



## F2N60-LC1

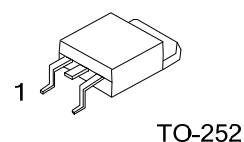
Preliminary

Power MOSFET

## 2.0A, 600V N-CHANNEL POWER MOSFET

### DESCRIPTION

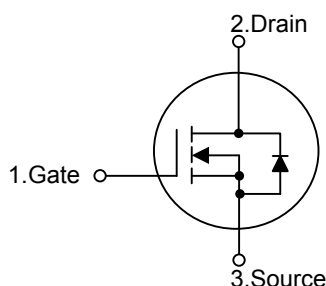
The UTC **F2N60-LC1** is a N-Channel enhancement mode silicon gate power MOSFET with Fast Body Diode, is designed high voltage, high speed power switching applications such, is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.



### FEATURES

- \*  $R_{DS(ON)} \leq 5.5 \Omega$  @  $V_{GS}=10V$ ,  $I_D=1.0A$
- \* Fast body diode MOSFET technology
- \* High Switching Speed
- \* 100% Avalanche Tested

### SYMBOL



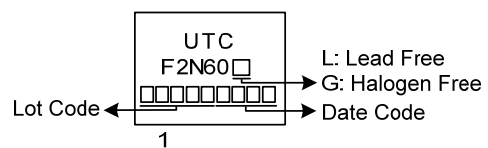
### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
F2N60L-TN3-R	F2N60G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>F2N60G-TN3-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>		<p>(1) R: Tape Reel</p> <p>(2) TN3: TO-252</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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## ■ MARKING



■ 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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	2	A
	Pulsed (Note 2)	$I_{DM}$	4	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	49	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	6	V/ns
Power Dissipation		$P_D$	45	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.  $L = 30\text{mH}$ ,  $I_{AS} = 1.8\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$

4.  $I_{SD} \leq 2.0\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^{\circ}\text{C}$

■ THERMAL CHARACTERISTICS

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		$\theta_{JA}$	100	$^{\circ}\text{C}/\text{W}$
Junction to Case		$\theta_{JC}$	2.77 (Note)	$^{\circ}\text{C}/\text{W}$

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

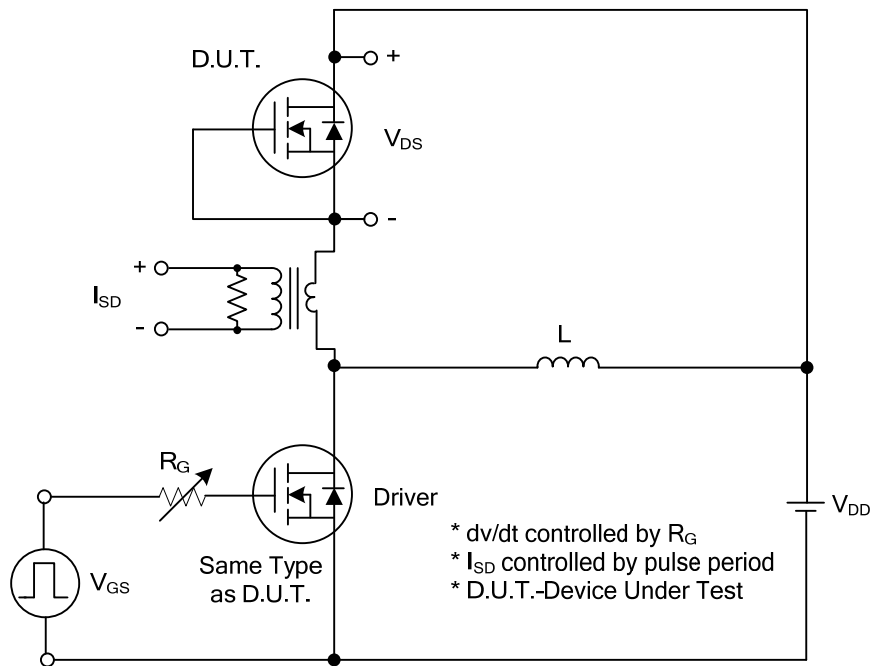
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	600			V
Drain-Source Leakage Current		I <sub>DSS</sub>	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V			10	μA
Gate- Source Leakage Current	Forward	I <sub>GSS</sub>	V <sub>GS</sub> =+30V, V <sub>DS</sub> =0V			+100	nA
	Reverse		V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =1.0A			5.5	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		265		pF
Output Capacitance		C <sub>OSS</sub>			31		pF
Reverse Transfer Capacitance		C <sub>RSS</sub>			3		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q <sub>G</sub>	V <sub>DS</sub> =480V, V <sub>GS</sub> =10V, I <sub>D</sub> =2A I <sub>G</sub> =1mA (Note 1, 2)		7.5		nC
Gate to Source Charge		Q <sub>GS</sub>			2.6		nC
Gate to Drain Charge		Q <sub>GD</sub>			1		nC
Turn-ON Delay Time (Note 1)		t <sub>D(ON)</sub>	V <sub>DD</sub> =100V, V <sub>GS</sub> =10V, I <sub>D</sub> =2A, R <sub>G</sub> =25Ω (Note 1, 2)		5		ns
Rise Time		t <sub>R</sub>			16		ns
Turn-OFF Delay Time		t <sub>D(OFF)</sub>			24		ns
Fall-Time		t <sub>F</sub>			24		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I <sub>S</sub>				2	A
Maximum Body-Diode Pulsed Current (Note 1)		I <sub>SM</sub>				4	A
Drain-Source Diode Forward Voltage (Note 1)		V <sub>SD</sub>	I <sub>S</sub> =2A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time		t <sub>rr</sub>	I <sub>S</sub> =2A, V <sub>GS</sub> =0V,		87		ns
Body Diode Reverse Recovery Charge		Q <sub>rr</sub>	dI <sub>F</sub> /dt=100A/μs		0.3		μC

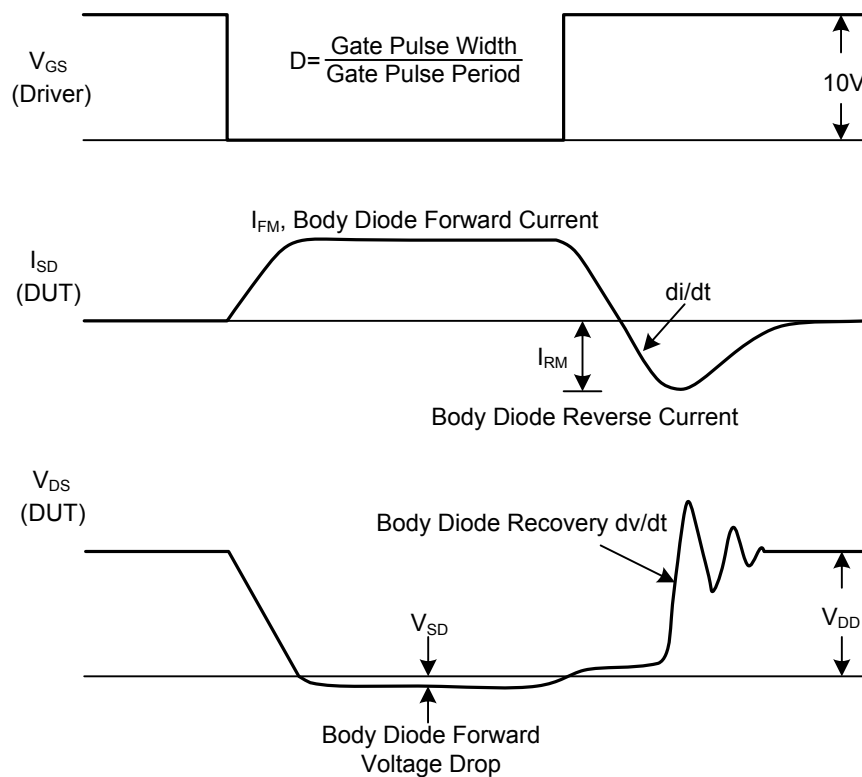
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

# ■ TEST CIRCUITS AND WAVEFORMS

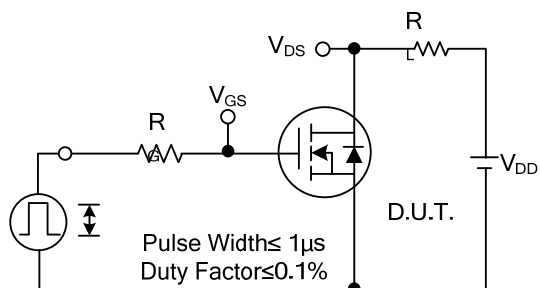


**Peak Diode Recovery dv/dt Test Circuit**

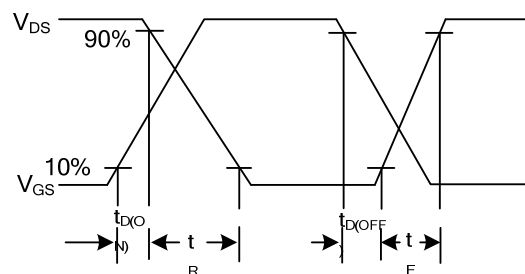


**Peak Diode Recovery dv/dt Waveforms**

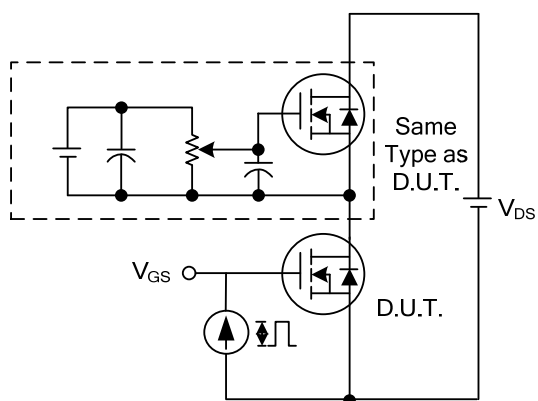
# ■ TEST CIRCUITS AND WAVEFORMS



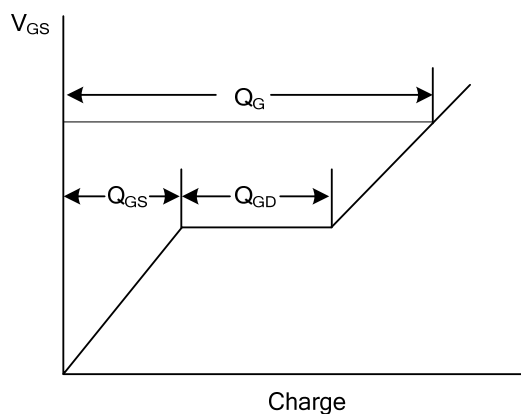
Switching Test Circuit



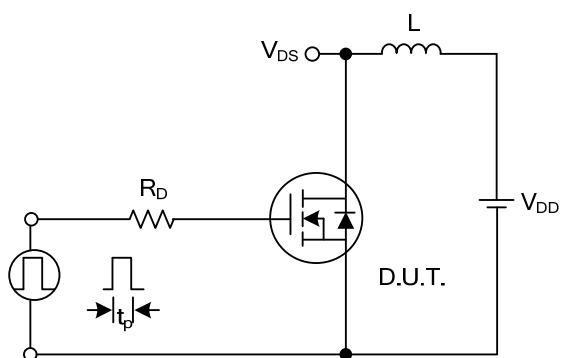
Switching Waveforms



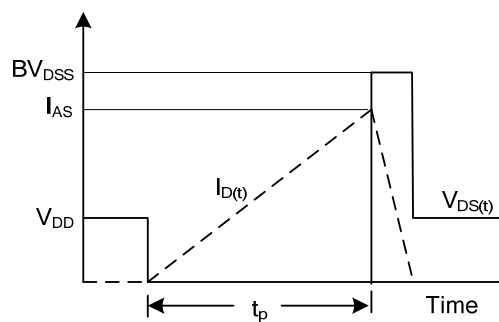
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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