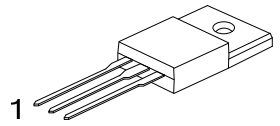
11A, 400V N-CHANNEL SUPER-JUNCTION MOSFET



TO-220F

■ DESCRIPTION

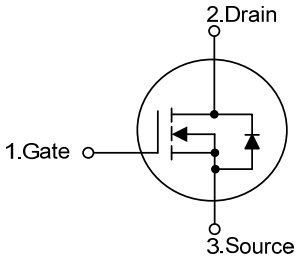
The UTC **11NM40** is an Super Junction MOSFET Structure . It uses UTC advanced planar stripe, DMOS technology to provide customers perfect switching performance, minimal on-state resistance.

The UTC **11NM40** is universally applied in electronic lamp ballasts based on half bridge topology, high efficiency switched mode power supplies, active power factor correction, etc.

■ FEATURES

* $R_{DS(ON)}$ < 0.38Ω @ V_{GS}=10V, I_D=5.7A
* High switching speed
* Low effective output capacitance (Typ.=95pF)
* Low gate charge (Typ.=40nC)

■ SYMBOL



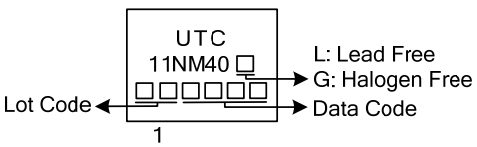
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
11NM40L-TF3-T	11NM40G-TF3-T	TO-220F	G	D	S	Tube

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

SF11N40L-TF3-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube (2) TF3: TO-220F (3) L: Lead Free, G: Halogen Free and Lead Free

■ MARKING



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

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage			V_{DSS}	400	V
Gate-Source Voltage			V_{GSS}	±30	V
Drain Current	Continuous	T_C=25°C	I_D	11.6	A
		T_C=100°C		7	A
	Pulsed (Note 1)		I_{DM}	33	A
Avalanche Current (Note 1)			I_{AR}	11	A
Single Pulsed Avalanche Energy (Note 2)			E_{AS}	154	mJ
Repetitive Avalanche Energy (Note 1)			E_{AR}	12.5	mJ
Peak Diode Recovery dv/dt (Note 3)			dv/dt	4.5	V/ns
Total Power Dissipation	T_C=25°C		P_D	125	W
	Derate above 25°C			1.0	W/°C
Operating Temperature Range			T_J	-55~+150	°C
Storage Temperature Range			T_{STG}	-55~+150	°C
Maximum Lead Temperature for Soldering Purposes, 1/8" from Case for 5 Seconds			T_L	300	°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 = 2.3mH, I_{AS} = 11.6A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
4. I_{SD} ≤ 11.6A, di/dt ≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL CHARACTERISTICS

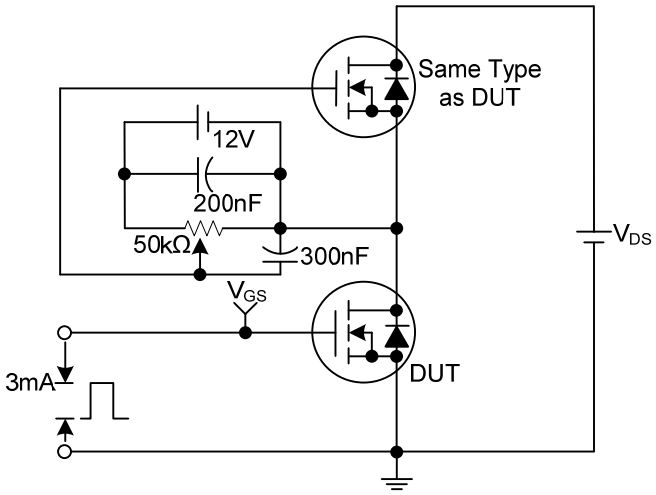
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	62.5	°C/W
Junction to Case	θ_{JC}	1.0	°C/W

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

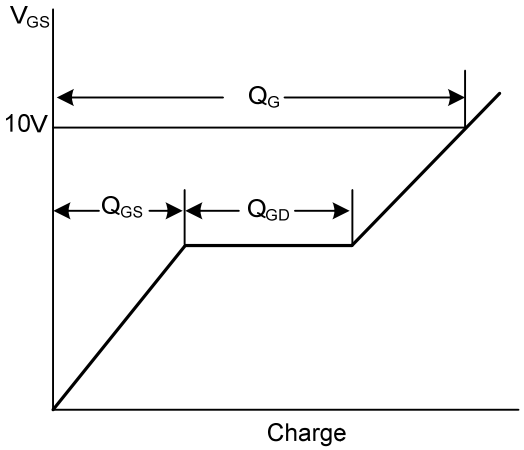
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA, T_J=25°C	400			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	I_D=250μA, Referenced to 25°C		0.6		V/°C
Drain-Source Avalanche Breakdown Voltage		BV_{DS}	V_{GS}=0V, I_D=11A		700		V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=400V, V_{GS}=0V			1	μA
			V_{DS}=320V, T_C=125°C			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	3.0		5.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{DS}=10V, I_D=5.7A		0.32	0.38	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		1148	1490	pF
Output Capacitance		C_{OSS}			671	870	pF
Reverse Transfer Capacitance		C_{RSS}			63	82	pF
Output Capacitance		C_{OSS}	V_{GS}=0V, V_{DS}=320V, f=1.0MHz		35		pF
Effective Output Capacitance		C_{OSS} eff	V_{DS}=0V~320V, V_{GS}=0V		95		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{GS}=10V, V_{DS}=320V, I_D=11A (Note 4, 5)		40	52	nC
Gate to Source Charge		Q_{GS}			7.2		nC
Gate to Drain Charge		Q_{GD}			21		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=200V, I_D=11A, R_G=25Ω (Note 4, 5)		55	80	ns
Rise Time		t_R			115	205	ns
Turn-OFF Delay Time		$t_{D(OFF)}$			330	400	ns
Fall-Time		t_F			140	180	ns
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				11.6	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				33	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S=11.6A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time		t_{RR}	I_S=11.6A, V_{GS}=0V, dI_F/dt=100A/μs (Note 4)		390		ns
Body Diode Reverse Recovery Charge		Q_{RR}			5.7		μC

Notes: 1. Repetitive Rating : Pulse width limited by maximum junction temperature.
2. I_{AS}=5.5A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C.
3. I_{SD}≤11A, di/dt≤200A/μs, V_{DD}≤BV_{DSS}, Starting T_J=25°C.
4. Pulse Test : Pulse width≤300μs, Duty cycle≤2%.
5. Essentially independent of operating temperature.

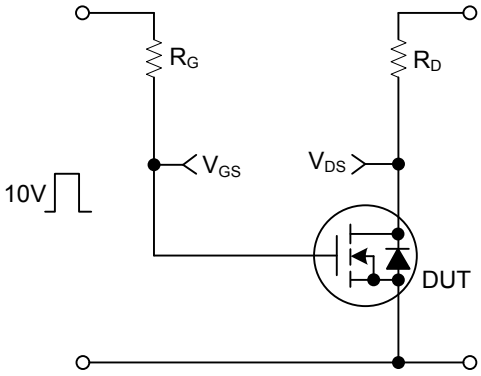
■ TEST CIRCUITS AND WAVEFORMS



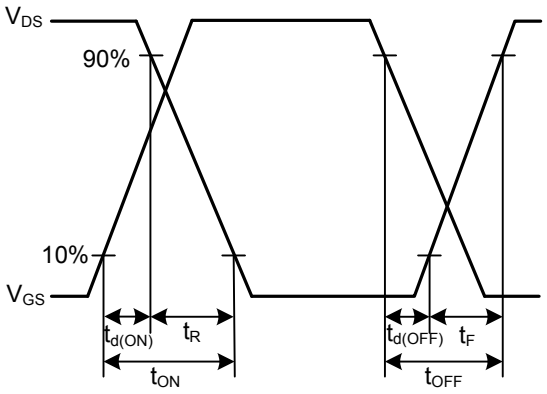
Gate Charge Test Circuit



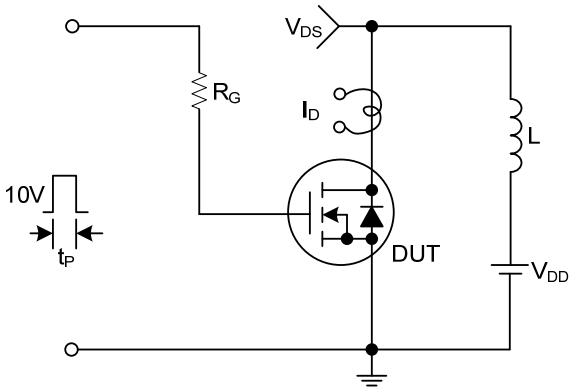
Gate Charge Waveforms



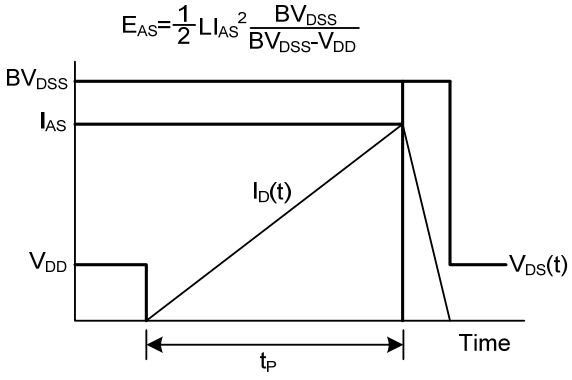
Resistive Switching Test Circuit



Resistive Switching Waveforms

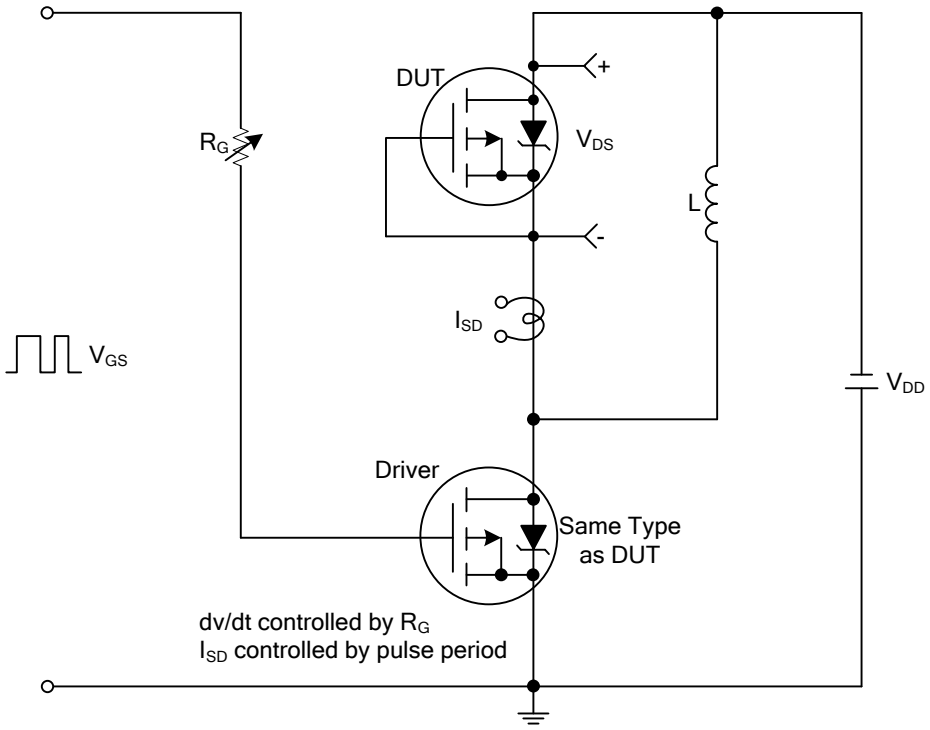


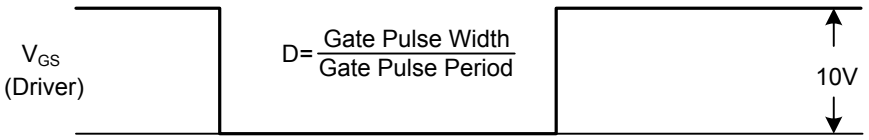
Unclamped Inductive Switching Test Circuit

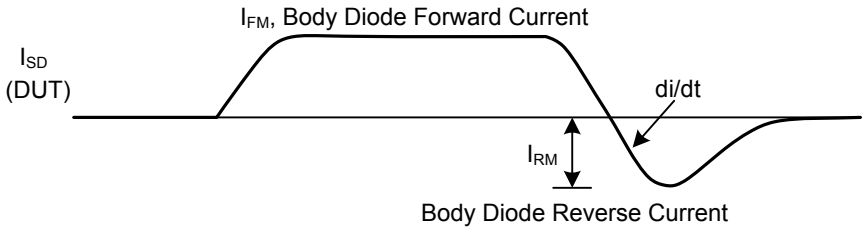


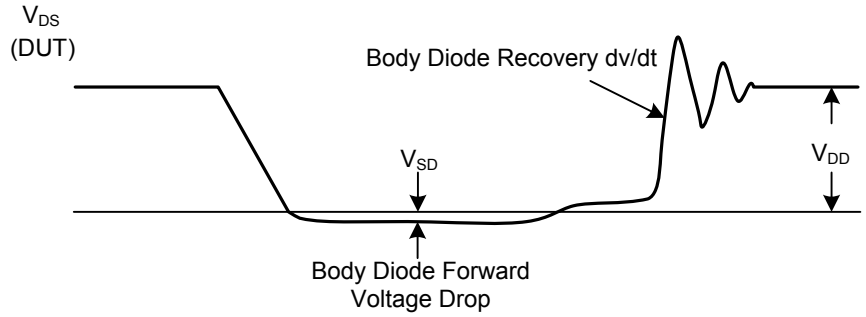
Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS(Cont.)









Peak Diode Recovery dv/dt Test Circuit and Waveforms