



UT50N04

Power MOSFET

50A, 40V N-CHANNEL POWER MOSFET

DESCRIPTION

The UTC **UT50N04** is a N-channel enhancement MOSFET using UTC's advanced technology to provide the customers with perfect $R_{DS(ON)}$ and high switching speed.

FEATURES

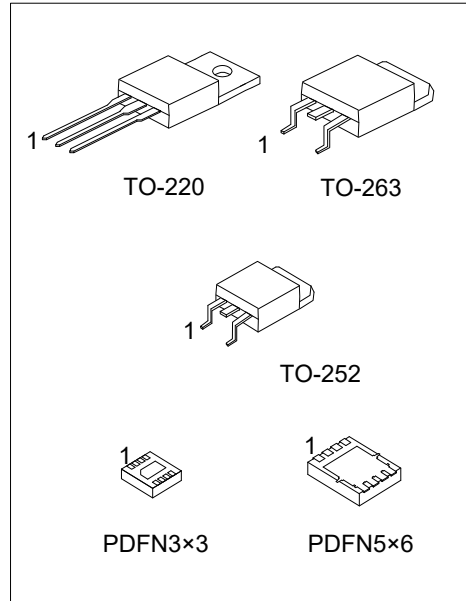
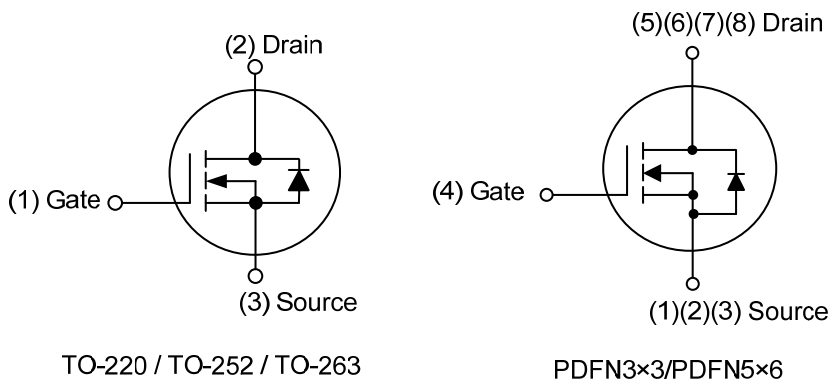
TO-220/TO-252/TO-263

- * $R_{DS(ON)} \leq 7.0 \text{ m}\Omega @ V_{GS}=10\text{V}, I_D=25\text{A}$
- * $R_{DS(ON)} \leq 10 \text{ m}\Omega @ V_{GS}=4.5\text{V}, I_D=20\text{A}$

PDFN3x3/PDFN5x6

- * $R_{DS(ON)} \leq 7.0 \text{ m}\Omega @ V_{GS}=10 \text{ V}, I_D=25\text{A}$
- * $R_{DS(ON)} \leq 11 \text{ m}\Omega @ V_{GS}=4.5\text{V}, I_D=20\text{A}$
- * High Switching Speed

SYMBOL



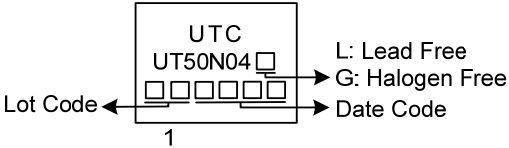
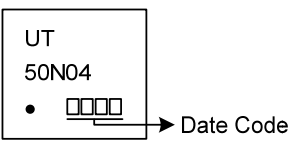
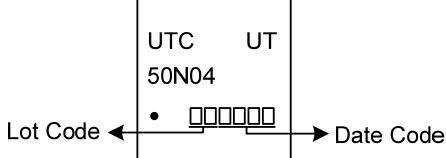
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UT50N04L-TA3-T	UT50N04G-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
UT50N04L-TN3-R	UT50N04G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
UT50N04L-TQ2-T	UT50N04G-TQ2-T	TO-263	G	D	S	-	-	-	-	-	Tube
UT50N04L-TQ2-R	UT50N04G-TQ2-R	TO-263	G	D	S	-	-	-	-	-	Tape Reel
UT50N04L-P3030-R	UT50N04G-P3030-R	PDFN3x3	S	S	S	G	D	D	D	D	Tape Reel
UT50N04L-P5060-R	UT50N04G-P5060-R	PDFN5x6	S	S	S	G	D	D	D	D	Tape Reel

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

<p>UT50N04G-TA3-T</p> <ul style="list-style-type: none"> (1) Packing Type (2) Package Type (3) Green Package 	<ul style="list-style-type: none"> (1) T: Tube, R: Tape Reel (2) TA3: TO-220, TN3: TO-252, TQ2: TO-263 P3030: PDFN3x3, P5060: PDFN5x6 (3) G: Halogen Free and Lead Free, L: Lead Free
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■ MARKING

TO-220 / TO-252 / TO-263	PDFN3×3
 <p>UTC UT50N04 □ □ □ □ □ □ □ Lot Code ← → Date Code 1 L: Lead Free G: Halogen Free</p>	 <p>UT 50N04 • □ □ □ → Date Code</p>
PDFN5×6	-
 <p>UTC UT 50N04 • □ □ □ □ □ Lot Code ← → Date Code</p>	-

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	40	V
Gate-Source Voltage		V_{GSS}	± 20	V
Drain Current	Continuous ($V_{GS}=10V$)	I_D	50	A
	Pulsed(Note 2)	I_{DM}	150	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	78	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.5	V/ns
Power Dissipation	TO-220/TO-263	P_D	166	W
	TO-252		55	W
	PDFN3×3		33	W
	PDFN5×6		42	W
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +175	°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. $L=0.1mH$, $I_{AS}=39.5A$, $V_{DD}=25V$, $R_G=25\Omega$, Starting $T_J=25^\circ C$

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

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-263	θ_{JA}	62.5	°C/W
	TO-252		50 (Note)	°C/W
	PDFN3×3		75 (Note)	°C/W
	PDFN5×6		65(Note)	°C/W
Junction to Case	TO-220/TO-263	θ_{JC}	0.75	°C/W
	TO-252		2.2(Note)	°C/W
	PDFN3×3		3.89 (Note)	°C/W
	PDFN5×6		2.97(Note)	°C/W

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

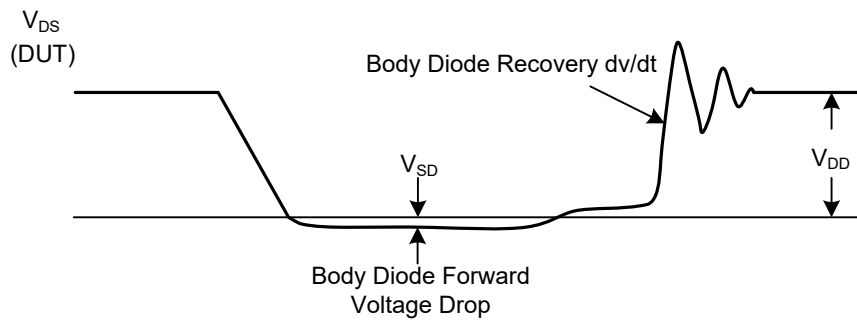
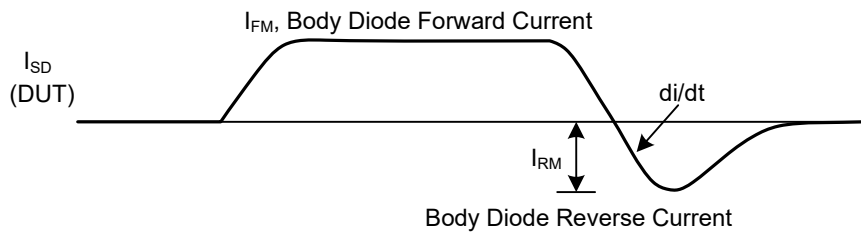
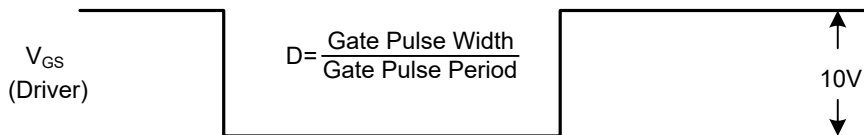
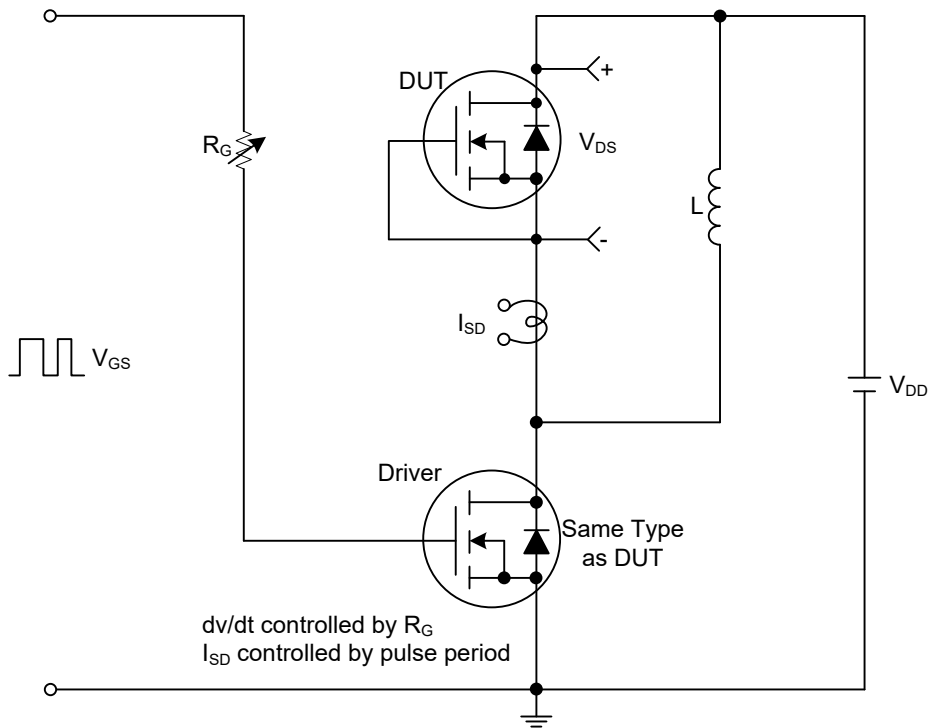
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	40			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V			20	μA
Gate- Source Leakage Current	Forward	V _{GS} =+20V, V _{DS} =0V			+200	nA
	Reverse		V _{GS} =-20V, V _{DS} =0V			-200
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	0.8		2.3	V
Static Drain-Source On-State Resistance	TO-220	R _{DS(ON)}	V _{GS} =10V, I _D =25A		7.0	mΩ
	TO-252					
	TO-263					
	PDFN3×3					
	PDFN5×6		V _{GS} =4.5V, I _D =20A (Note 2)		10	mΩ
			V _{GS} =10V, I _D =25A		7.0	mΩ
			V _{GS} =4.5V, I _D =20A (Note 2)		11	mΩ
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		1800		pF
Output Capacitance	C _{OSS}			265		pF
Reverse Transfer Capacitance	C _{RSS}			230		pF
SWITCHING PARAMETERS						
Total Gate Charge	Q _G	V _{DS} =32V, V _{GS} =4.5V, I _D =50A I _G =1mA (Note 2)		33		nC
Gate to Source Charge	Q _{GS}			7.5		nC
Gate to Drain Charge	Q _{GD}			18		nC
Turn-ON Delay Time	t _{D(ON)}	V _{DD} =20V, V _{GS} =10V, I _D =50A, R _G =3.3Ω, (Note 2)		12		ns
Rise Time	t _R			18		ns
Turn-OFF Delay Time	t _{D(OFF)}			45		ns
Fall-Time	t _F			23		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I _S				50	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				200	A
Drain-Source Diode Forward Voltage	V _{SD}	I _S =50A, V _{GS} =0V			1.3	V
Body Diode Reverse Recovery Time	t _{rr}	I _F =30A, V _{GS} =0V, di/dt=100A/μs		45		ns
Body Diode Reverse Recovery Charge	Q _{rr}			32		nC

Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

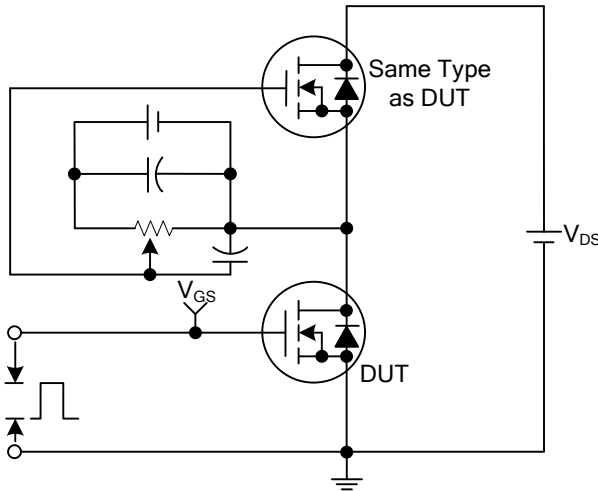
2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

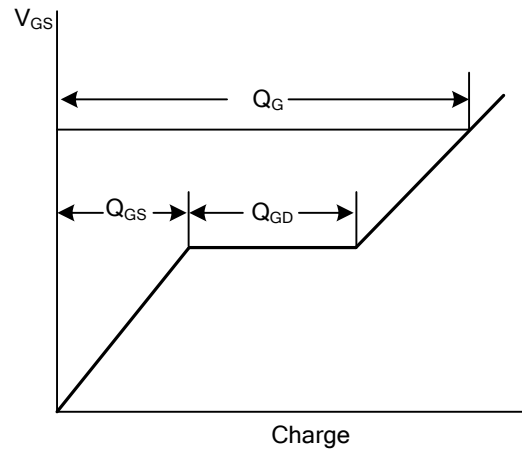


Peak Diode Recovery dv/dt Test Circuit and Waveforms

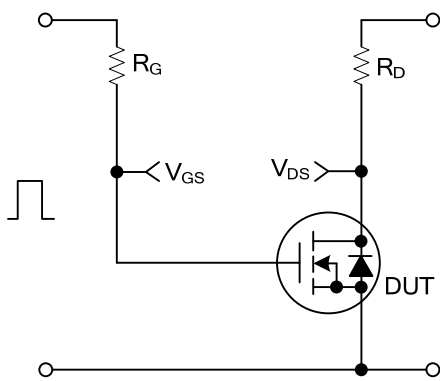
TEST CIRCUITS AND WAVEFORMS



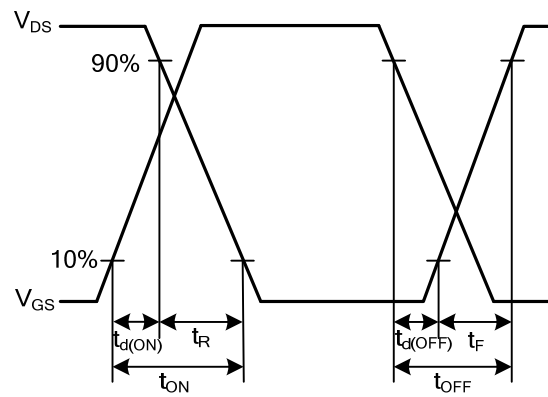
Gate Charge Test Circuit



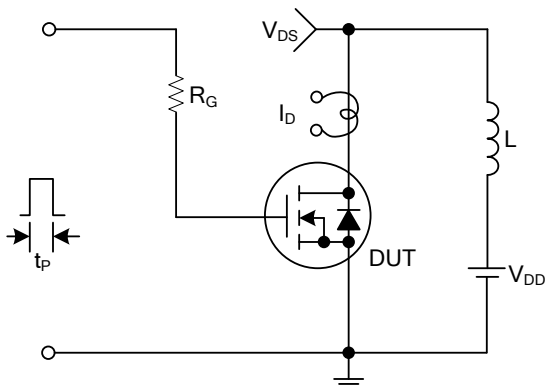
Gate Charge Waveforms



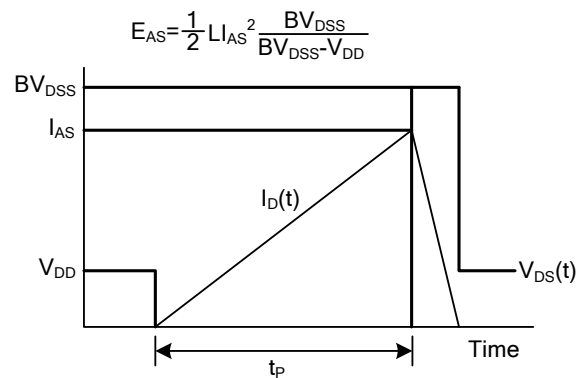
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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