



UT120N04M

Preliminary

Power MOSFET

120A, 40V N-CHANNEL POWER MOSFET

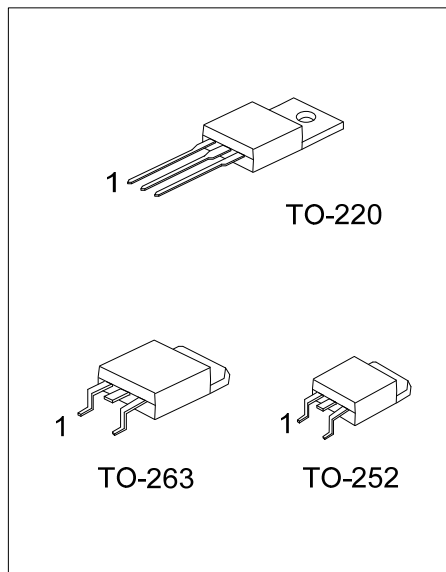
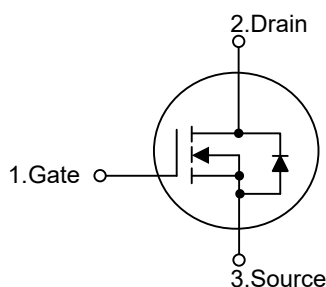
DESCRIPTION

The UTC **UT120N04M** is an N-channel enhancement mode Power FET, it uses UTC's advanced technology to provide customers a minimum on-state resistance and high switching speed.

FEATURES

- * $R_{DS(ON)} \leq 3.2 \text{ m}\Omega$ @ $V_{GS}=10\text{V}$, $I_D=60\text{A}$
- * $R_{DS(ON)} \leq 4.7 \text{ m}\Omega$ @ $V_{GS}=4.5\text{V}$, $I_D=40\text{A}$
- * High switching speed
- * Improved dv/dt capability

SYMBOL



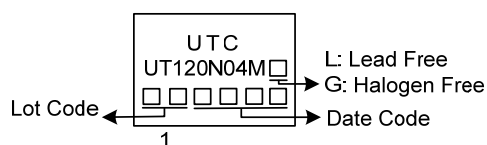
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
UT120N04ML-TA3-T	UT120N04MG-TA3-T	TO-220	G	D	S	Tube
UT120N04ML-TN3-R	UT120N04MG-TN3-R	TO-252	G	D	S	Tape Reel
UT120N04ML-TQ2-T	UT120N04MG-TQ2-T	TO-263	G	D	S	Tube
UT120N04ML-TQ2-R	UT120N04MG-TQ2-R	TO-263	G	D	S	Tape Reel

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

UT120N04MG-TA3-T	(1) Packing Type	(1) T: Tube, R: Tape Reel
	(2) Package Type	(2) TA3: TO-220, TN3: TO-252, TQ2: TO-263
	(3) Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	± 20	V
Drain Current	Continuous	I_D	120	A
	Pulsed	I_{DM}	240	A
Avalanche Energy	Single Pulsed	E_{AS}	250	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.3	V/ns
Power Dissipation	TO-220/TO-263	P_D	90	W
	TO-252		54	W
Junction Temperature		T_J	+150	$^{\circ}\text{C}$
Storage Temperature Range		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. $L = 0.1\text{mH}$, $I_{AS} = 70.7\text{A}$, $V_{DD} = 30\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 30\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-263	θ_{JA}	62.5	$^{\circ}\text{C/W}$
	TO-252		110	$^{\circ}\text{C/W}$
Junction to Case	TO-220/TO-263	θ_{JC}	0.38	$^{\circ}\text{C/W}$
	TO-252		2.31	$^{\circ}\text{C/W}$

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

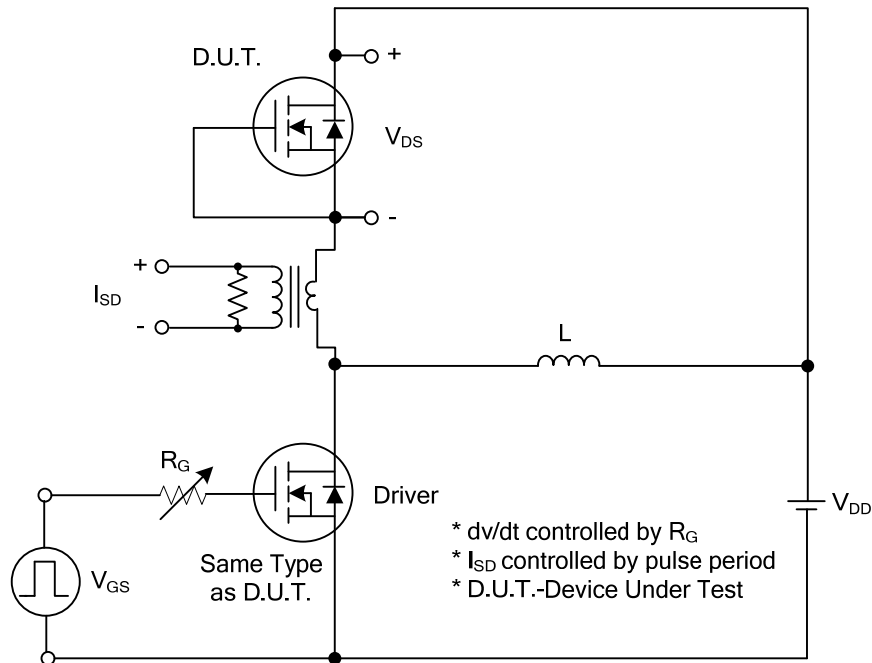
■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	40			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =40V, V _{GS} =0V			1	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =+20V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-20V, V _{DS} =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} = V _{GS} , I _D =250μA	1.0		3.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =60A			3.2	mΩ
			V _{GS} =4.5V, I _D =40A			4.7	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		6012		pF
Output Capacitance		C _{OSS}			690		pF
Reverse Transfer Capacitance		C _{RSS}			582		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DD} =32V, V _{GS} =10V, I _D =120A, (Note 1, 2)		156		nC
Gate to Source Charge		Q _{GS}			17		nC
Gate to Drain Charge		Q _{GD}			53		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DD} =20V, V _{GS} =10V I _D =120A, R _G =3Ω (Note 1, 2)		11		ns
Rise Time		t _R			19		ns
Turn-OFF Delay Time		t _{D(OFF)}			165		ns
Fall-Time		t _F			68		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				120	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				240	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =50A			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t _{rr}	I _S =30A, V _{GS} =0V		50		nS
Body Diode Reverse Recovery Charge		Q _{rr}	dI _F /dt=100A/μs		45		nC

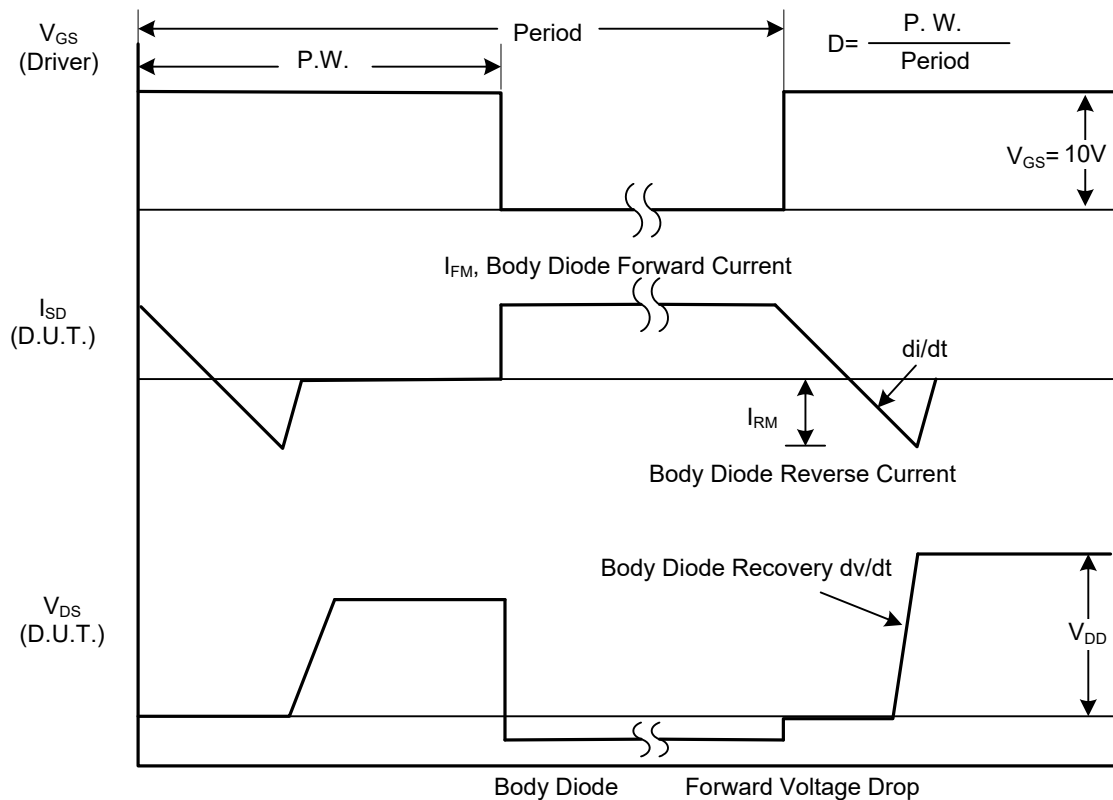
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

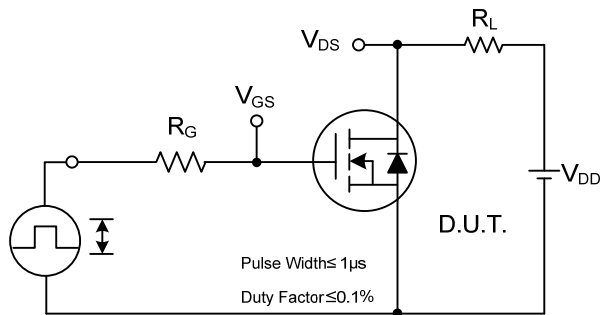


Peak Diode Recovery dv/dt Test Circuit

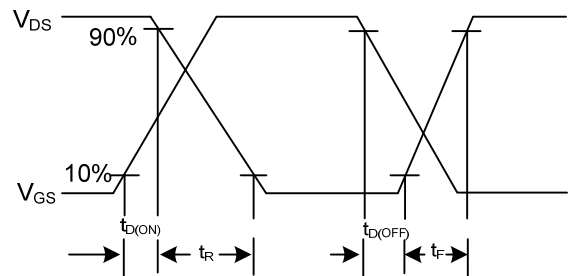


Peak Diode Recovery dv/dt Waveforms

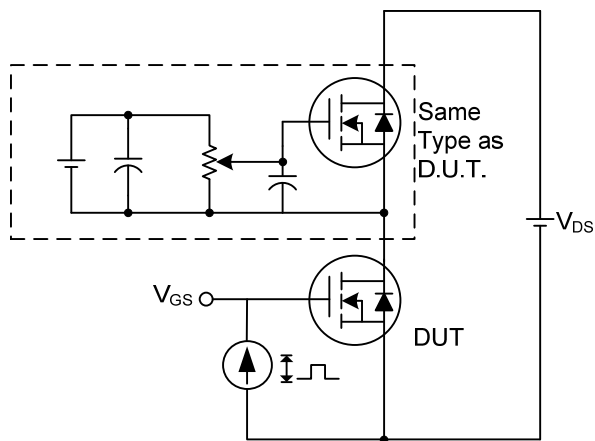
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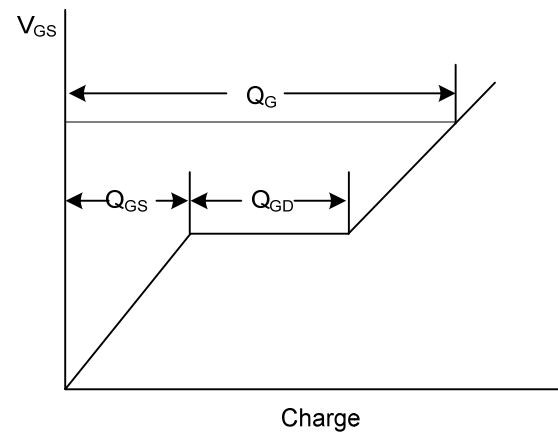
Switching Test Circuit



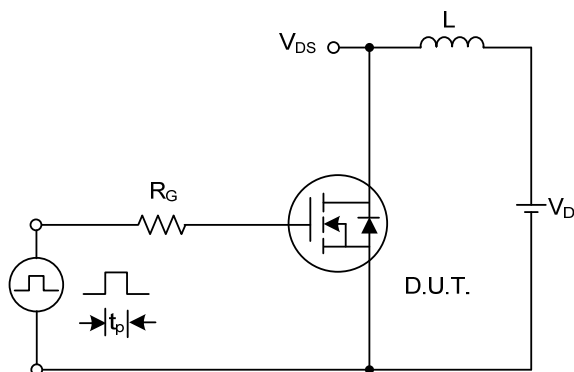
Switching Waveforms



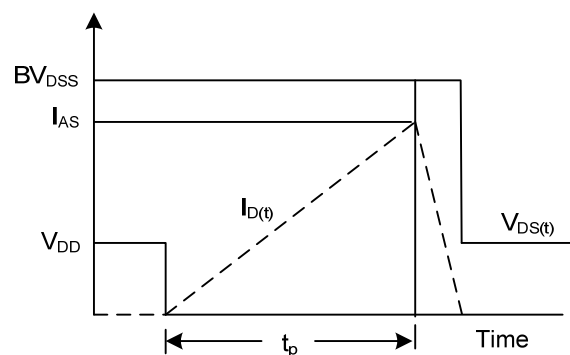
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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