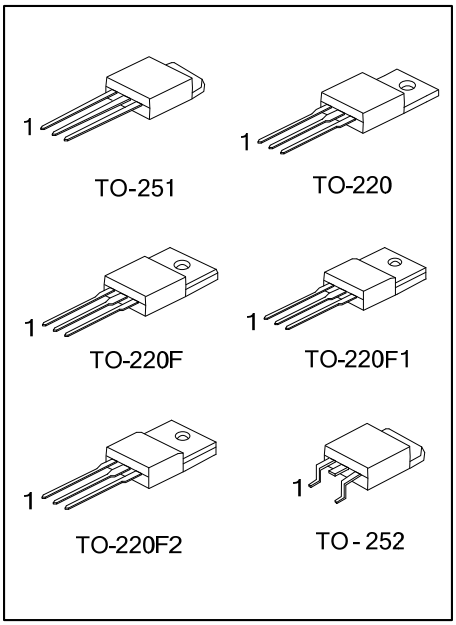
6A, 650V N-CHANNEL SUPER-JUNCTION MOSFET



■ DESCRIPTION

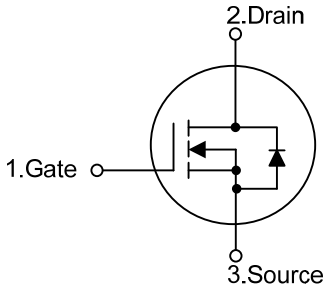
The UTC **6NM65-Q** is a Super Junction MOSFET Structure. It uses UTC advanced planar stripe, DMOS technology to provide customers perfect switching performance, minimal on-state resistance.

The UTC **6NM65-Q** is universally applied in electronic lamp ballasts based on half bridge topology, high efficiency switched mode power supplies, active power factor correction, etc.

■ FEATURES

* $R_{DS(on)}$ < 1.08 Ω @ V_{GS}=10V, I_D=3A
* Improved dv/dt capability
* Fast switching
* 100% avalanche tested

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6NM65L-TA3-T	6NM65G-TA3-T	TO-220	G	D	S	Tube
6NM65L-TF1-T	6NM65G-TF1-T	TO-220F1	G	D	S	Tube
6NM65L-TF2-T	6NM65G-TF2-T	TO-220F2	G	D	S	Tube
6NM65L-TF3-T	6NM65G-TF3-T	TO-220F	G	D	S	Tube
6NM65L-TM3-T	6NM65G-TM3-T	TO-251	G	D	S	Tube
6NM65L-TN3-R	6NM65G-TN3-R	TO-252	G	D	S	Tape Reel

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

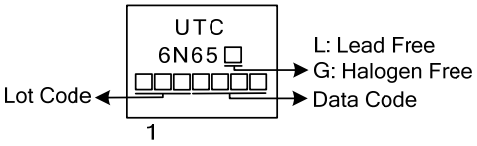
6NM65L-TA3-T
(1)Packing Type
(2)Package Type
(3)Green Package

(1) T: Tube, R: Tape Reel

(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TN3: TO-252

(3) L: Lead Free, G: Halogen Free and Lead Free

■ MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	650	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	Continuous	I_D	6.0	A
	Pulsed (Note 2)	I_{DM}	24	A
Avalanche Current (Note 2)		I_{AR}	1.6	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	184	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.7	V/ns
Power Dissipation	TO-220	P_D	125	W
	TO-220F/TO-220F1 TO-220F2		40	W
	TO-251/TO-252		55	W
Junction Temperature		T_J	+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=144mH, I_{AS}=1.6A, V_{DD}=50V, R_G=25 Ω, Starting T_J = 25°C
4. I_{SD}≤6.0A, di/dt≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

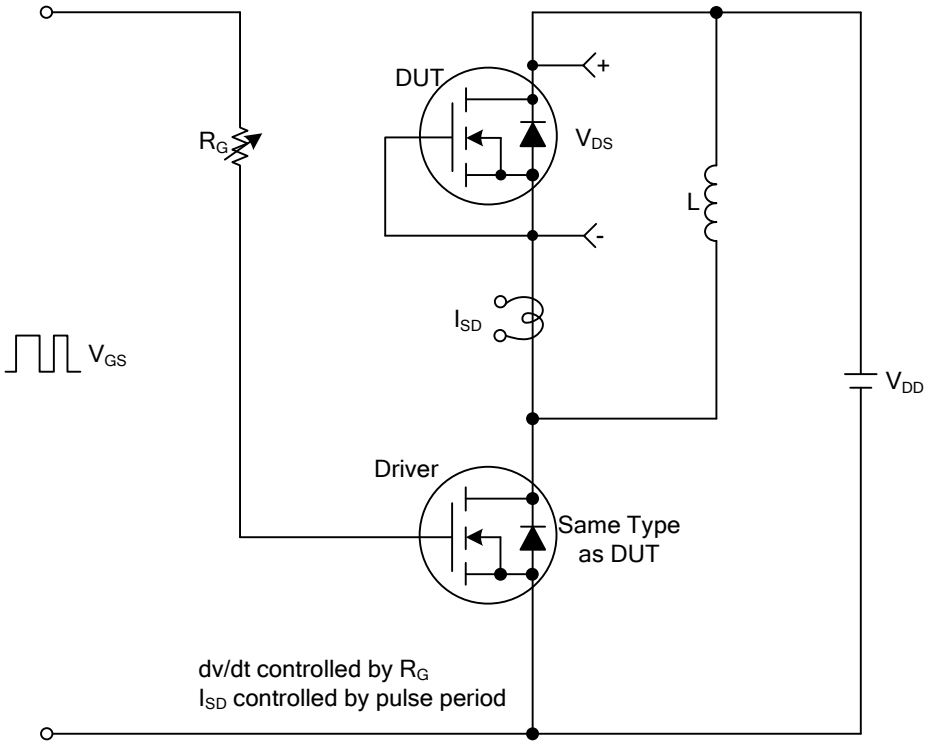
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2	$θ_{JA}$	62.5	°C/W
	TO-251/TO-252		110	°C/W
Junction to Case	TO-220	$θ_{JC}$	1.0	°C/W
	TO-220F/TO-220F1 TO-220F2		3.13	°C/W
	TO-251/TO-252		2.27	°C/W

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

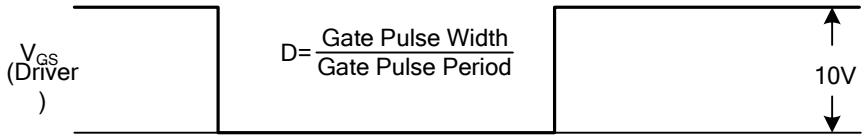
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0V, I_D = 250μA	650			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 650V, V_{GS} = 0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 30V, V_{DS} = 0V			100	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 = 3.0A			1.08	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		330		pF
Output Capacitance		C_{OSS}			190		pF
Reverse Transfer Capacitance		C_{RSS}			20		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=50V, V_{GS}=10 V, I_D=1.3A, I_G=100μA (Note 1, 2)		42		nC
Gate to Source Charge		Q_{GS}			4.0		nC
Gate to Drain Charge		Q_{GD}			12		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DD}=30V, V_{GS}=10 V, I_D=0.5A, R_G=25Ω (Note 1, 2)		50		nS
Rise Time		t_R			130		nS
Turn-OFF Delay Time		$t_{D(OFF)}$			270		nS
Fall-Time		t_F			90		nS
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Body-Diode Continuous Current		I_S				6	A
Maximum Body-Diode Pulsed Current		I_{SM}				24	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=6.0A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t_{rr}	I_S=6.0A, V_{GS}=0V, dI_F/dt=100A/μs		430		nS
Body Diode Reverse Recovery Charge		Q_{rr}			3.91		μC

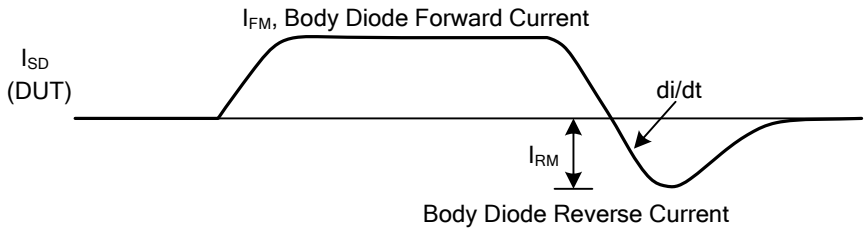
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
2. Essentially independent of operating ambient temperature

■ TEST CIRCUITS AND WAVEFORMS

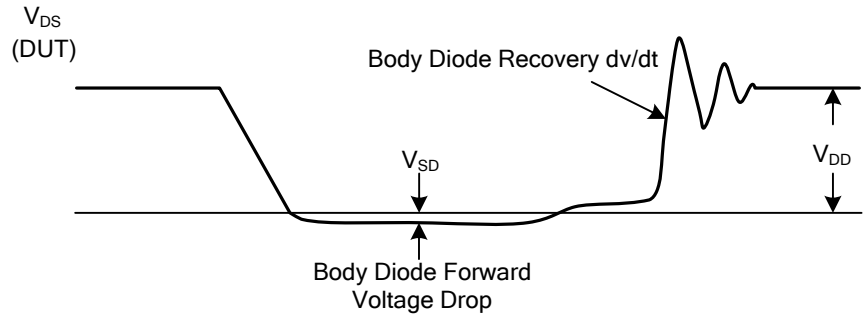


Peak Diode Recovery dv/dt Test Circuit & Waveforms

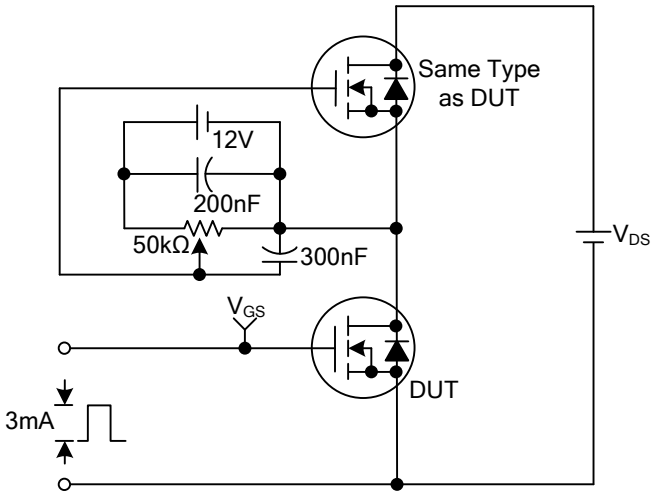




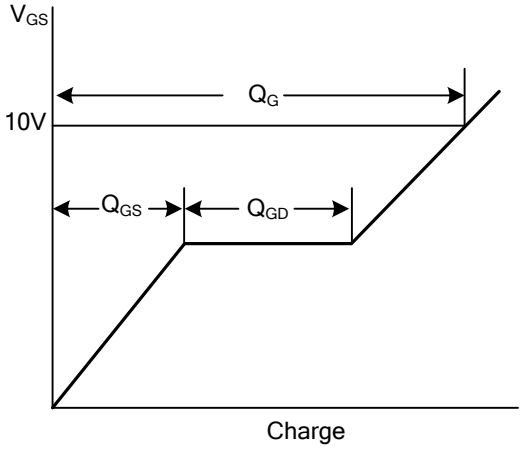
Body Diode Reverse Current



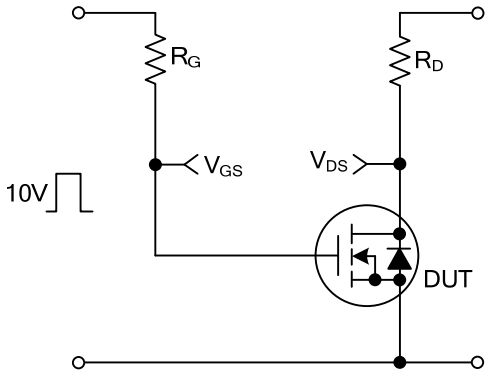
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



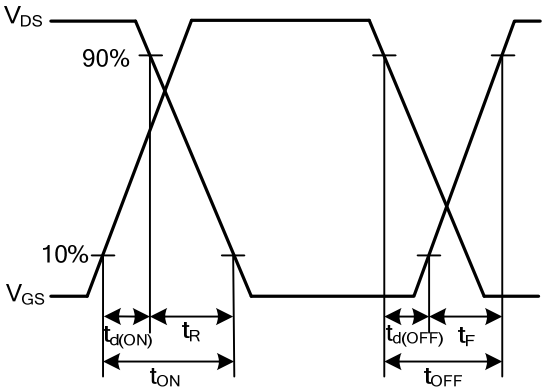
Gate Charge Test Circuit



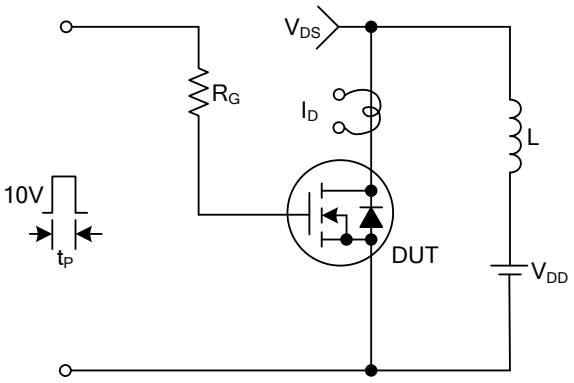
Gate Charge Waveforms



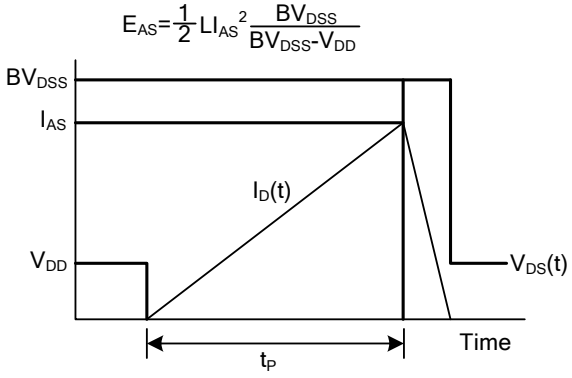
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms