



## UTR040N04

Preliminary

Power MOSFET

### 120A, 40V N-CHANNEL ENHANCEMENT MODE POWER MOSFET

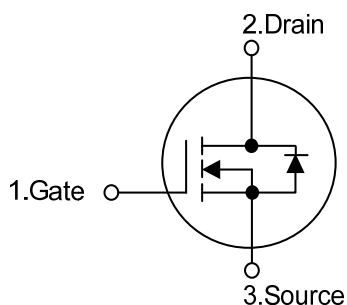
#### DESCRIPTION

The UTC **UTR040N04** uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

#### FEATURES

- \*  $R_{DS(ON)} \leq 4.0 \text{ m}\Omega$  @  $V_{GS}=10\text{V}$ ,  $I_D=60\text{A}$
- \*  $R_{DS(ON)} \leq 6.0 \text{ m}\Omega$  @  $V_{GS}=4.5\text{V}$ ,  $I_D=60\text{A}$
- \* High density cell design for ultra low  $R_{DS(ON)}$
- \* Fully characterized avalanche voltage and current
- \* Good stability and uniformity with high EAS
- \* Excellent package for good heat dissipation

#### SYMBOL

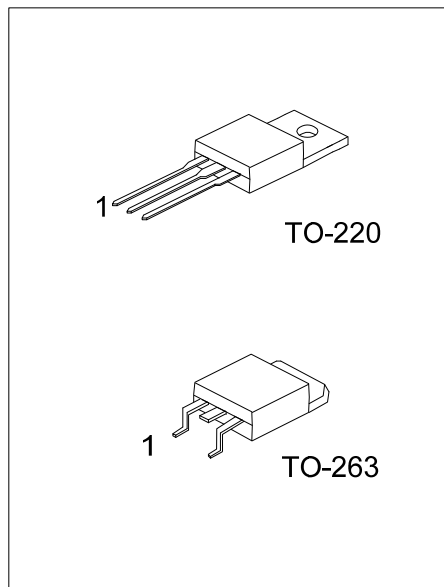


#### ORDERING INFORMATION

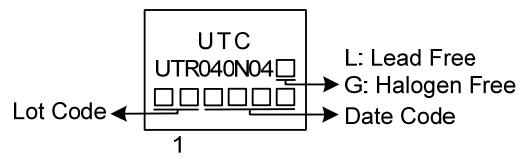
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
UTR040N04L-TA3-T	UTR040N04G-TA3-T	TO-220	G	D	S	Tube
UTR040N04L-TQ2-T	UTR040N04G-TQ2-T	TO-263	G	D	S	Tube
UTR040N04L-TQ2-R	UTR040N04G-TQ2-R	TO-263	G	D	S	Tape Reel

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

UTR040N04G-TA3-T		(1)Packing Type	(1) T: Tube, R: Tape Reel
		(2)Package Type	(2) TA3: TO-220, 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		$V_{GS}$	$\pm 20$	V
Drain Current	Continuous	$I_D$	120	A
	Pulsed (Note 2)	$I_{DM}$	240	A
Single Pulsed Avalanche Energy (Note 3)		$E_{AS}$	157	mJ
Peak Diode Recovery $dv/dt$ (Note 4)		$dv/dt$	1.6	V/ns
Power Dissipation		$P_D$	100	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.  $L = 0.1\text{mH}$ ,  $I_{AS} = 57\text{A}$ ,  $V_{DD} = 25\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$

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

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		$\theta_{JA}$	62.5	$^{\circ}\text{C}/\text{W}$
Junction to Case		$\theta_{JC}$	0.75	$^{\circ}\text{C}/\text{W}$

Note: The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

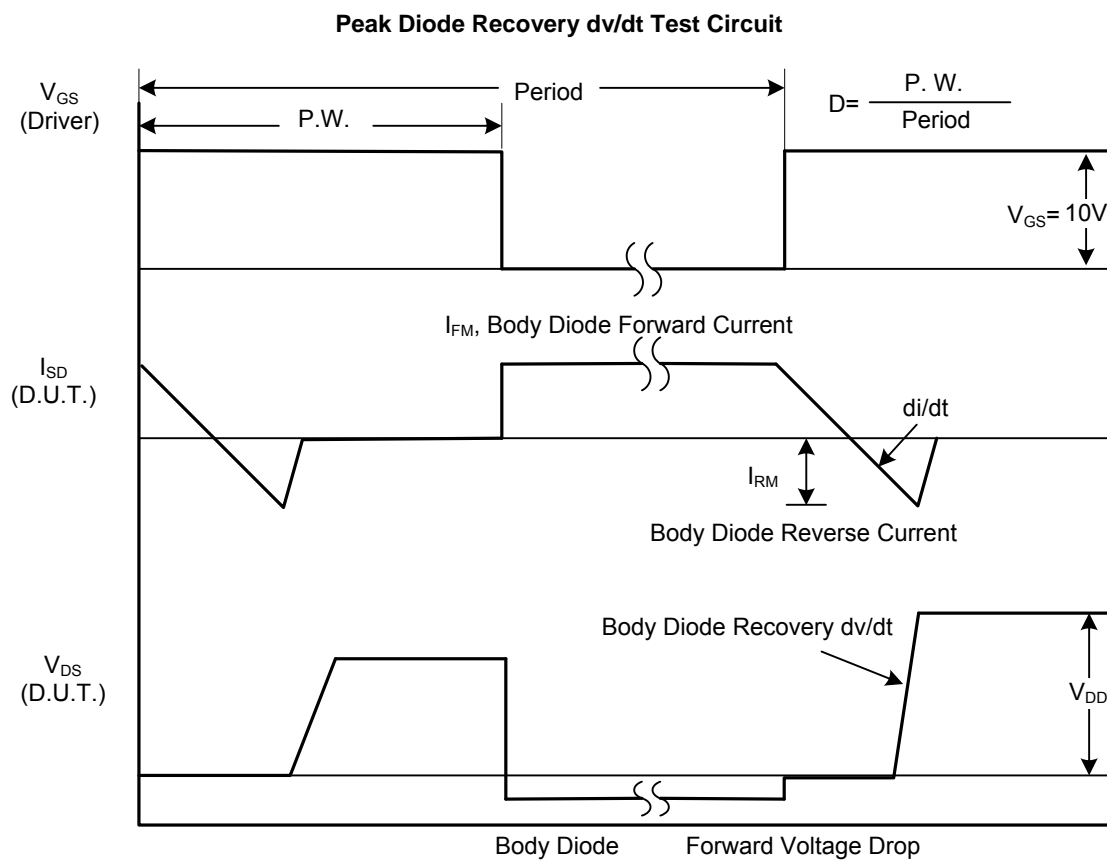
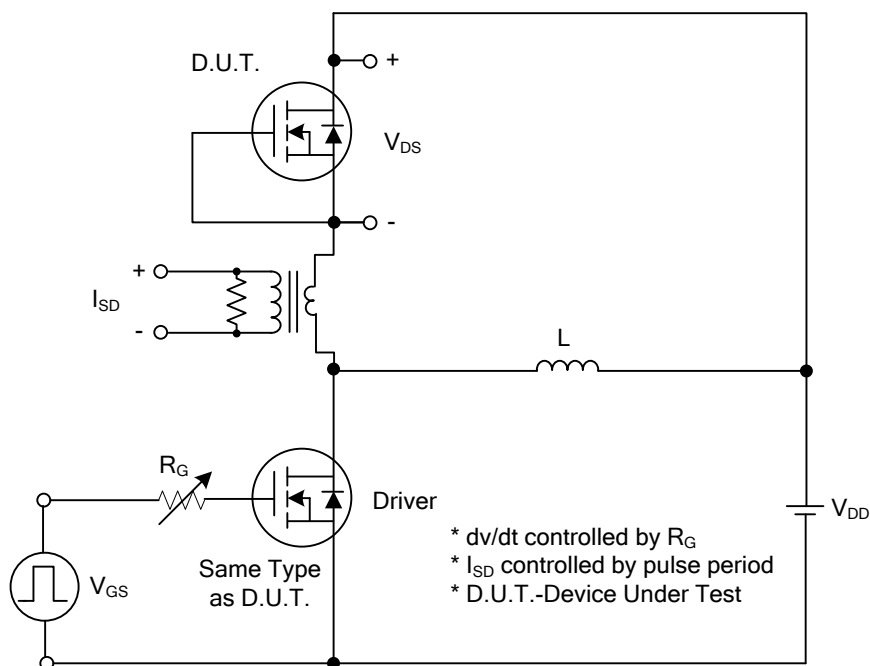
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^{\circ}\text{C}$ , unless otherwise specified)

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	40			V
Drain-Source Leakage Current		I <sub>DSS</sub>	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V			1	μA
Gate-Source Leakage Current	Forward	I <sub>GSS</sub>	V <sub>GS</sub> =+20V, V <sub>DS</sub> =0V			+100	nA
	Reverse		V <sub>GS</sub> =-20V, 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	1.0		2.5	V
Static Drain-Source On-State Resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =60A		3.0	4.0	mΩ
			V <sub>GS</sub> =4.5V, I <sub>D</sub> =60A			6.0	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz		4255		pF
Output Capacitance		C <sub>OSS</sub>			600		pF
Reverse Transfer Capacitance		C <sub>RSS</sub>			520		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q <sub>G</sub>	V <sub>DS</sub> =32V, V <sub>GS</sub> =10V, I <sub>D</sub> =120A		154		nC
Gate to Source Charge		Q <sub>GS</sub>			16		nC
Gate to Drain Charge		Q <sub>GD</sub>			43		nC
Turn-ON Delay Time		t <sub>D(ON)</sub>	V <sub>DD</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =120A, R <sub>G</sub> =3Ω		16		ns
Rise Time		t <sub>R</sub>			22		ns
Turn-OFF Delay Time		t <sub>D(OFF)</sub>			75		ns
Fall-Time		t <sub>F</sub>			35		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I <sub>S</sub>				120	A
Maximum Body-Diode Pulsed Current		I <sub>SM</sub>				240	A
Drain-Source Diode Forward Voltage		V <sub>SD</sub>	I <sub>SD</sub> =120A			1.4	V
Body Diode Reverse Recovery Time		t <sub>rr</sub>	I <sub>S</sub> =30A, dI/dt=100A/μs		58		ns
Body Diode Reverse Recovery Charge		Q <sub>rr</sub>			68		nC

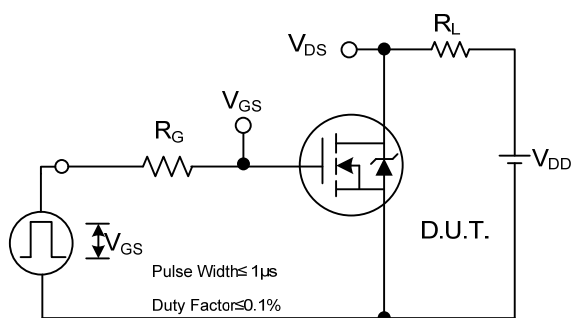
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

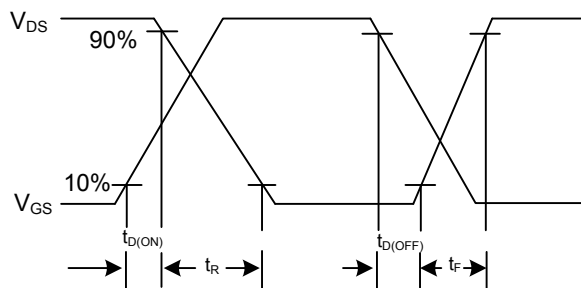
## ■ TEST CIRCUITS AND WAVEFORMS



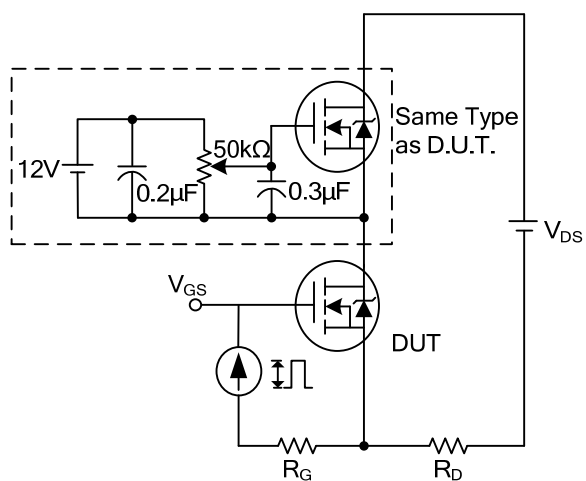
### ■ TEST CIRCUITS AND WAVEFORMS



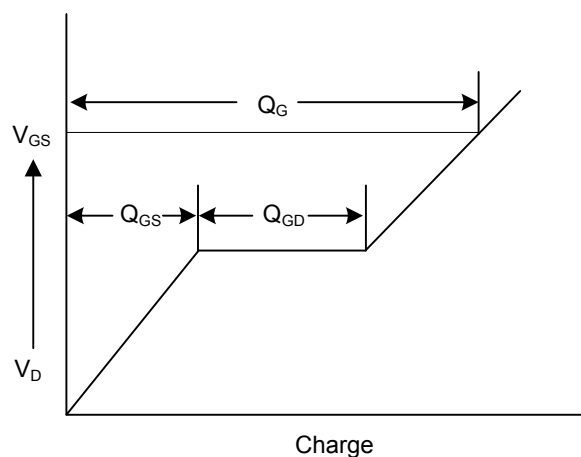
Switching Test Circuit



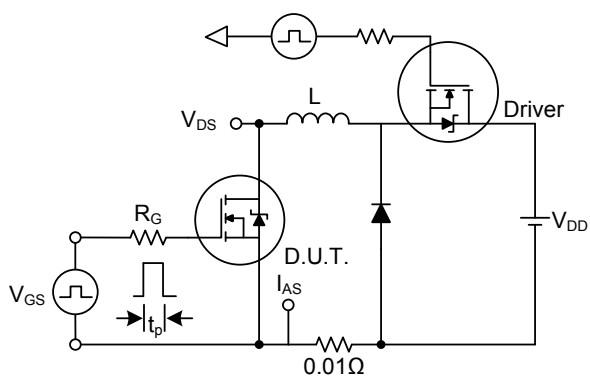
Switching Waveforms



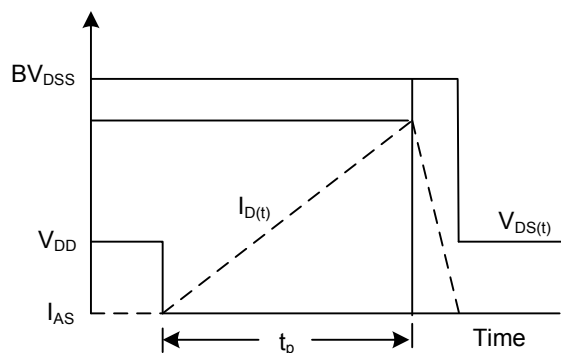
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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