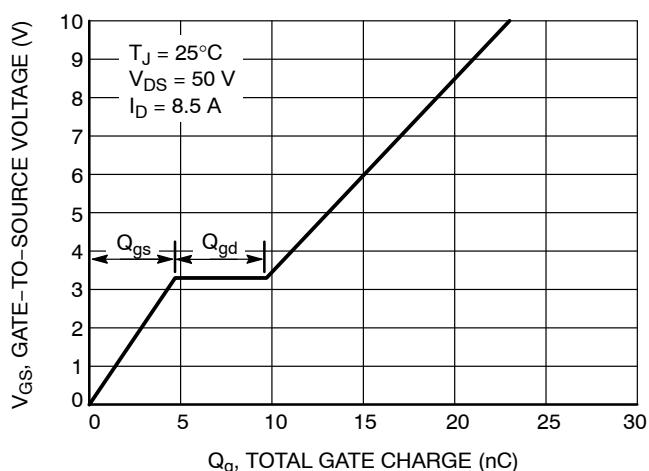


Figure 8. Gate-to-Source vs. Total Charge

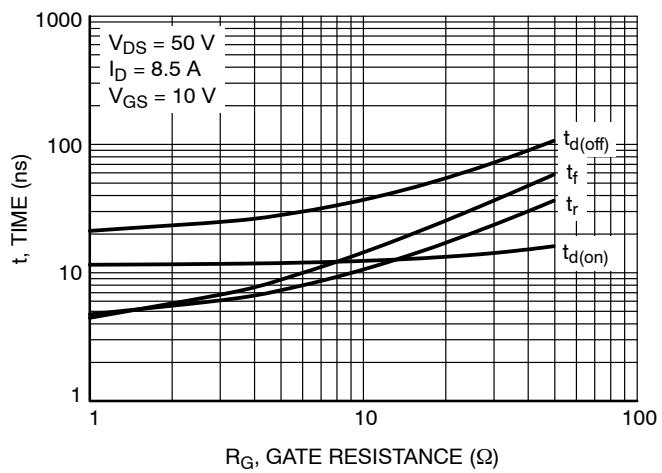


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

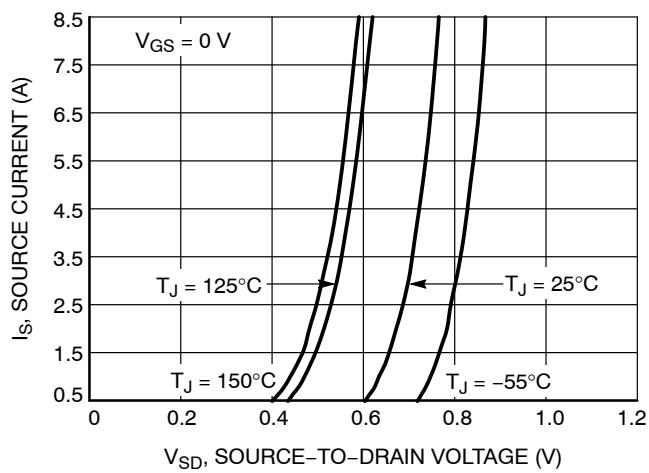


Figure 10. Diode Forward Voltage vs. Current

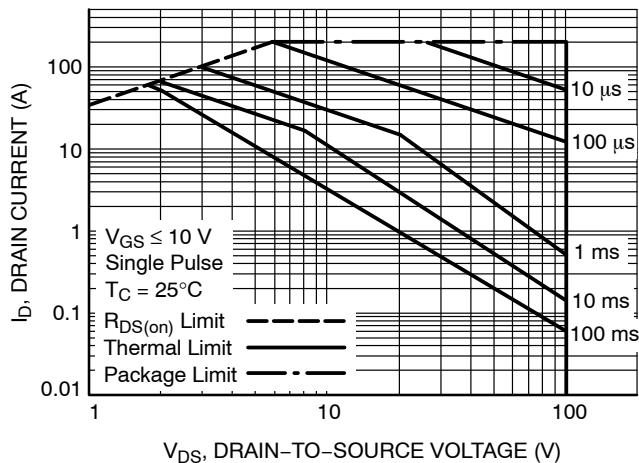


Figure 11. Maximum Rated Forward Biased Safe Operating Area

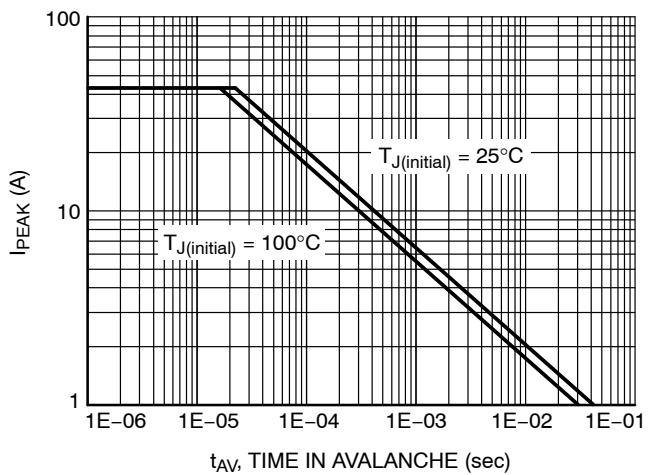


Figure 12. Maximum Drain Current vs. Time in Avalanche

TYPICAL CHARACTERISTICS – N-CHANNEL

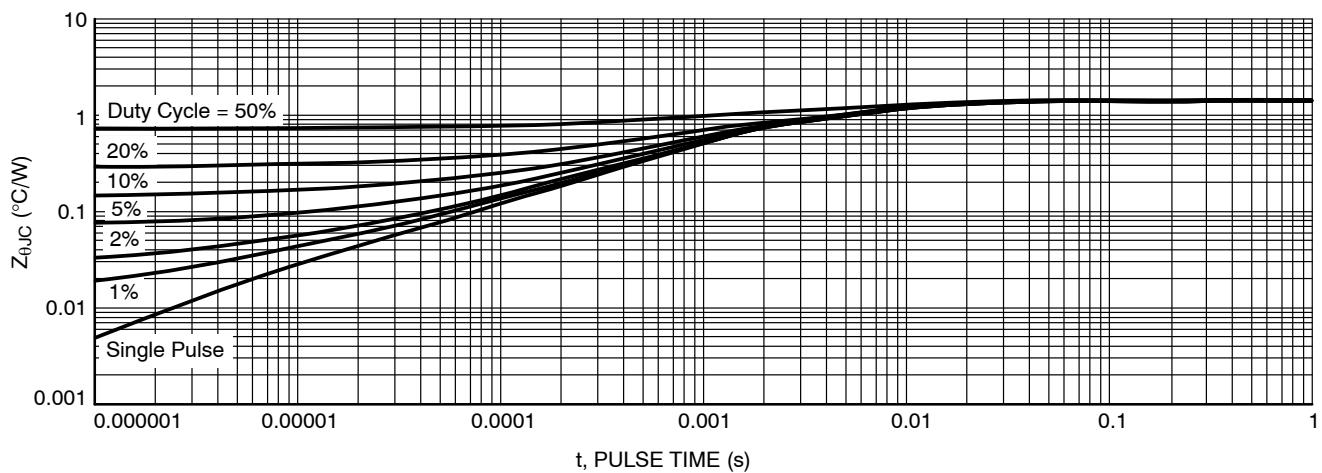
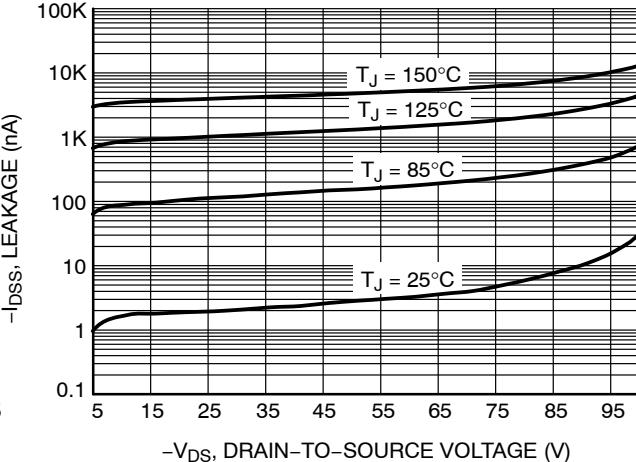
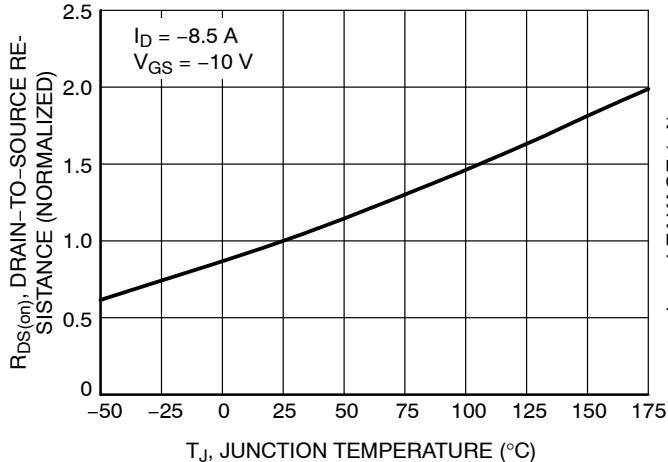
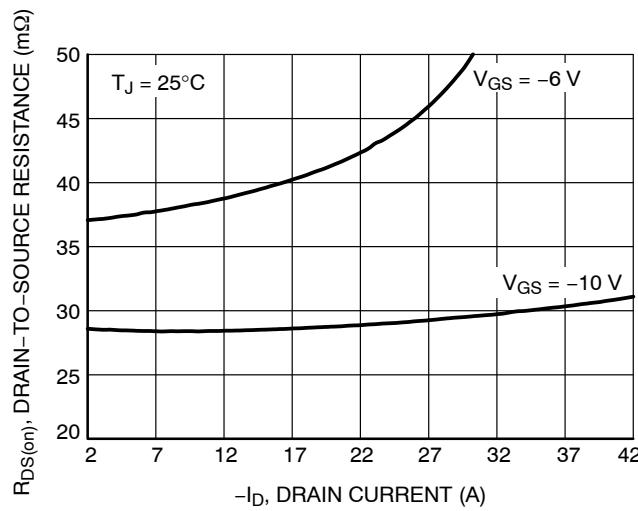
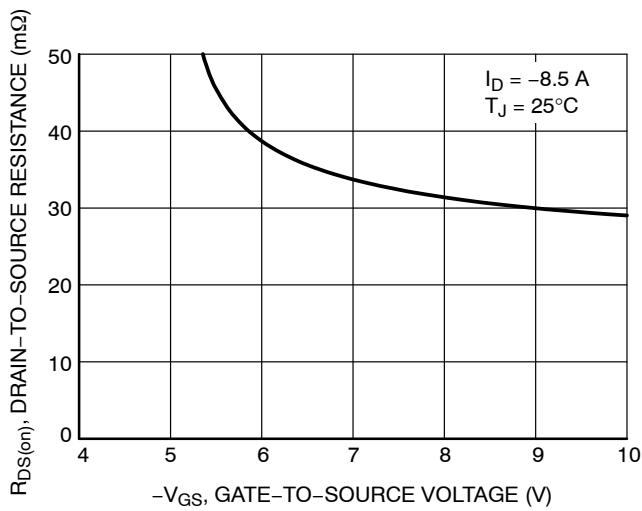
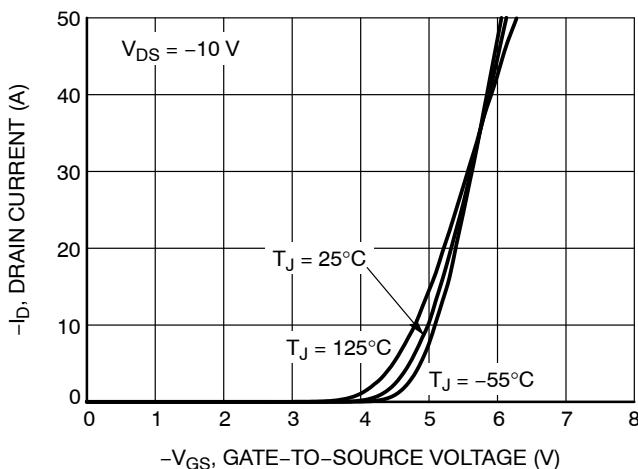
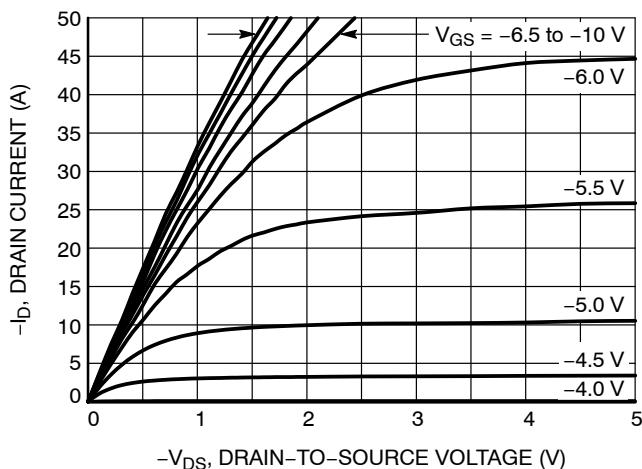
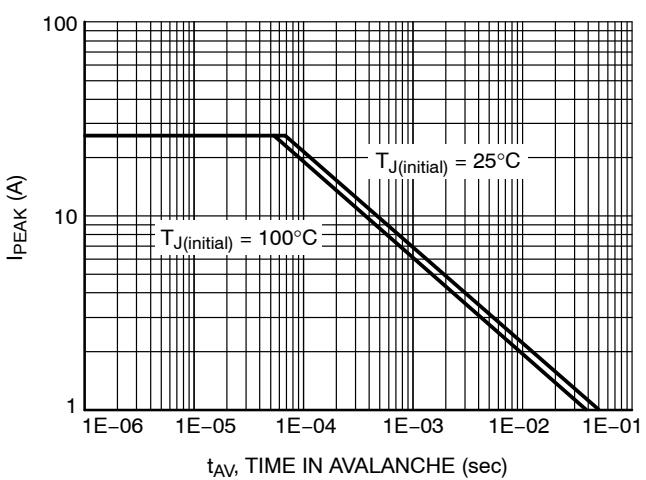
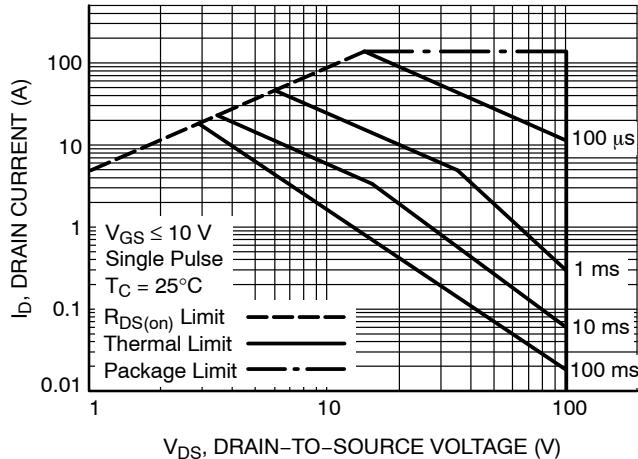
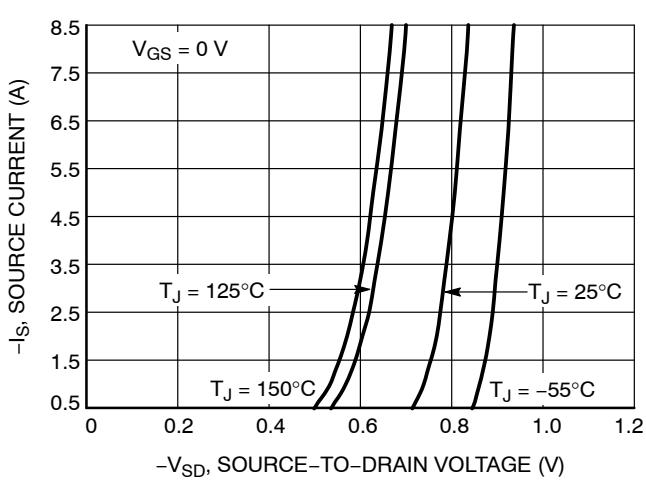
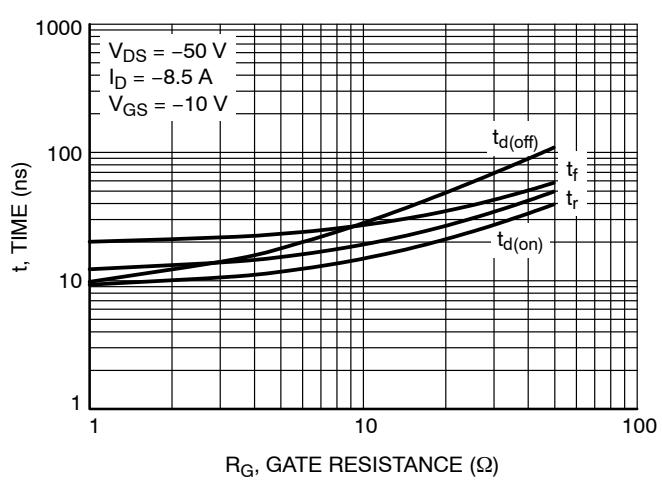
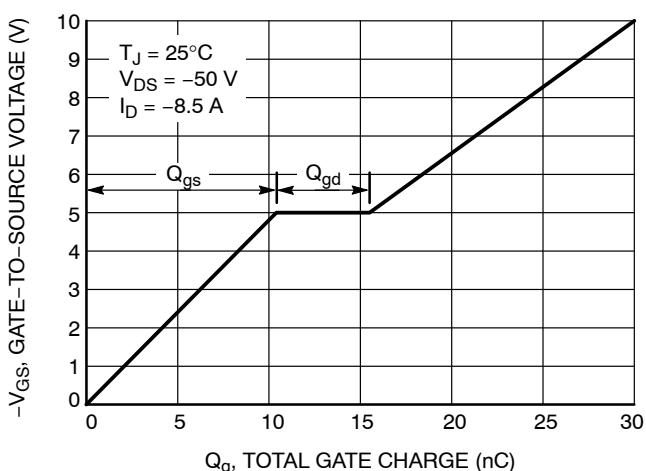
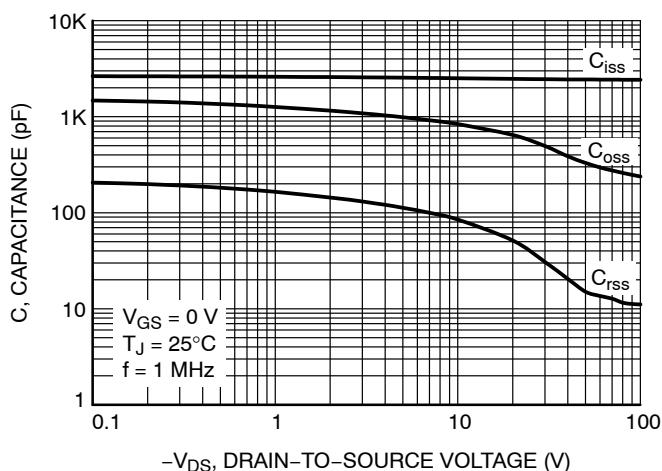


Figure 13. Thermal Response

TYPICAL CHARACTERISTICS – P-CHANNEL



TYPICAL CHARACTERISTICS – P-CHANNEL



TYPICAL CHARACTERISTICS – P-CHANNEL

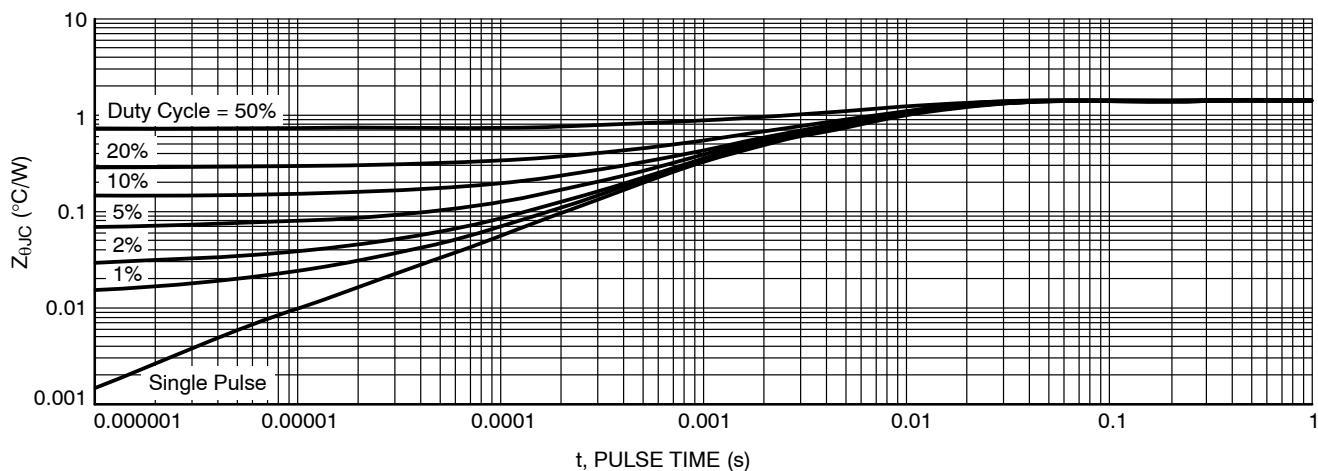


Figure 26. Thermal Response

ORDERING INFORMATION

Device	Device Marking	Package	Shipping (Qty / Packing) [†]
NTMFC013NP10M5L	13NP10M5L	SO8FL (Pb-Free/Halogen Free)	3000 / 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.

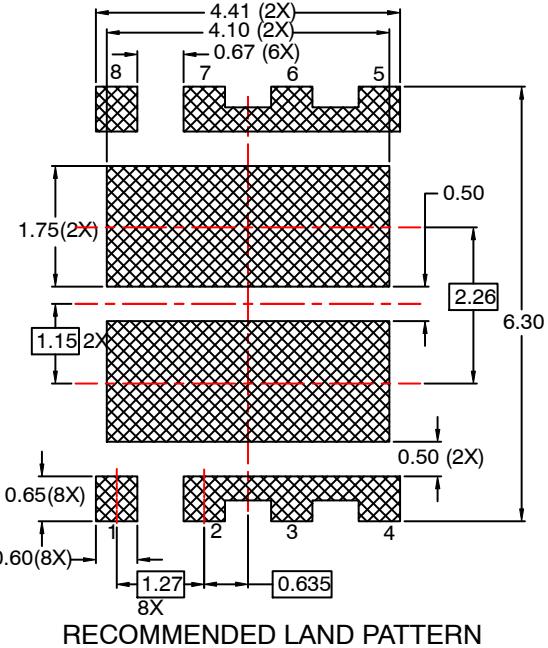
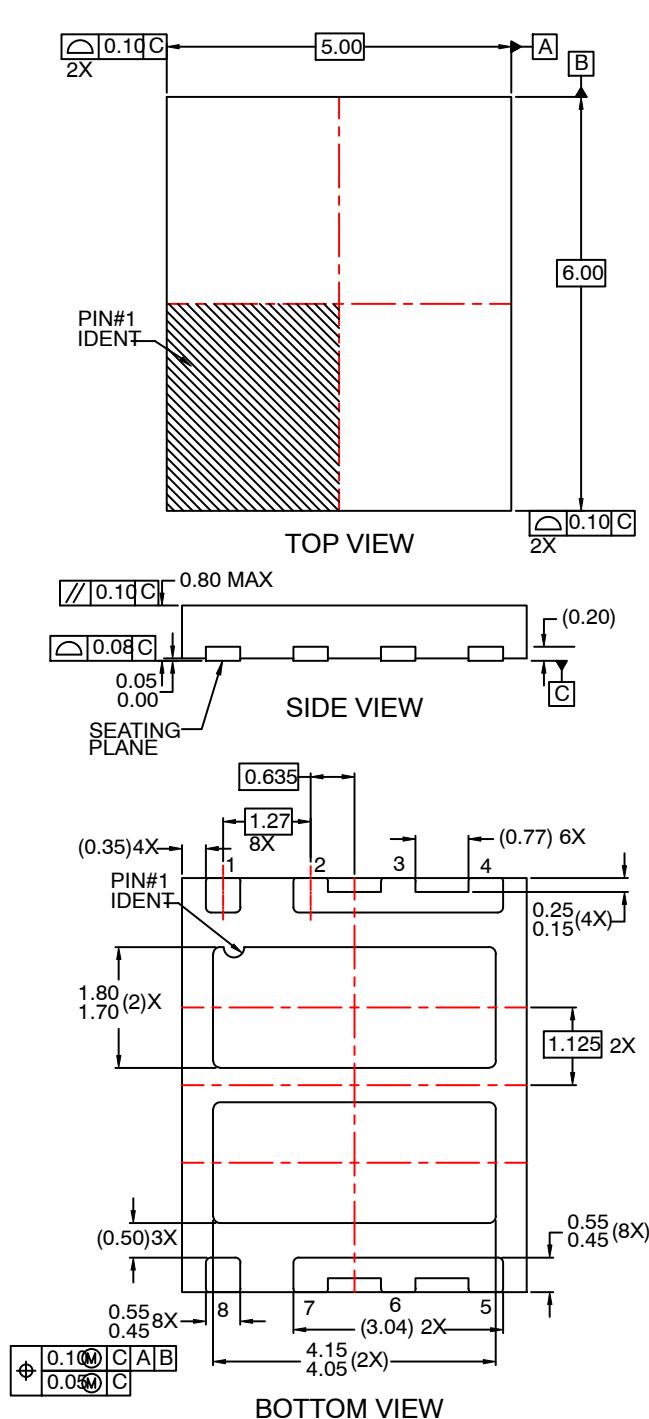
NTMFC013NP10M5L

PACKAGE DIMENSIONS

WDFN8 5x6, 1.27P

CASE 511DC

ISSUE O



NOTES:

- A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MO-229.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.

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