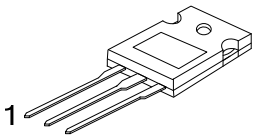
42A, 600V N-CHANNEL SUPER-JUNCTION MOSFET



TO-247

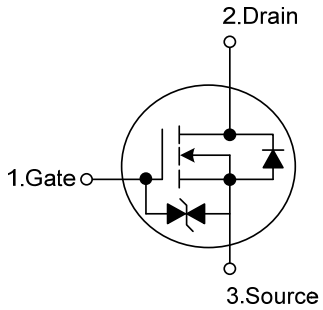
■ DESCRIPTION

The **UTC 42NM60Z** is an N-channel enhancement mode silicon-gate power MOSFET with fast body diode and ESD Type, designed for high-voltage, high-speed power switching applications. such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics.

■ FEATURES

* $R_{DS(ON)} \leq 95\ m\Omega$ @ V_{GS}=10V, I_D=10.5A
* Fast body diode MOSFET technology
* Low switching losses due to reduced Qrr
* Single Pulse Avalanche Energy Rated
* Fast Switching Speeds
* Linear Transfer Characteristics
* High Input Impedance
* Avalanche energy tested

■ SYMBOL



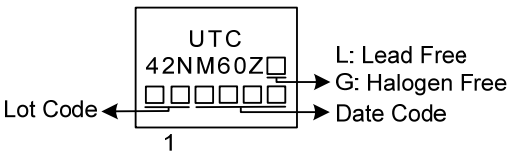
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
42NM60ZL-T47-T	42NM60ZG-T47-T	TO-247	G	D	S	Tube

Note: Pin Assignment: G: Gate C: Collector E: Emitter

42NM60ZG-T47-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube (2) T47: TO-247 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°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	I_D	42	A
	Pulsed (Note 2)	I_{DM}	126	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	288	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.48	V/nS
Power Dissipation		P_D	160	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 =100mH, I_{AS} = 2.4A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
4. I_{SD} ≤ 30A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	40	°C/W
Junction to Case	θ_{JC}	0.78	°C/W

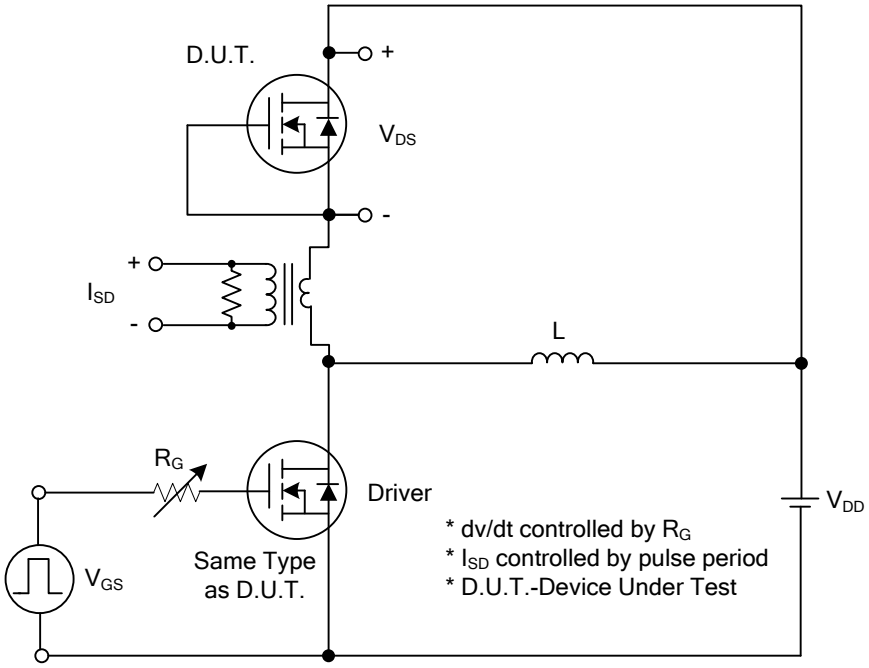
Note: Device mounted on FR-4 substrate P_C board, 2oz copper, with 1inch square copper plate.

■ ELECTRICAL CHARACTERISTICS (T_J = 25°C, unless otherwise specified)

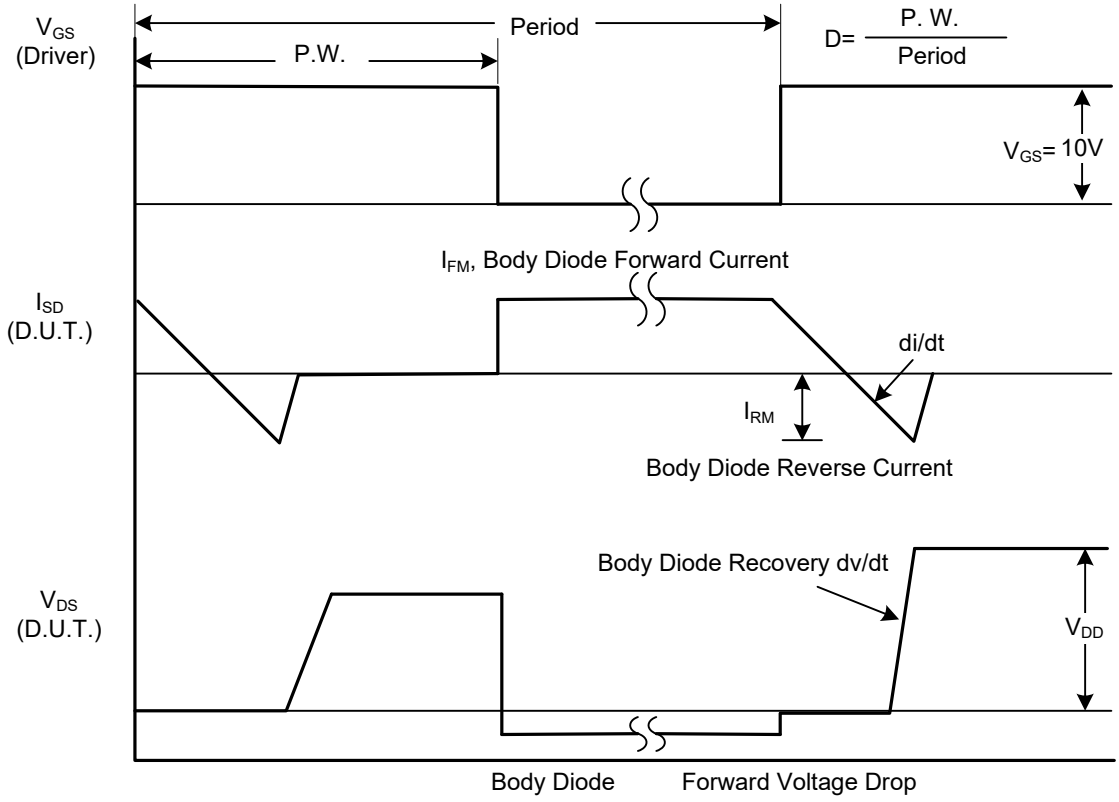
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	600			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=600V, V_{GS}=0V			10	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V, V_{DS}=0V			+10	μA
	Reverse		V_{GS}=-20V, V_{DS}=0V			-10	μA
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=10.5A			95	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=50V, f=1.0MHz		2682		pF
Output Capacitance		C_{OSS}			977		pF
Reverse Transfer Capacitance		C_{RSS}			44		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=480V, V_{GS}=10V, I_D=42A (Note1, 2)		117		nC
Gate to Source Charge		Q_{GS}			26		nC
Gate to Drain Charge		Q_{GD}			48		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DS}=100V, V_{GS}=10V, I_D=42A, R_G=25Ω (Note1, 2)		42		ns
Rise Time		t_R			74		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			338		ns
Fall-Time		t_F			129		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				42	A
Maximum Body-Diode Pulsed Current		I_{SM}				126	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=42A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t_{rr}	I_S=30A, V_{GS}=0V, dI_F/dt=100A/μs		486		ns
Body Diode Reverse Recovery Charge		Q_{rr}			9.04		μC

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS



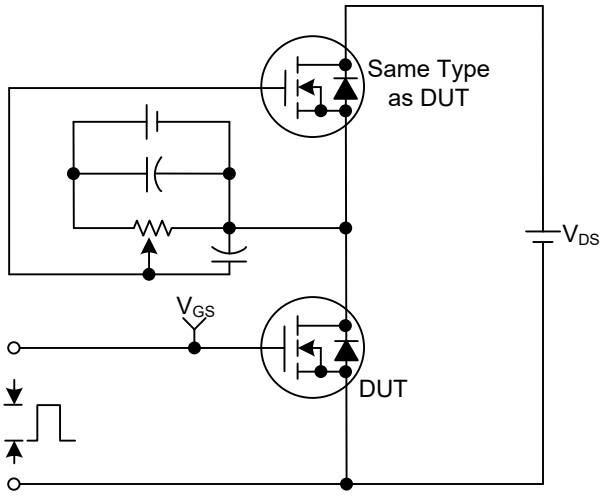
Peak Diode Recovery dv/dt Test Circuit



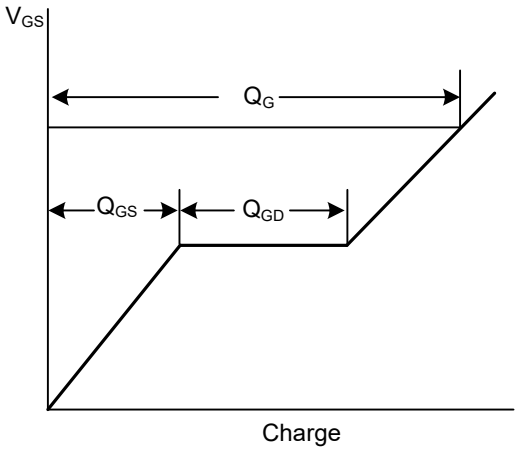
Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS

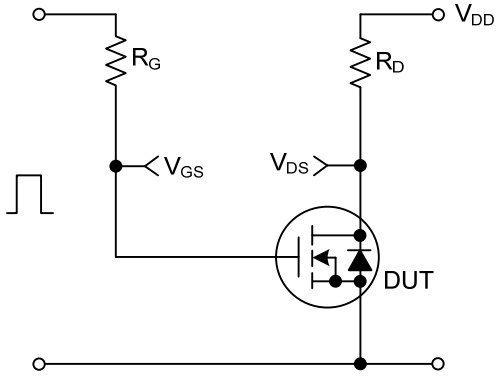
Gate Charge Test Circuit



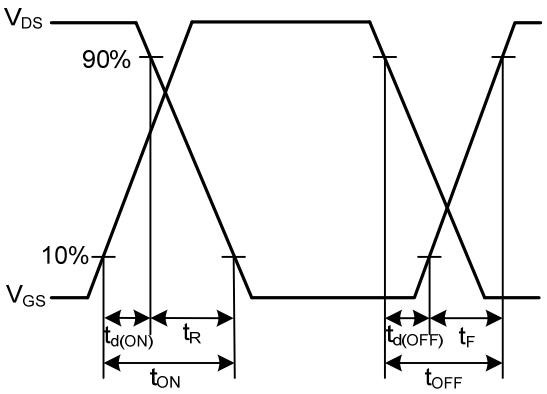
Gate Charge Waveforms



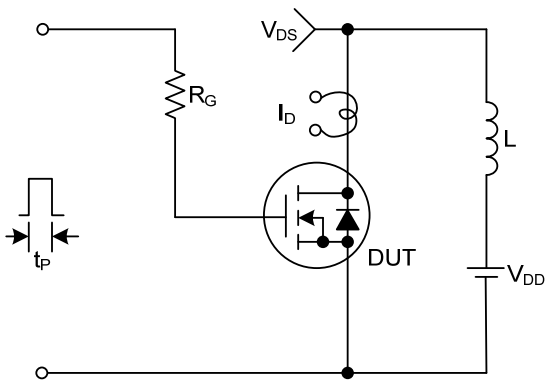
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

$$E_{AS}=\frac{1}{2}LI_{AS}^{2}\frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$