



7NM60

Power MOSFET

7A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

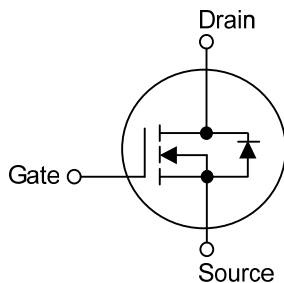
The UTC **7NM60** is a high voltage super junction MOSFET and is designed to have better characteristics.

The UTC **7NM60** Utilizing an advanced charge-balance technology, enhance system efficiency, improve EMI and reliability. such as low gate charge, low on-state resistance and have a high power density and high rugged avalanche characteristics. This super junction MOSFET usually used at AC/DC power conversion, and industrial power applications.

FEATURES

- * $R_{DS(ON)} \leq 0.95\Omega$ @ $V_{GS}=10V$, $I_D=3.7A$
- * Fast Switching Capability
- * Avalanche Energy Tested
- * Improved dv/dt Capability, High Ruggedness

SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
7NM60L-TF1-T	7NM60G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
7NM60L-TM3-T	7NM60G-TM3-T	TO-251	G	D	S	-	-	-	-	-	Tube
7NM60L-TN3-R	7NM60G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
7NM60L-K08-5060-R	7NM60G-K08-5060-R	DFN5060-8	S	S	S	G	D	D	D	D	Tape Reel

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

<p>7NM60G-TF1-T</p>		<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TF1: TO-220F1, TM3: TO-251, TN3: TO-252</p> <p>K08-5060: DFN5060-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

TO-220F1 / TO-251 / TO-252	DFN5060-8
<div><div>UTC 7NM60</div><div>Lot Code ← [][][][][] → Date Code</div><div>1</div><div>L: Lead Free G: Halogen Free</div></div>	<div><div>UTC 7NM60</div><div>Lot Code ← [] • [][][][][] → Date Code</div></div>

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current	Continuous	I_D	7	A
	Pulsed (Note 2)	I_{DM}	14	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	33.8	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.7	V/ns
Power Dissipation	TO-220F1	P_D	26	W
	TO-251/TO-252		52	W
	DFN5060-8		20	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. $L=10\text{mH}$, $I_{AS}=2.6\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, 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	RATINGS	UNIT
Junction to Ambient	TO-220F1	θ_{JA}	62.5	$^\circ\text{C/W}$
	TO-251/TO-252		110	
	DFN5060-8		75	
Junction to Case	TO-220F1	θ_{JC}	4.8	$^\circ\text{C/W}$
	TO-251/TO-252		2.4 (Note)	
	DFN5060-8		6.25 (Note)	

Note: Device mounted on FR-4 substrate P_C board, 2oz copper, with 1inch square copper plate.

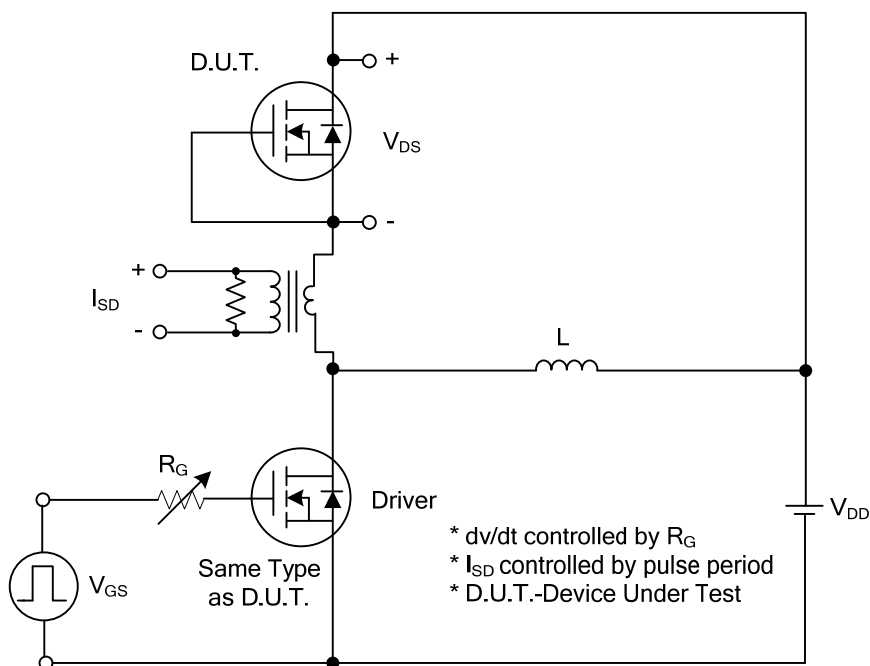
■ ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} = 0V, I _D = 250μA	600			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} = 600V, V _{GS} = 0V			10	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} = 30V, V _{DS} = 0V			100	nA
	Reverse		V _{GS} = -30V, V _{DS} = 0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} = V _{GS} , I _D = 250μA	2.5		4.5	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} = 10V, I _D = 3.7A			0.95	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz		424		pF
Output Capacitance		C _{OSS}			348		pF
Reverse Transfer Capacitance		C _{RSS}			35		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q _G	V _{DS} =480V, V _{GS} =10V, I _D =7A I _G =1mA (Note 1, 2)		17		nC
Gate-Source Charge		Q _{GS}			3.6		nC
Gate-Drain Charge		Q _{GD}			5.5		nC
Turn-On Delay Time		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =7A, R _G =25Ω (Note 1, 2)		5.6		ns
Turn-On Rise Time		t _R			20		ns
Turn-Off Delay Time		t _{D(OFF)}			50		ns
Turn-Off Fall Time		t _F			36		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				7	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				14	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =7A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time		t _{rr}	I _S =7A, V _{GS} =0V, dI/dt=100A/μs		320		nS
Body Diode Reverse Recovery Charge		Q _{rr}			3.2		nC

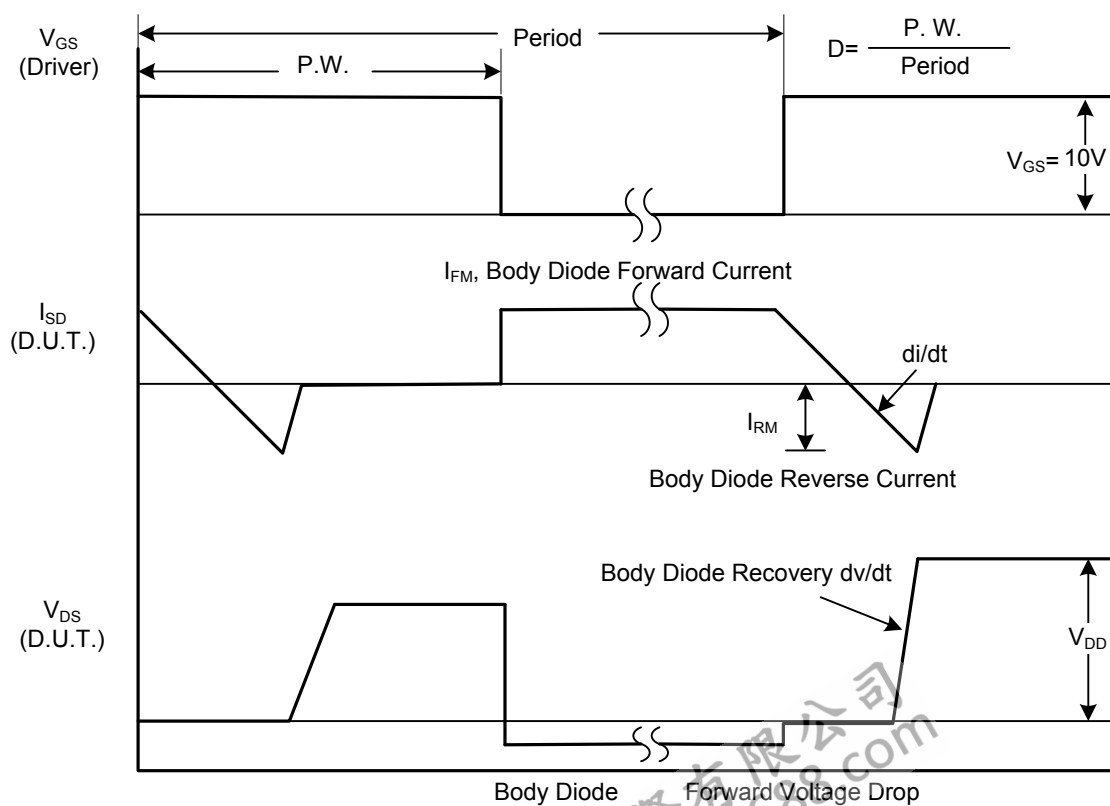
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

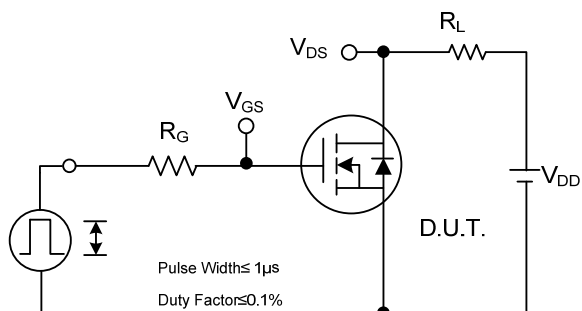


Peak Diode Recovery dv/dt Test Circuit

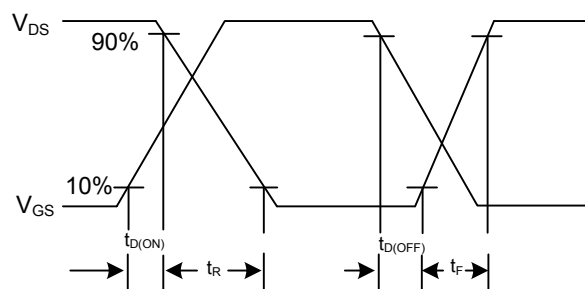


Peak Diode Recovery dv/dt Waveforms

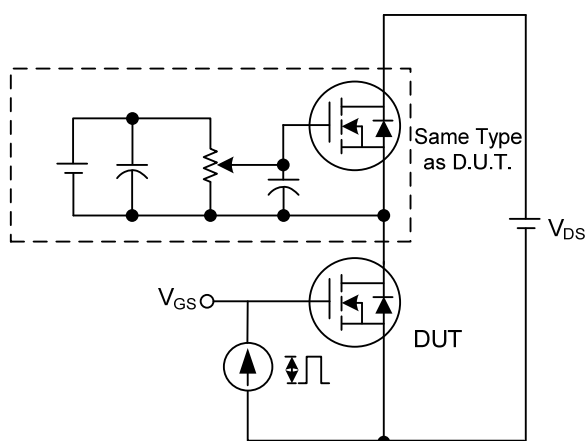
TEST CIRCUITS AND WAVEFORMS



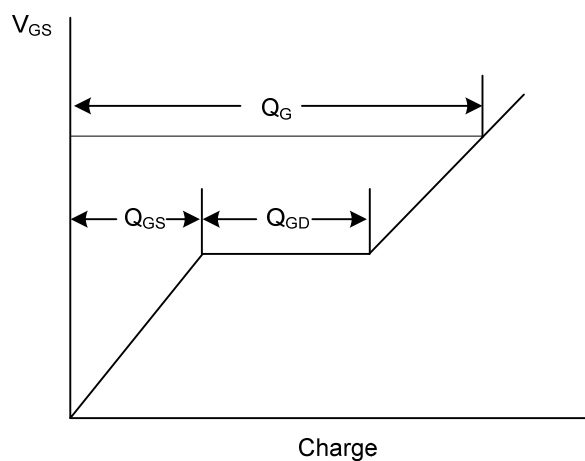
Switching Test Circuit



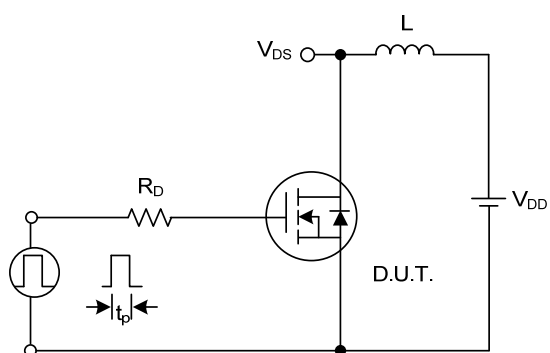
Switching Waveforms



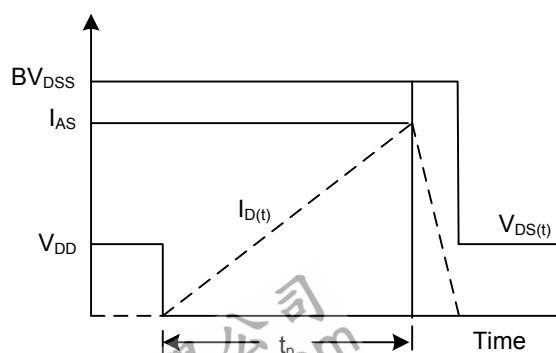
Gate Charge Test Circuit



Gate Charge Waveform

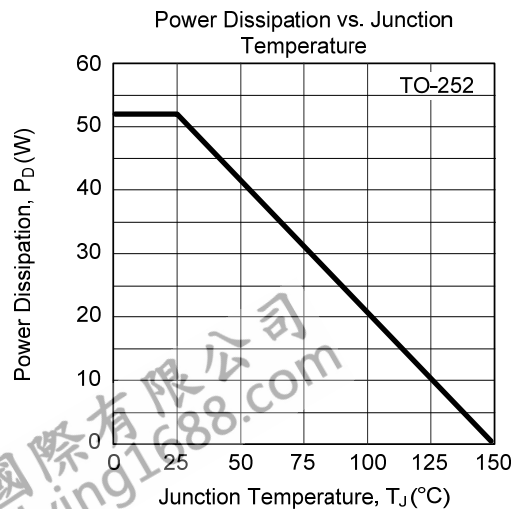
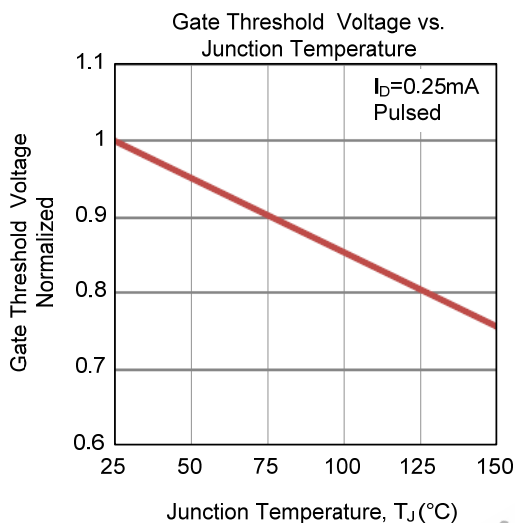
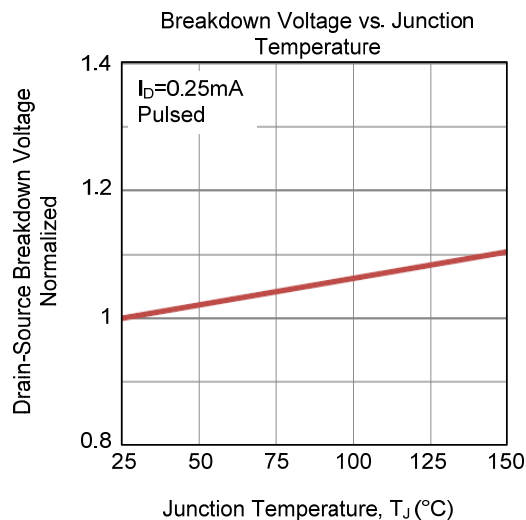
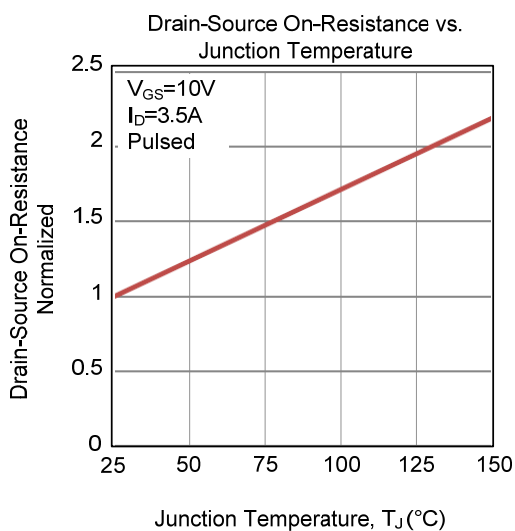
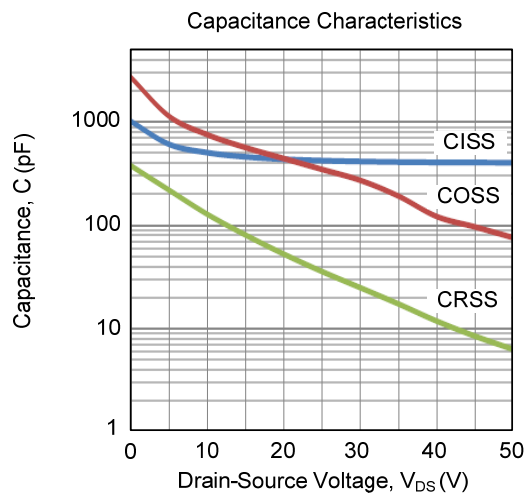
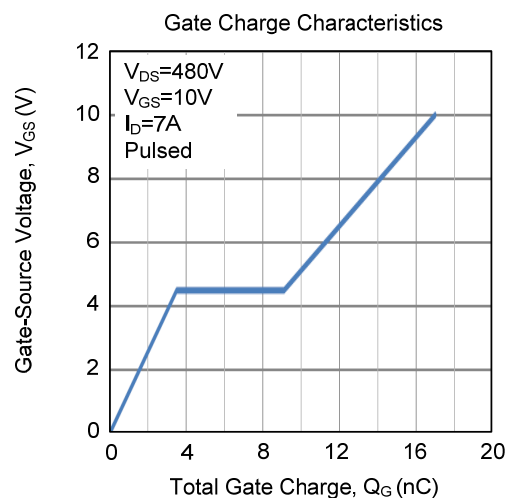


Unclamped Inductive Switching Test Circuit

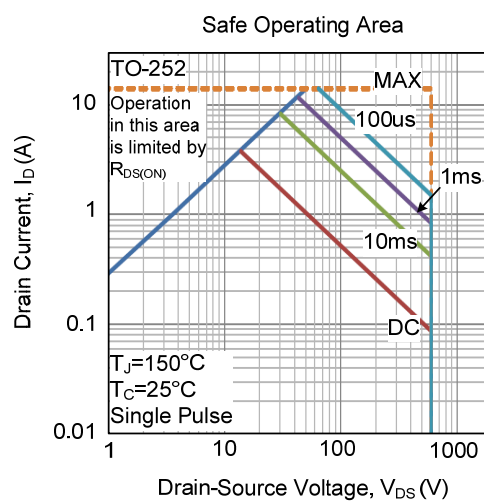
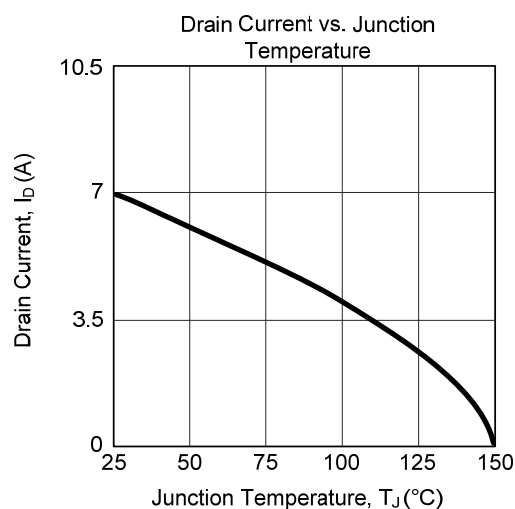


Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



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