



11NM60Z-U3

Preliminary

Power MOSFET

11A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

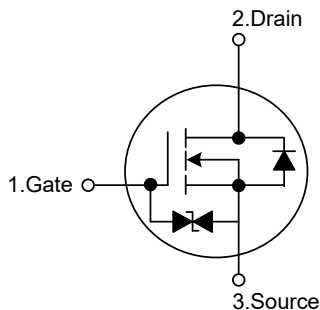
DESCRIPTION

The **UTC 11NM60Z-U3** 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

- * $R_{DS(ON)} \leq 0.5 \Omega$ @ $V_{GS}=10V$, $I_D=3.5A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness
- * With ESD protection

SYMBOL

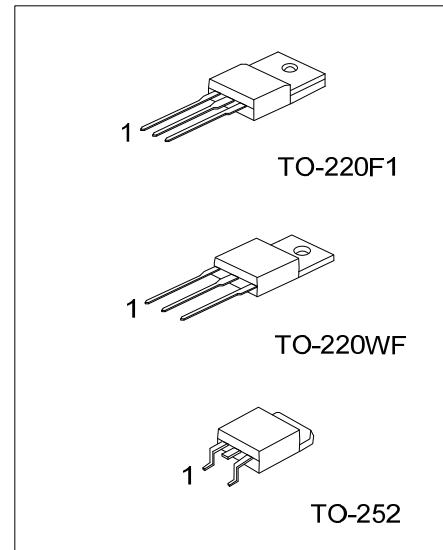


ORDERING INFORMATION

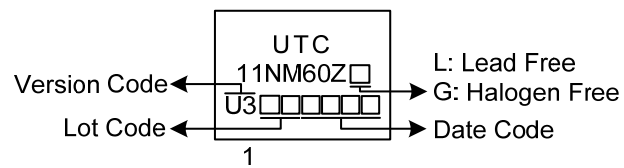
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
11NM60ZL-U3-TF1-T	11NM60ZG-U3-TF1-T	TO-220F1	G	D	S	Tube
11NM60ZL-U3-TW1-T	11NM60ZG-U3-TW1-T	TO-220WF	G	D	S	Tube
11NM60ZL-U3-TN3-R	11NM60ZG-U3-TN3-R	TO-252	G	D	S	Tape Reel

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

11NM60ZG-U3-TF1-T	(1)Packing Type (2)Package Type (3)Version Code (4)Green Package	(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TW1: TO-220WF, TN3: TO-252 (3) Version U3 (4) G: Halogen Free and Lead Free, L: Lead Free
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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}	±20	V
Drain Current	Continuous	T _C =25°C	I _D	11	A
					A
	Pulsed (Note 2)		I _{DM}	33	A
Avalanche Energy	Single Pulsed (Note 3)		E _{AS}	64	mJ
Peak Diode Recovery dv/dt (Note 4)			dv/dt	1.6	V/ns
Power Dissipation	TO-220F1/TO-220WF		P _D	27	W
	TO-252			56	W
Junction Temperature			T _J	+150	°C
Storage Temperature			T _{STG}	-55 ~ +150	°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. $L = 100\text{mH}$, $I_{AS} = 1.1\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\Omega$ Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 11\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1/TO-220WF	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220F1/TO-220WF	θ_{JC}	4.62	$^\circ\text{C}/\text{W}$
	TO-252		2.23 (Note)	$^\circ\text{C}/\text{W}$

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

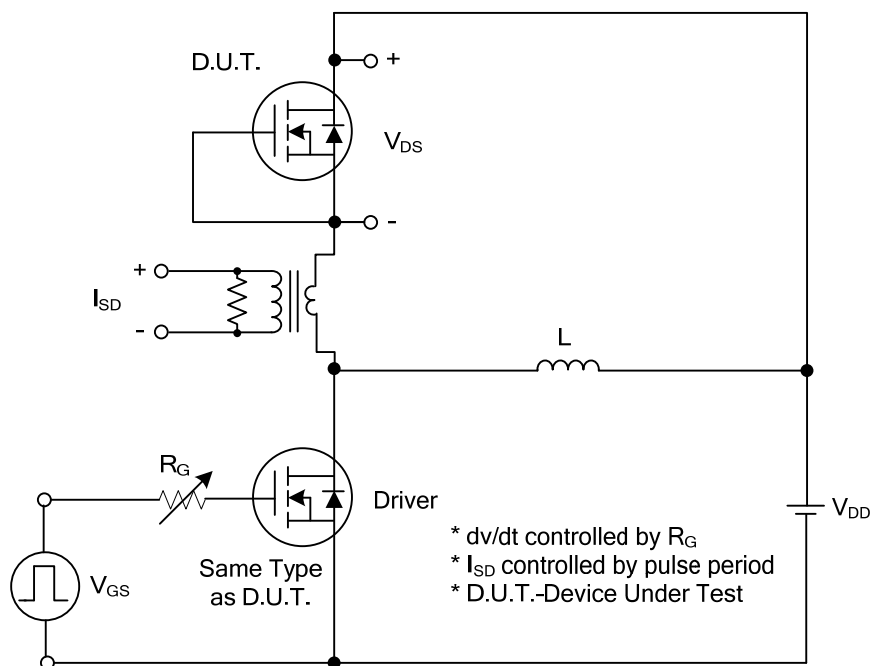
■ ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$			10	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 10	μA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=3.5A$			0.5	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{GS}=0V, V_{DS}=50V, f=1MHz$		540		pF
Output Capacitance	C_{OSS}			135		pF
Reverse Transfer Capacitance	C_{RSS}			5.4		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	$V_{DS}=480V, V_{GS}=10V, I_D=2A$ (Note 1, 2)		30		nC
Gate-Source Charge	Q_{GS}			7.7		nC
Gate-Drain Charge	Q_{DD}			8.4		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V, I_D=2A,$ $R_G=25\Omega$ (Note 1, 2)		8		ns
Turn-On Rise Time	t_R			23		ns
Turn-Off Delay Time	$t_{D(OFF)}$			88		ns
Turn-Off Fall Time	t_F			35		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				11	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=11A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	$I_S=11A, V_{GS}=0V,$ $dI_F/dt=100A/\mu s$		300		ns
Body Diode Reverse Recovery Charge	Q_{rr}			3.3		μC

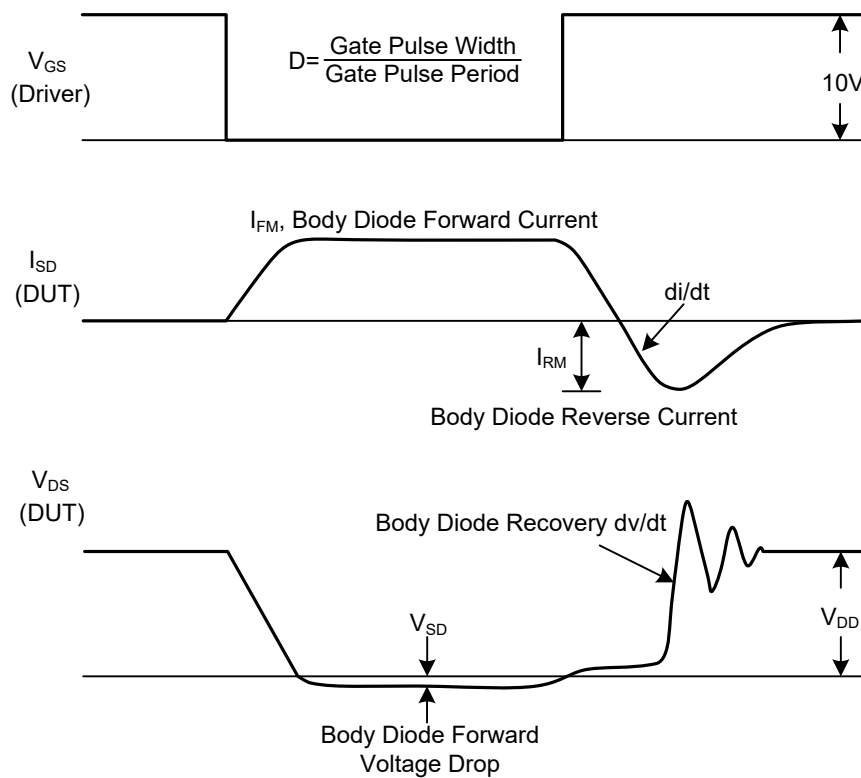
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

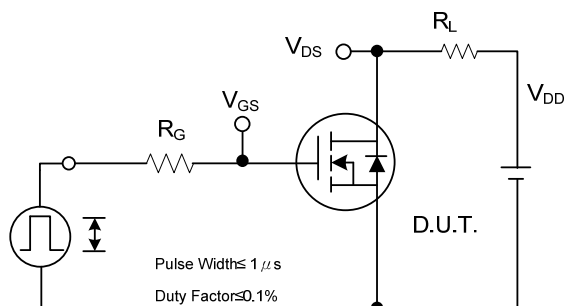


Peak Diode Recovery dv/dt Test Circuit

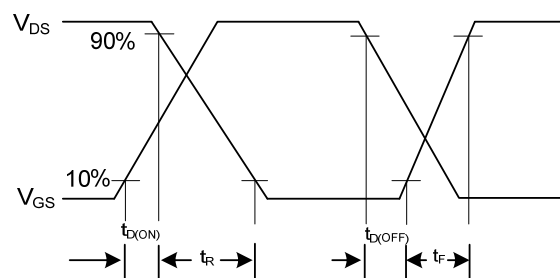


Peak Diode Recovery dv/dt Waveforms

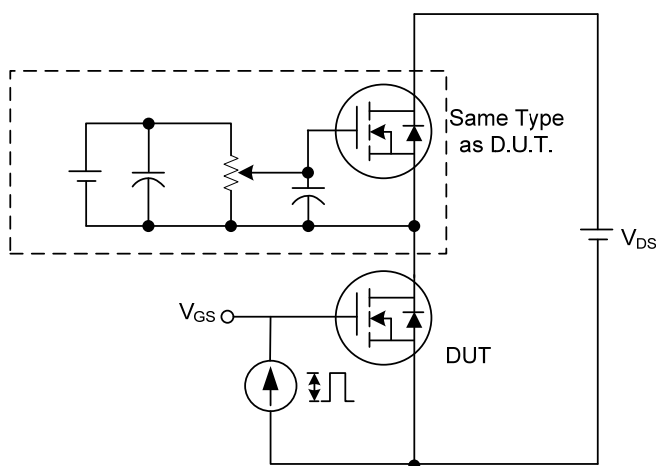
■ TEST CIRCUITS AND WAVEFORMS



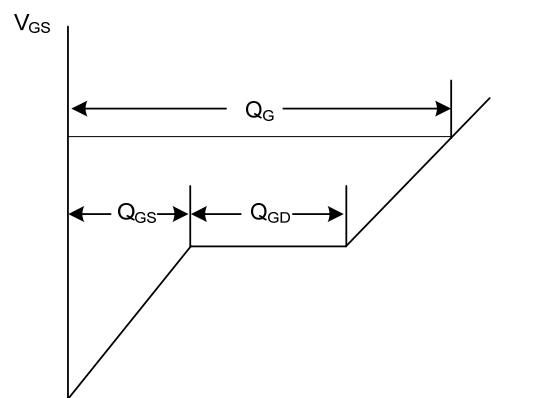
Switching Test Circuit



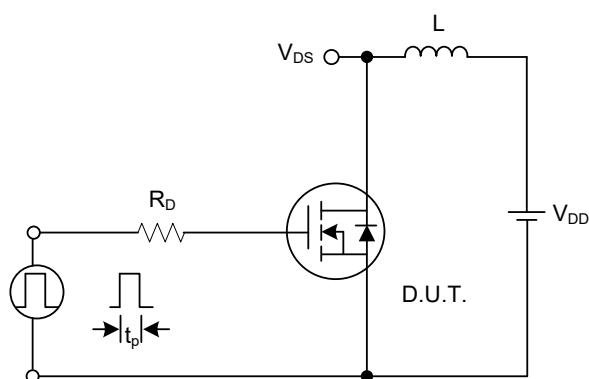
Switching Waveforms



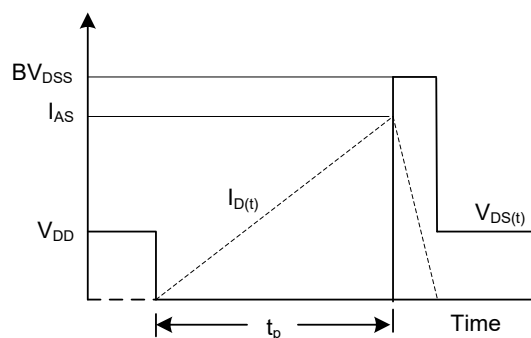
Gate Charge Test Circuit



Charge
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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