



-40V, -50A P-CHANNEL POWER MOSFET

DESCRIPTION

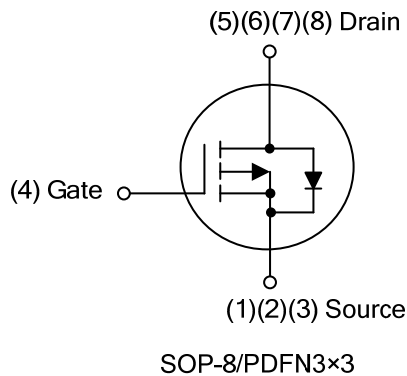
The UTC **UT50P04M** is a P-channel power MOSFET using UTC's advanced technology to provide the customers with high switching speed and a minimum on-state resistance, and it can also withstand high energy in the avalanche.

This UTC **UT50P04M** is suitable for motor drivers, high-side switch and 12V board net, etc.

FEATURES

- * $R_{DS(ON)} \leq 16 \text{ m}\Omega$ @ $V_{GS} = -10\text{V}$, $I_D = -30\text{A}$
- $R_{DS(ON)} \leq 27 \text{ m}\Omega$ @ $V_{GS} = -4.5\text{V}$, $I_D = -20\text{A}$
- * High Switching Speed

SYMBOL



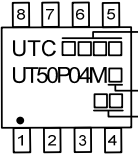
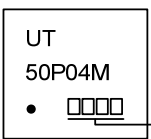
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UT50P04ML-S08-R	UT50P04MG-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel
UT50P04ML-P3030-R	UT50P04MG-P3030-R	PDFN3x3	S	S	S	G	D	D	D	D	Tape Reel

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

UT50P04MG-S08-R		(1) Packing Type	(1) R: Tape Reel
		(2) Package Type	(2) S08: SOP-8, P3030: PDFN3x3
		(3) Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

SOP-8	PDFN3×3
 Diagram of SOP-8 marking: A rectangular package with pins 1-8. Markings include: UTC, UT50P04M, and a date code (four digits) at the top; L (Lead Free), G (Halogen Free), and a lot code (two digits) on the right; and a date code (four digits) at the bottom.	 Diagram of PDFN3×3 marking: A square package with markings: UT, 50P04M, and a date code (four digits) at the top; and a date code (four digits) at the bottom.

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

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage			V _{DSS}	-40	V
Gate-Source Voltage			V _{GSS}	±20	V
Drain Current	Continuous	PDFN3×3	I _D	-50	A
		SOP-8		-13	A
	Pulsed	PDFN3×3	I _{DM}	-100	A
		SOP-8		-39	A
Avalanche Energy	Single Pulsed (Note 3)		E _{AS}	61	mJ
Peak Diode Recovery dv/dt (Note 4)			dv/dt	1	V/ns
Power Dissipation		SOP-8	P _D	2	W
		PDFN3×3		32	W
Junction Temperature			T _J	-55 ~ +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. $L=0.1\text{mH}$, $I_{AS}=-35\text{A}$, $V_{DD}=-30\text{V}$, $R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$

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

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOP-8	θ_{JA}	90	$^{\circ}\text{C/W}$
	PDFN3×3		60	$^{\circ}\text{C/W}$
Junction to Case	SOP-8	θ_{JC}	62.5	$^{\circ}\text{C/W}$
	PDFN3×3		3.9	$^{\circ}\text{C/W}$

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

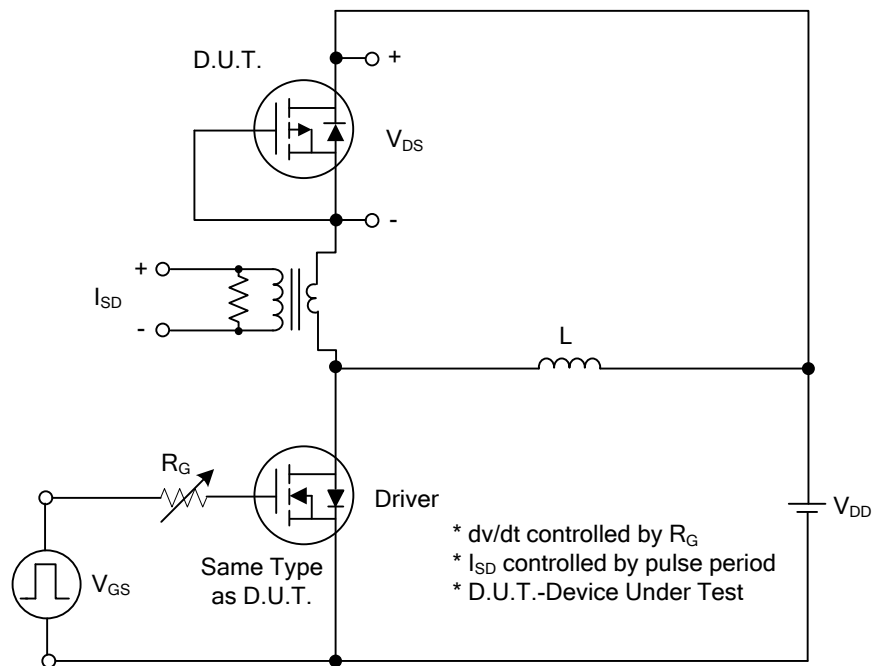
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0 V, I _D =-250μA	-40			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =-40V, V _{GS} =0V			-1	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{DS} =0V, V _{GS} =+20V			100	nA
	Reverse		V _{DS} =0V, V _{GS} =-20V			-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-Resistance		R _{DS(ON)}	V _{GS} =-10V, I _D =-30A			16	mΩ
			V _{GS} =-4.5V, I _D =-20A			27	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{DS} =-25V, V _{GS} =0V, f=1.0MHz		2980		pF
Output Capacitance		C _{OSS}			300		pF
Reverse Transfer Capacitance		C _{RSS}			240		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =-32V, V _{GS} =-10V, I _D =-50A (Note 1, 2)		52		nC
Gate Source Charge		Q _{GS}			7		nC
Gate Drain Charge		Q _{GD}			12		nC
Turn-ON Delay Time (Note 1)		t _{D(ON)}	V _{DD} =-30V, V _{GS} =-10V, I _D =-50A, R _G =3Ω (Note 1, 2)		5.5		ns
Turn-ON Rise Time		t _R			4.5		ns
Turn-OFF Delay Time		t _{D(OFF)}			92		ns
Turn-OFF Fall-Time		t _F			48		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				-50	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				-100	A
Diode Forward Voltage (Note 1)		V _{SD}	I _S =-50A, V _{GS} =0V			-1.4	V
Body Diode Reverse Recovery Time(Note 1)		t _{rr}	I _S =-30A, V _{GS} =0V,		78		ns
Body Diode Reverse Recovery Charge		Q _{rr}	di _F /dt=100A/μs		118		nC

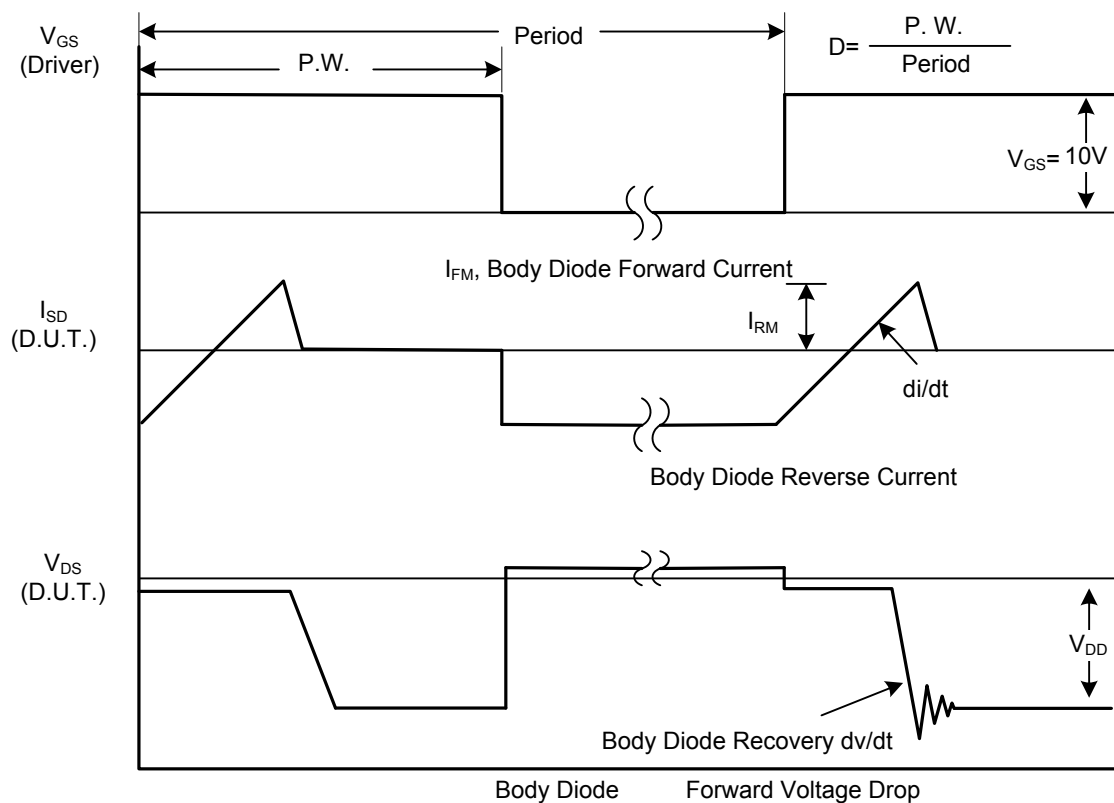
Notes: 1. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

TEST CIRCUITS AND WAVEFORMS

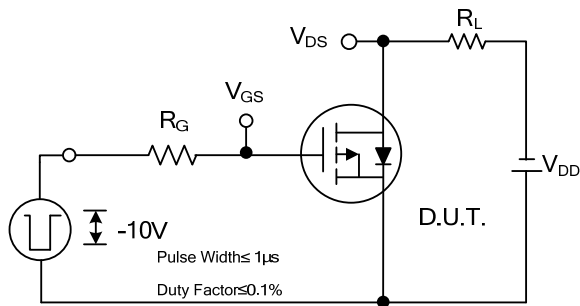


Peak Diode Recovery dv/dt Test Circuit

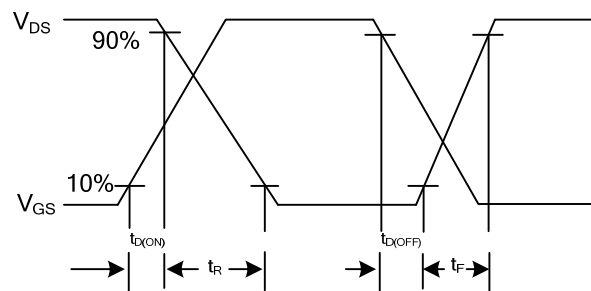


Peak Diode Recovery dv/dt Waveforms

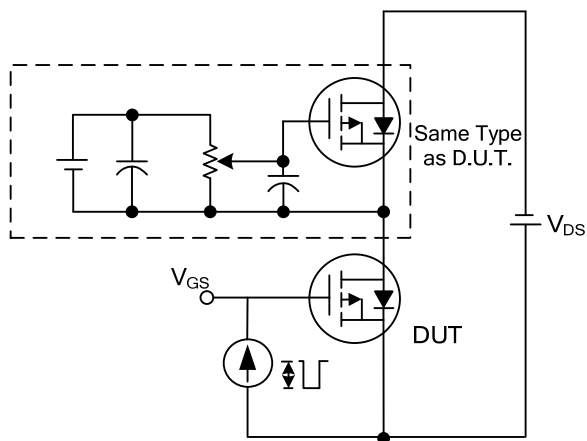
■ TEST CIRCUITS AND WAVEFORMS



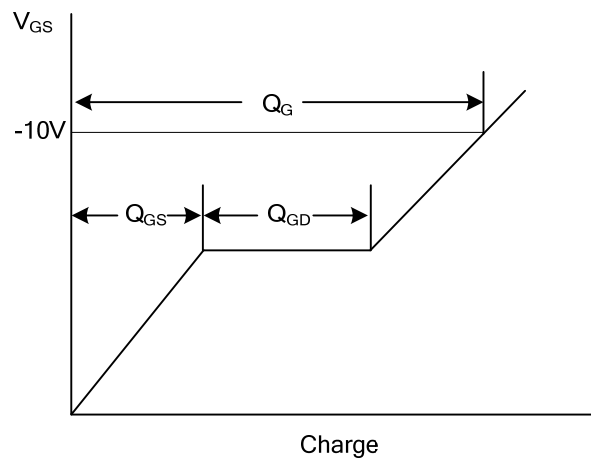
Switching Test Circuit



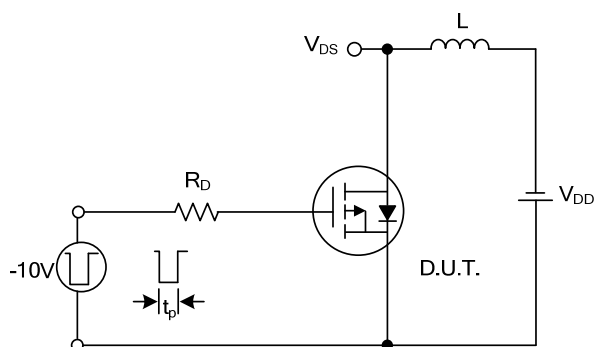
Switching Waveforms



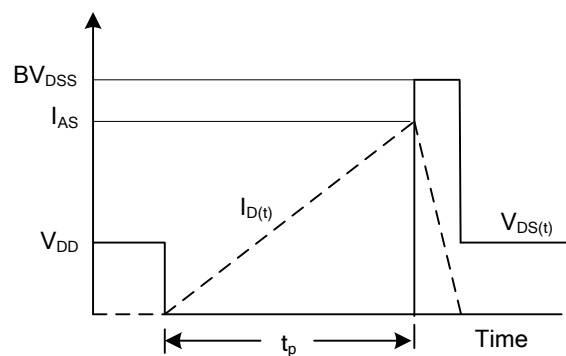
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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