



**F7NM65**

Preliminary

*Power MOSFET*

**7.0A, 650V N-CHANNEL SUPER-JUNCTION MOSFET**

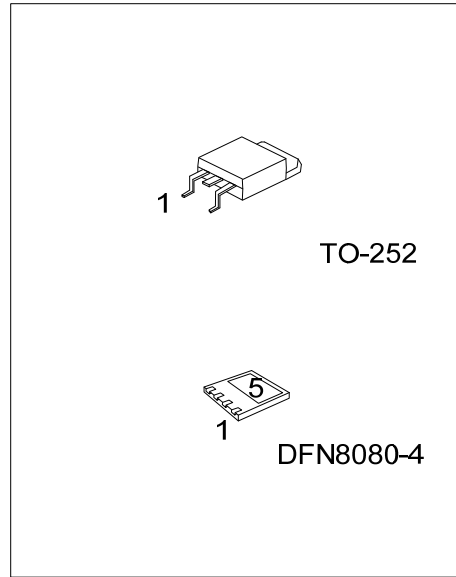
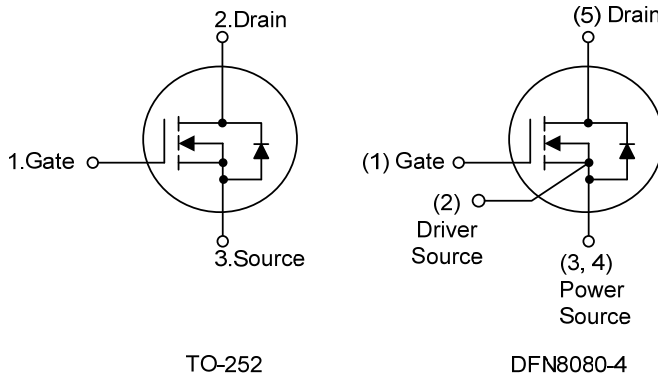
■ DESCRIPTION

The **UTC F7NM65** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

■ FEATURES

- \*  $R_{DS(ON)} \leq 0.9 \Omega @ V_{GS}=10V, I_D=3.5A$
- \* High switching Speed
- \* 100% avalanche tested
- \* Improved dv/dt capability

■ SYMBOL



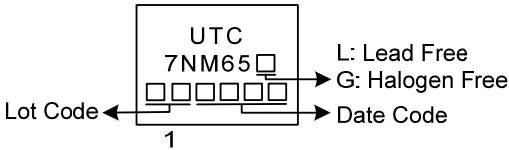
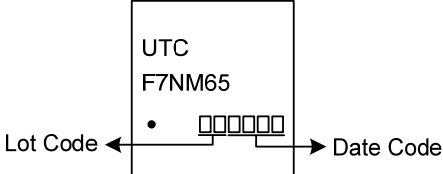
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment					Packing
Lead Free	Halogen Free		1	2	3	4	5	
F7NM65L-TN3-R	F7NM65G-TN3-R	TO-252	G	D	S	-	-	Tape Reel
F7NM65L-K04-8080-R	F7NM65G-K04-8080-R	DFN8080-4	G	S	S	S	D	Tape Reel

Note: Pin Assignment: G: Gate D: Drain S: Source

<p>F7NM65G-TN3-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) TN3: TO-252, K04-8080: DFN8080-4 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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### MARKING

TO-252	DFN8080-4
 <p>The TO-252 marking diagram shows a rectangular package with the following markings: 'UTC' at the top, '7NM65' below it, and a small square symbol to the right. Below these are five small squares representing a lot code. To the left of these squares is an arrow pointing left labeled 'Lot Code'. To the right of the squares are two arrows: one pointing right labeled 'Date Code', and one pointing right labeled 'G: Halogen Free'. Below the squares is a '1' indicating a lead-free part. To the right of the package are two arrows: one pointing right labeled 'L: Lead Free', and one pointing right labeled 'G: Halogen Free'.</p>	 <p>The DFN8080-4 marking diagram shows a rectangular package with the following markings: 'UTC' at the top, 'F7NM65' below it, and a small square symbol to the right. Below these are five small squares representing a lot code. To the left of these squares is an arrow pointing left labeled 'Lot Code'. To the right of the squares are two arrows: one pointing right labeled 'Date Code', and one pointing right labeled 'G: Halogen Free'.</p>

■ ABSOLUTE MAXIMUM RATINGS ( $T_c=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	650	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current ( $T_c=25^\circ\text{C}$ )	Continuous	$I_D$	7	A
	Pulsed (Note 2)	$I_{DM}$	14	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	128	mJ
Peak Diode Recovery $dv/dt$ (Note 4)		$dv/dt$	4.75	V/ns
Power Dissipation	TO-252	$P_D$	42	W
	DFN8080-4		25	W
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature		$T_{STG}$	-55 ~ +150	$^\circ\text{C}$

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

3.  $L=100\text{mH}$ ,  $I_{AS}=1.6\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$ .

4.  $I_{SD} \leq 7.0\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$ .

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-252	$\theta_{JA}$	110	$^\circ\text{C}/\text{W}$
	DFN8080-4		35 (Note)	$^\circ\text{C}/\text{W}$
Junction to Case	TO-252	$\theta_{JC}$	2.97 (Note)	$^\circ\text{C}/\text{W}$
	DFN8080-4		5 (Note)	$^\circ\text{C}/\text{W}$

Note: The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2 OZ copper.

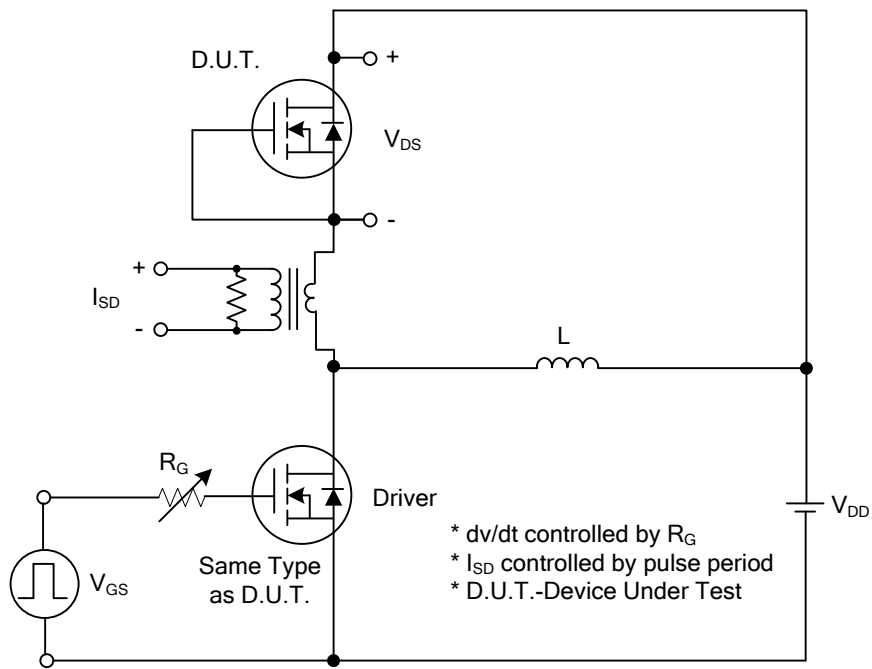
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	650			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=650\text{V}$ , $V_{GS}=0\text{V}$			10	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$V_{GS}=+30\text{V}$			+100	nA
	Reverse	$V_{GS}=-30\text{V}$			-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=3.5\text{A}$			0.9	$\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=50\text{V}$ , $f=1.0\text{MHz}$		410		pF
Output Capacitance	$C_{OSS}$			62		pF
Reverse Transfer Capacitance	$C_{RSS}$			4		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 2)	$Q_G$	$V_{DS}=520\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=7.0\text{A}$ (Note 1, 2)		27		nC
Gate to Source Charge	$Q_{GS}$			8		nC
Gate to Drain Charge	$Q_{GD}$			8.2		nC
Turn-ON Delay Time (Note 2)	$t_{D(ON)}$	$V_{DD}=100\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=7.0\text{A}$ , $R_G=25\Omega$ (Note 1, 2)		4		ns
Rise Time	$t_R$			18		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			58		ns
Fall-Time	$t_F$			38		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				7	A
Maximum Pulsed Drain-Source Diode Forward Current (Note 1)	$I_{SM}$				14	A
Drain-Source Diode Forward Voltage (Note 2)	$V_{SD}$	$I_S=7.0\text{A}$ , $V_{GS}=0\text{V}$			1.4	V
Reverse Recovery Time	$t_{rr}$	$I_S=7.0\text{A}$ , $V_{GS}=0\text{V}$ ,		120		ns
Reverse Recovery Charge (Note 1)	$Q_{rr}$	$dI_F/dt = 100\text{A}/\mu\text{s}$		450		nC

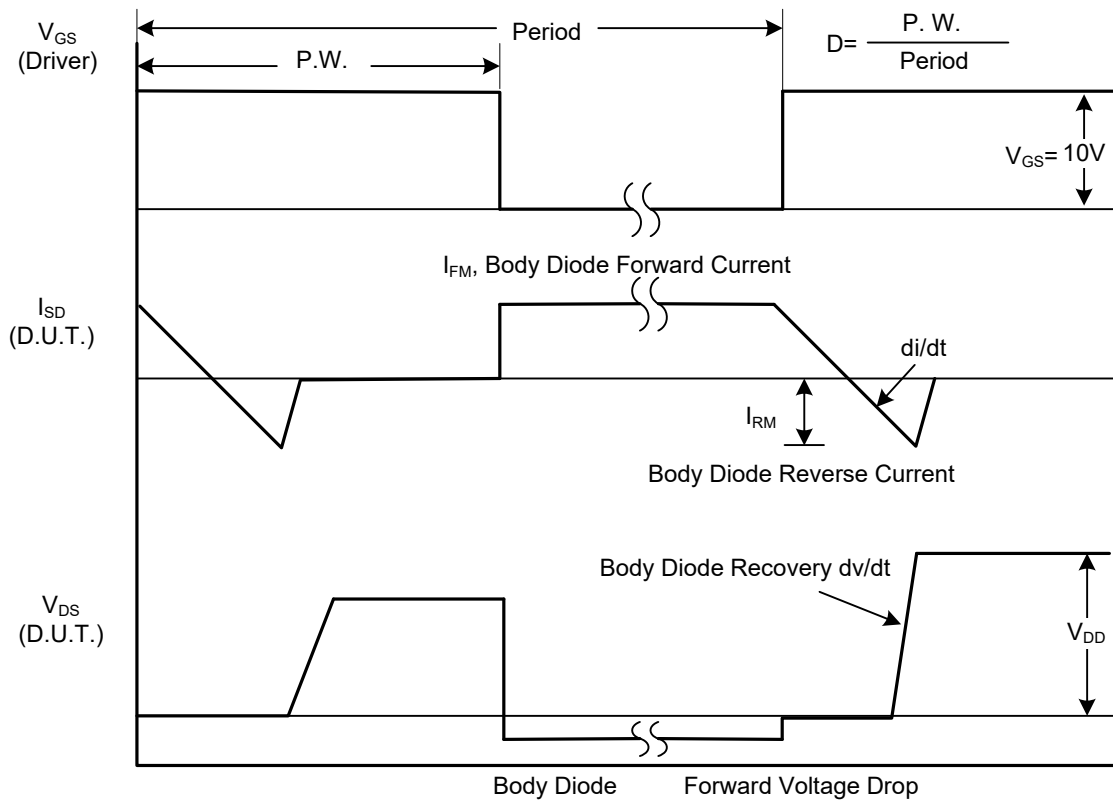
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

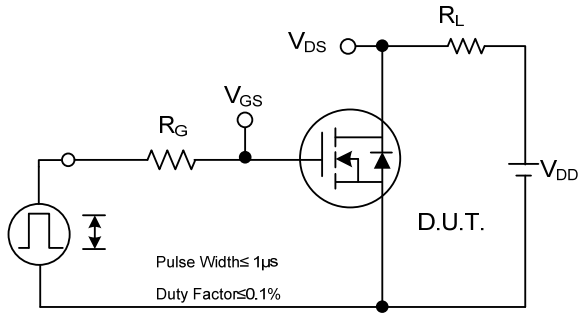


Peak Diode Recovery dv/dt Test Circuit

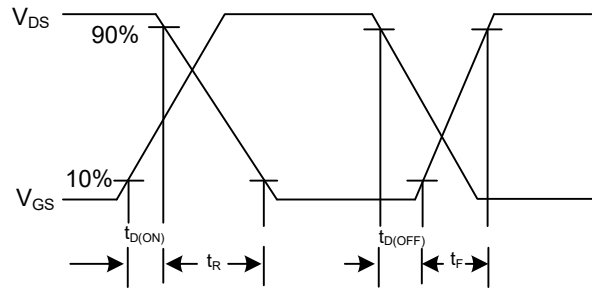


Peak Diode Recovery dv/dt Waveforms

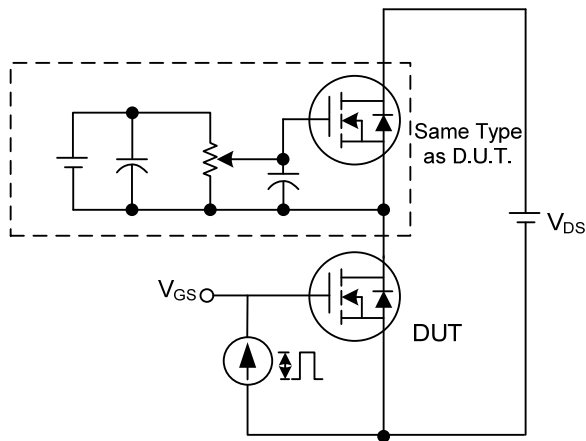
■ TEST CIRCUITS AND WAVEFORMS



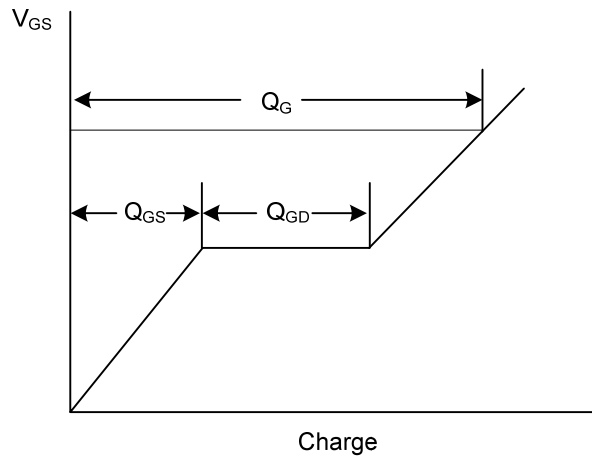
Switching Test Circuit



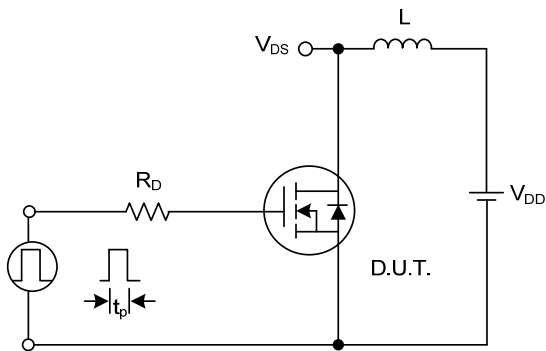
Switching Waveforms



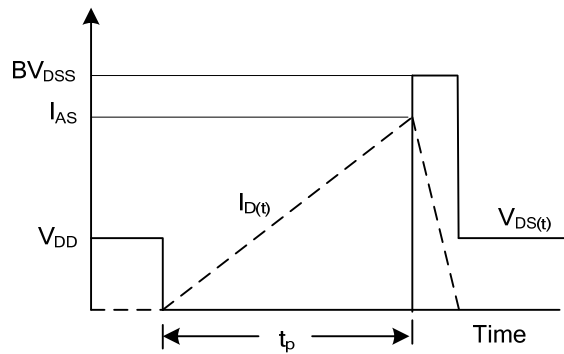
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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