



04NM50

Preliminary

Power MOSFET

0.4A, 500V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

The UTC **04NM50** is an Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(on)} < 12\Omega @ V_{GS}=10V, I_D=0.2A$
- * High breakdown voltage

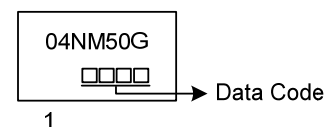
ORDERING INFORMATION

Ordering Number	Package	Pin Assignment			Packing
		1	2	3	
04NM50G-AA3-R	SOT-223	G	D	S	Tape Reel

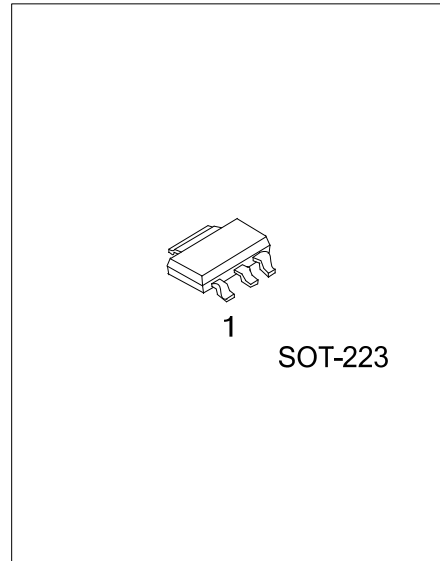
Note: Pin Assignment: G: Gate D: Drain S: Source

<p>04NM50G-AA3-R</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) R: Tape Reel (2) AA3: SOT-223 (3) G: Halogen Free and Lead Free</p>
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MARKING



1



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	500	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current	Continuous	I_D	0.4	A
	Pulsed	I_{DM}	1.6	A
Power Dissipation		P_D	9	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.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	150	$^\circ\text{C/W}$
Junction to Case	θ_{JC}	14	$^\circ\text{C/W}$

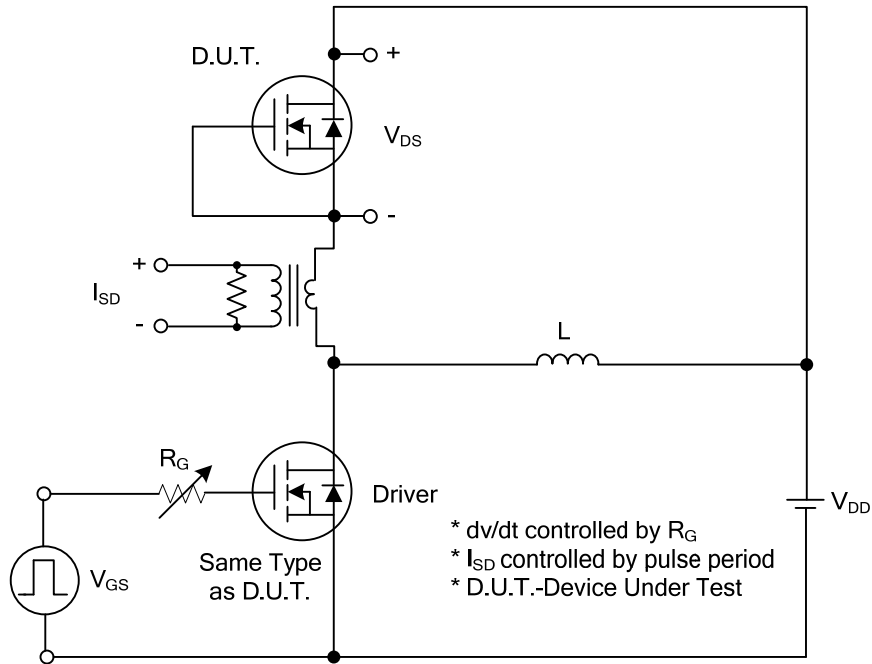
■ ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$	500			V	
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 500\text{V}$, $V_{GS} = 0\text{V}$			10	μA	
Gate-Source Leakage Current	Forward	I_{GSS}			+100	nA	
							$V_{GS} = +30\text{V}$, $V_{DS} = 0\text{V}$
	Reverse				-100	nA	
		$V_{GS} = -30\text{V}$, $V_{DS} = 0\text{V}$					
ON CHARACTERISTICS							
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	2.5		4.5	V	
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{V}$, $I_D = 0.2\text{A}$			12	Ω	
DYNAMIC PARAMETERS							
Input Capacitance	C_{ISS}	$V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1.0\text{MHz}$		30		pF	
Output Capacitance	C_{OSS}				25		pF
Reverse Transfer Capacitance	C_{RSS}				7.5		pF
SWITCHING PARAMETERS							
Total Gate Charge	Q_G	$V_{DS} = 50\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 1.3\text{A}$, $I_D = 100\mu\text{A}$ (Note 1, 2)		8		nC	
Gate to Source Charge	Q_{GS}				2.5		nC
Gate to Drain Charge	Q_{GD}				3		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DS} = 30\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 0.5\text{A}$, $R_G = 25\Omega$ (Note 1, 2)		38		ns	
Rise Time	t_R				23		ns
Turn-OFF Delay Time	$t_{D(OFF)}$				26		ns
Fall-Time	t_F				30		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current	I_S				0.4	A	
Maximum Body-Diode Pulsed Current	I_{SM}				1.6	A	
Drain-Source Diode Forward Voltage	V_{SD}	$I_S = 0.4\text{A}$, $V_{GS} = 0\text{V}$			1.4	V	

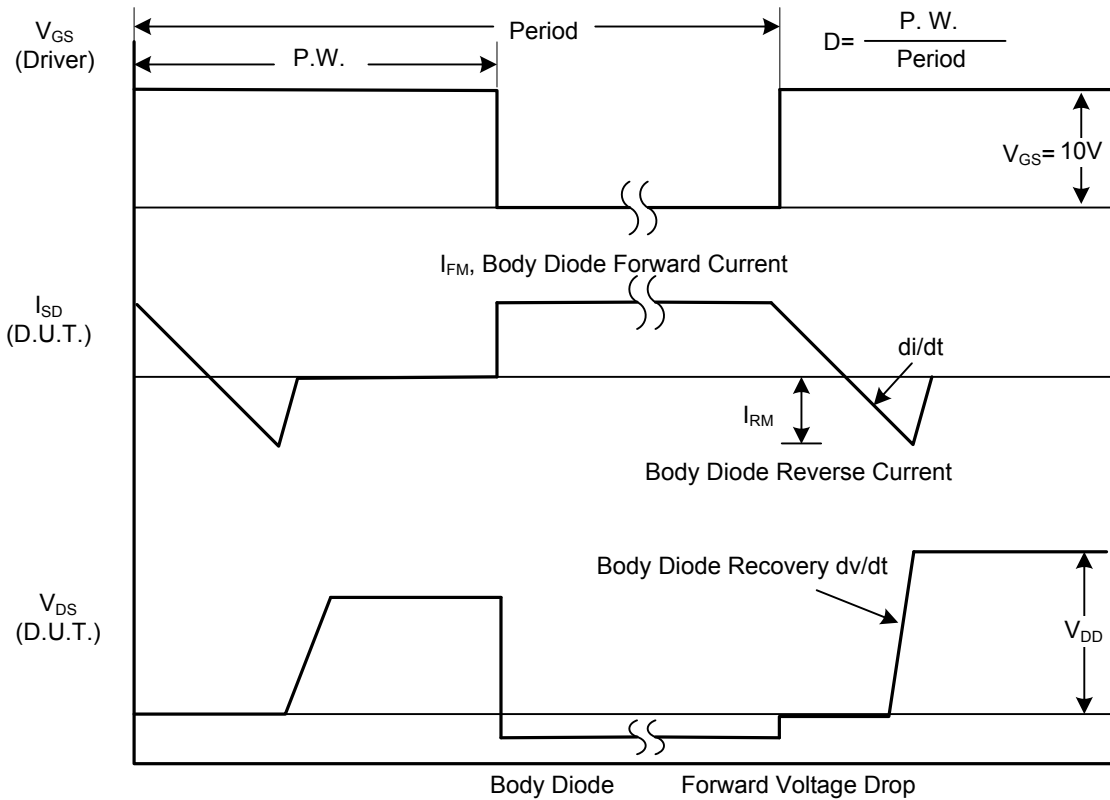
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

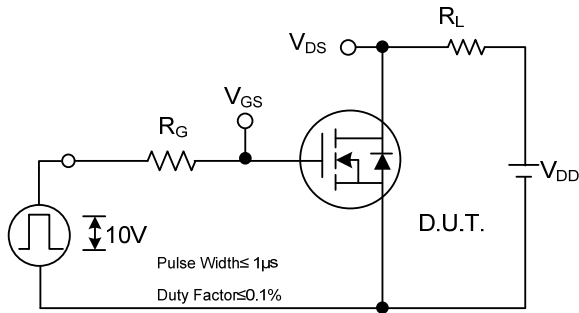


Peak Diode Recovery dv/dt Test Circuit

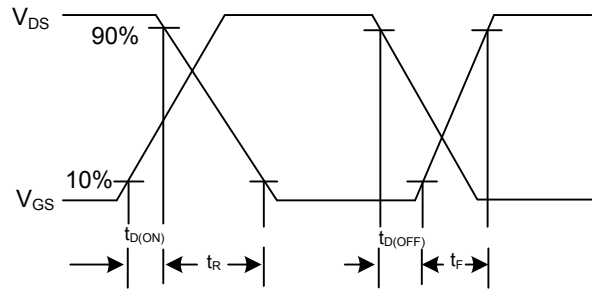


Peak Diode Recovery dv/dt Waveforms

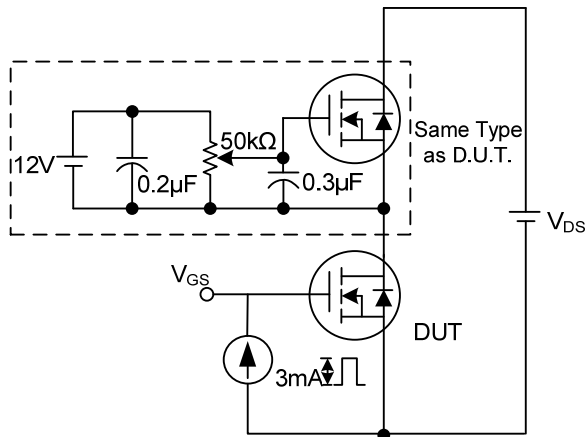
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



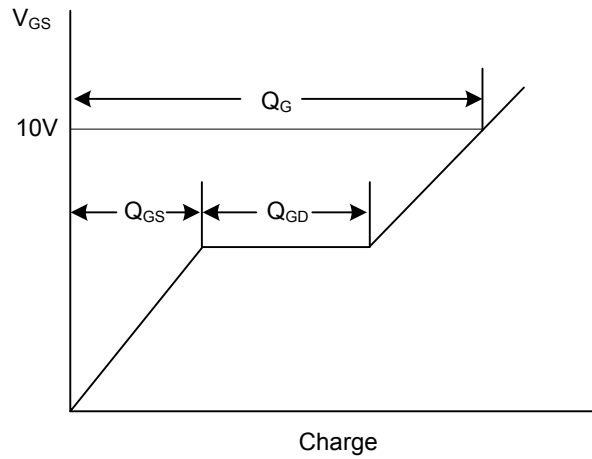
Switching Test Circuit



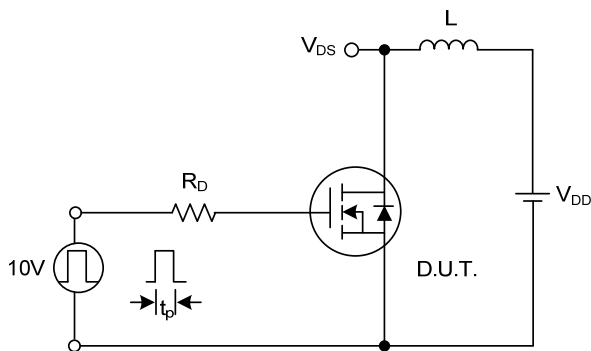
Switching Waveforms



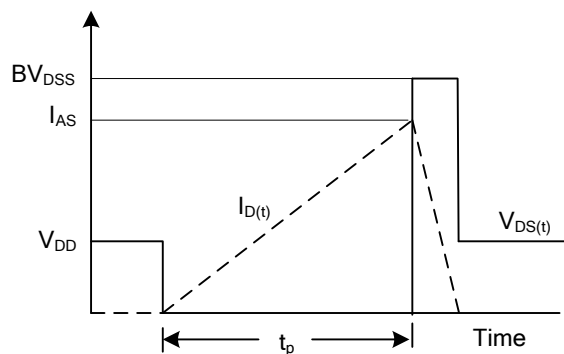
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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