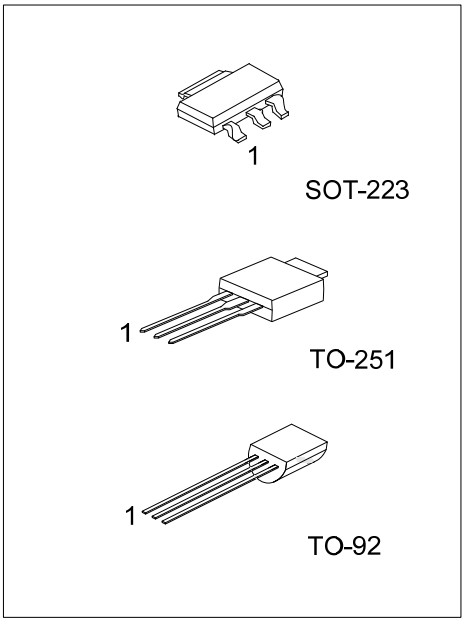
0.5A, 700V N-CHANNEL SUPER-JUNCTION MOSFET



■ DESCRIPTION

The UTC **05NM70** 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

* $R_{DS(on)}$ < 14.4 Ω @ V_{GS}=10V, I_D=0.25A
* High breakdown voltage

■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
-	05NM70G-AA3-R	SOT-223	G	D	S	Tape Reel
05NM70L-TM3-T	05NM70G-TM3-T	TO-251	G	D	S	Tube
05NM70L-T92-B	05NM70G-T92-B	TO-92	G	D	S	Tape Box
05NM70L-T92-K	05NM70G-T92-K	TO-92	G	D	S	Bulk

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

05NM70G-AA3-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel, T: Tube, B: Tape Box, K: Bulk (2) AA3: SOT-223, TM3: TO-251, T92: TO-92 (3) L: Lead Free, G: Halogen Free and Lead Free

■ MARKING

SOT-223	TO-251	TO-92
05NM70G □□□□ Data Code 1	UTC 05NM70□ □□□□□□ L: Lead Free G: Halogen Free Lot Code Data Code 1	UTC 05NM70□ □□□ L: Lead Free G: Halogen Free Data Code 1

■ ABSOLUTE MAXIMUM RATINGS (T_C =25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	700	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	Continuous	I_D	0.5	A
	Pulsed	I_{DM}	2.0	A
Avalanche Current (Note 2)		I_{AR}	0.8	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	3.2	mJ
Power Dissipation	SOT-223	P_D	9	W
	TO-251		27.5	W
	TO-92		1.4	W
Junction Temperature		T_J	150	°C
Storage Temperature Range		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 = 10mH, I_{AS} = 0.8A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C

■ THERMAL DATA

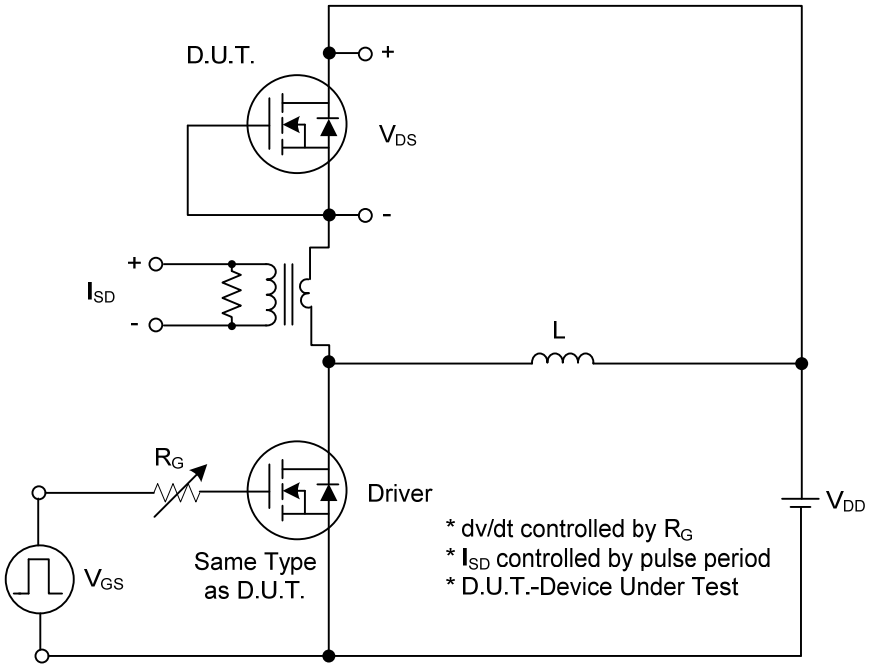
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	°C/W
	TO-251		110	°C/W
	TO-92		180	°C/W
Junction to Case	SOT-223	θ_{JC}	14	°C/W
	TO-251		4.53	°C/W
	TO-92		88	°C/W

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

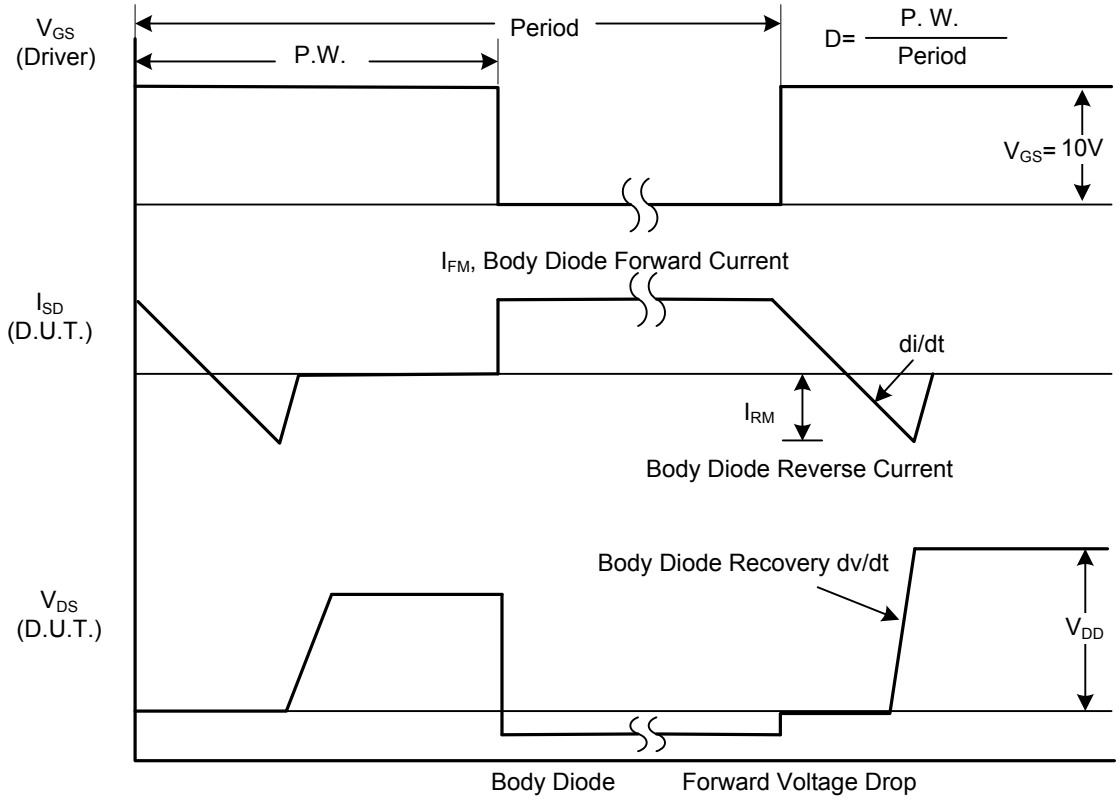
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	700			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=700V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+30V, V_{DS}=0V			+100	nA
	Reverse		V_{GS}=-30V, V_{DS}=0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2.5		4.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=0.25A			14.4	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		40		pF
Output Capacitance		C_{OSS}			22		pF
Reverse Transfer Capacitance		C_{RSS}			5		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=50V, V_{GS}=10V, I_D=1.3A, I_D=100μA (Note 1, 2)		7		nC
Gate to Source Charge		Q_{GS}			1.5		nC
Gate to Drain Charge		Q_{GD}			2		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DS}=30V, V_{GS}=10V, I_D=0.5A, R_G=25Ω (Note 1, 2)		32		ns
Rise Time		t_R			22		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			28		ns
Fall-Time		t_F			26		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				0.5	A
Maximum Body-Diode Pulsed Current		I_{SM}				2.0	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=0.5A, V_{GS}=0V			1.4	V

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle≤2%.
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

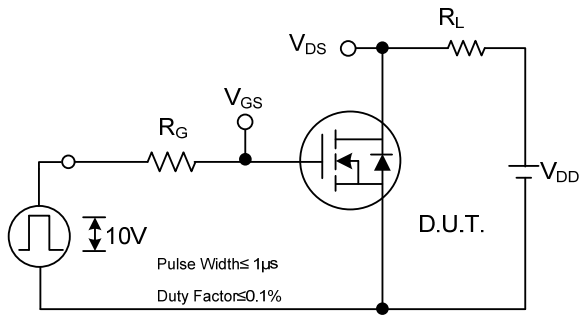


Peak Diode Recovery dv/dt Test Circuit

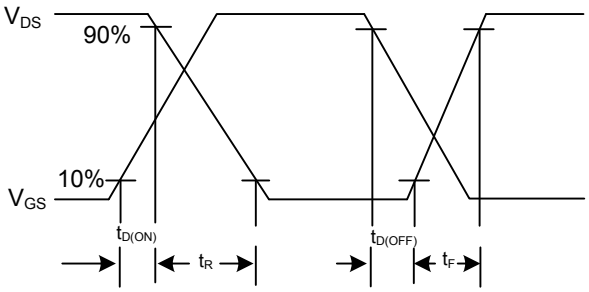


Peak Diode Recovery dv/dt Waveforms

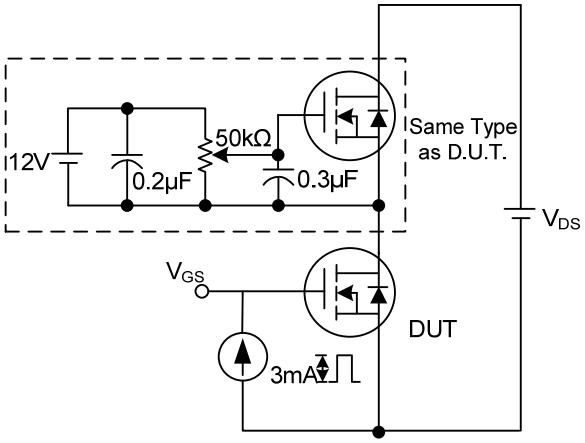
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



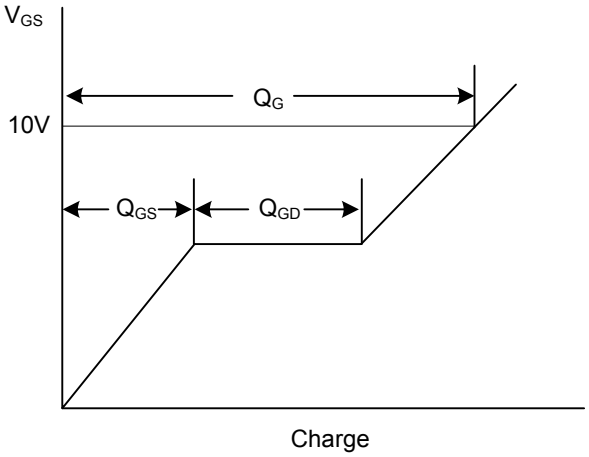
Switching Test Circuit



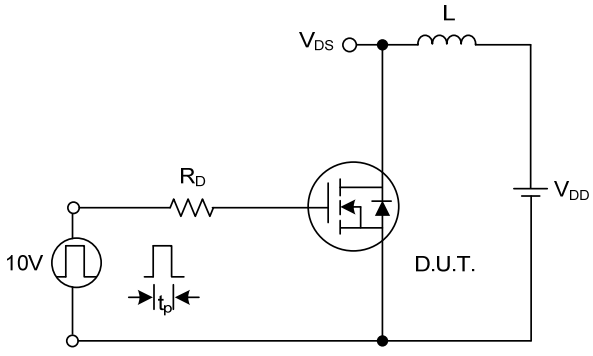
Switching Waveforms



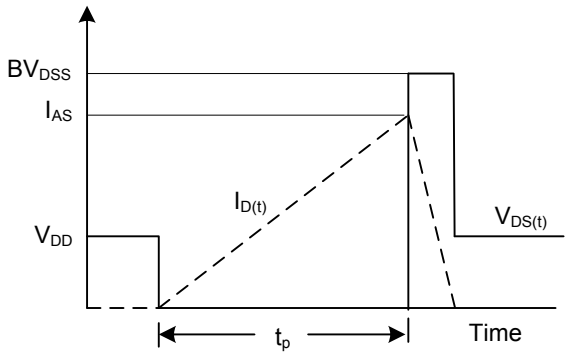
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms