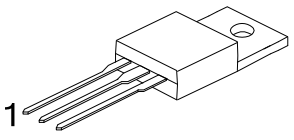
200A, 85V N-CHANNEL ENHANCEMENT MODE POWER MOSFET



TO-220

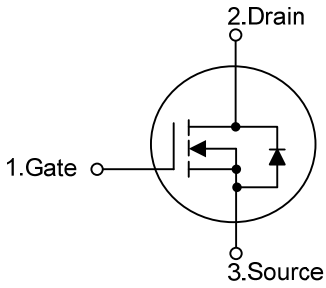
■ DESCRIPTION

The UTC **USGR028N85** is a uses Super Trench II technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of RDS(ON) and Qg. This device is ideal for high-frequency switching and synchronous rectification.

■ FEATURES

* $R_{DS(ON)} \leq 2.8\ m\Omega$ @ V_{GS}=10V, I_D=50A
* Excellent gate charge
* Very low on-resistance $R_{DS(ON)}$
* High switching speed
* Low reverse transfer capacitance

■ SYMBOL



■ ORDERING INFORMATION

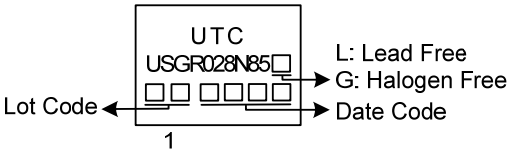
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
USGR028N85L-TA3-T	USGR028N85G-TA3-T	TO-220	G	D	S	Tube

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

USGR028N85G-TA3-T

(1)Packing Type	(1) T: Tube
(2)Package Type	(2) TA3: TO-220
(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING


UTC
USGR028N85□
□□ □□□□
Lot Code
1
L: Lead Free
G: Halogen Free
Date Code

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	85	V
Gate-Source Voltage		V_{GSS}	±20	V
Drain Current	Continuous	I_D	200	A
	Pulsed (Note 2)	I_{DM}	400	A
Single Pulsed Avalanche Energy (Note 3)		E_{AS}	300	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.9	V/ns
Power Dissipation		P_D	180	W
Junction Temperature		T_J	+150	°C
Storage Temperature Range		T_{STG}	-20 ~ +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=0.1mH, I_{AS}=77.5A, V_{DD}=50V, R_G=25 Ω, Starting T_J = 25°C
4. I_{SD}≤ 30A, di/dt≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	62.5	°C/W
Junction to Case	θ_{JC}	0.69 (Note)	°C/W

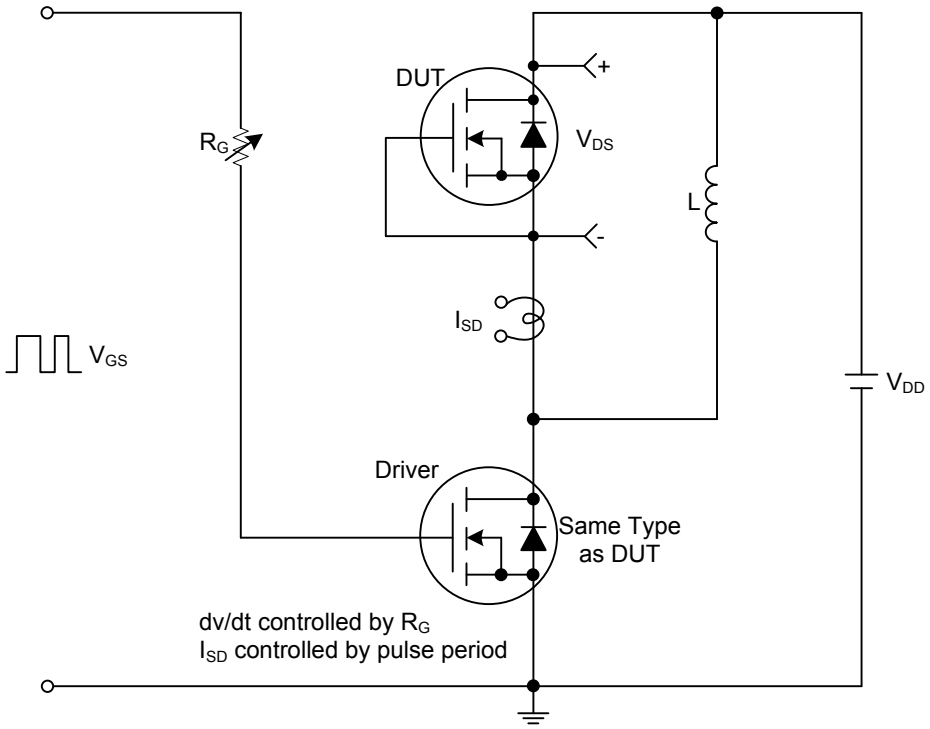
Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

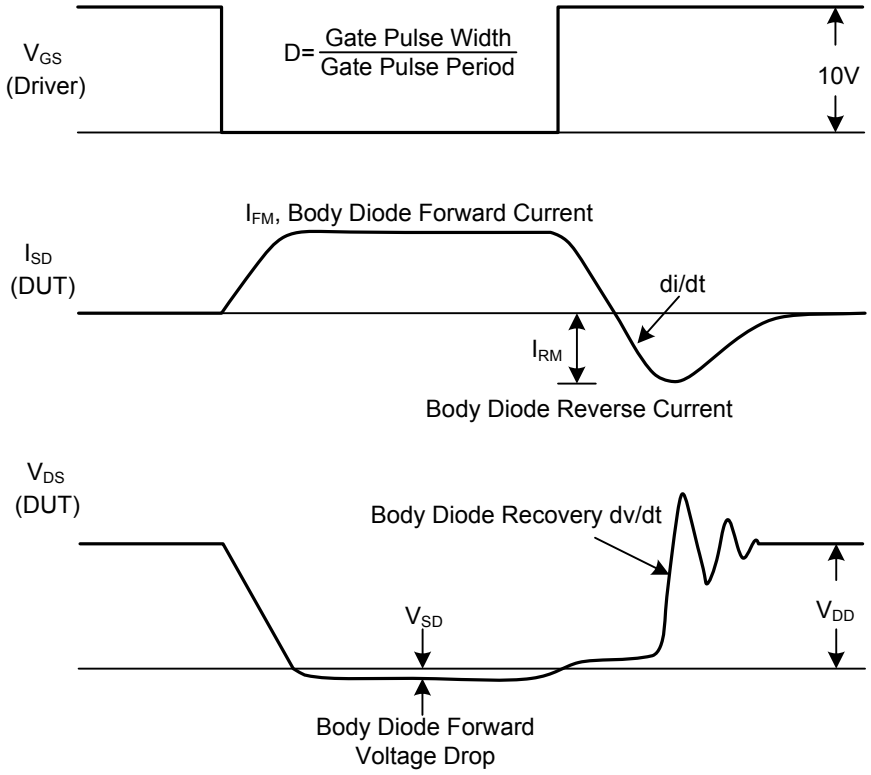
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	85			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=85V, V_{GS}=0V			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V, V_{DS}=0V			+100	nA
	Reverse		V_{GS}=-20V, V_{DS}=0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=50A		2.5	2.8	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		6310		pF
Output Capacitance		C_{OSS}			3110		pF
Reverse Transfer Capacitance		C_{RSS}			300		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=68V, V_{GS}=10V, I_D=200A, (Note 1, 2)		120		nC
Gate to Source Charge		Q_{GS}			29		nC
Gate to Drain Charge		Q_{GD}			35		nC
Turn-on Delay Time (Note 1)		$t_{D(ON)}$	V_{DD}=40V, V_{GS}=10V, I_D=200A, R_G =3.3Ω (Note 1, 2)		20		ns
Rise Time		t_R			25		ns
Turn-off Delay Time		$t_{D(OFF)}$			74		ns
Fall-Time		t_F			35		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				200	A
Maximum Body-Diode Pulsed Current		I_{SM}				400	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=200A, V_{GS}=0V			1.4	V
Reverse Recovery Time (Note 1)		t_{rr}	I_S=30A, V_{GS}=0V, dI_F/dt =100A/μs		64		nS
Reverse Recovery Charge		Q_{rr}			120		nC

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

■ TEST CIRCUITS AND WAVEFORMS



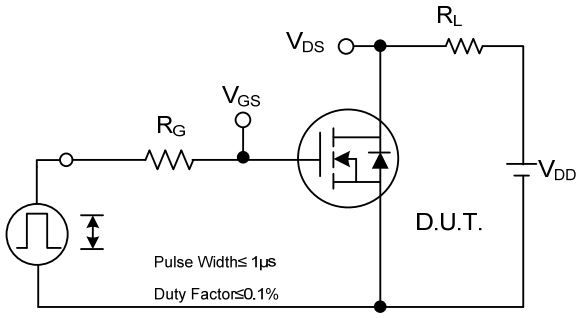
Peak Diode Recovery dv/dt Test Circuit



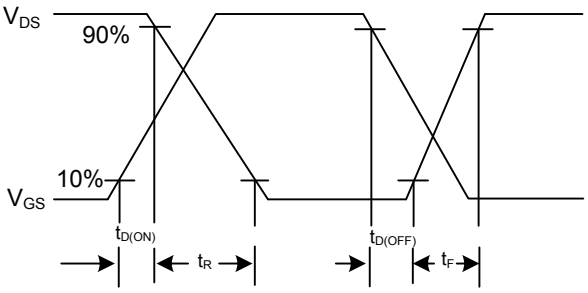
Peak Diode Recovery dv/dt Test Circuit and Waveforms

Peak Diode Recovery dv/dt Waveforms

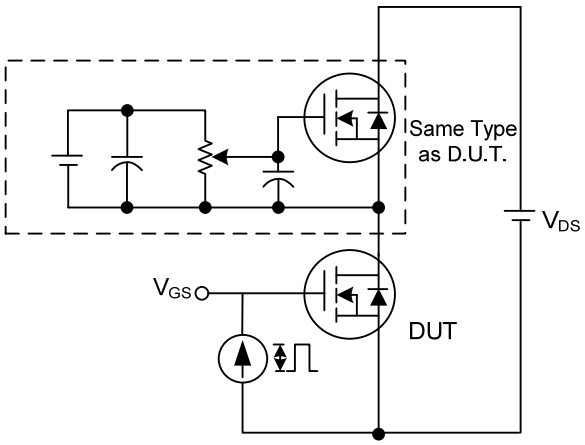
■ TEST CIRCUITS AND WAVEFORMS



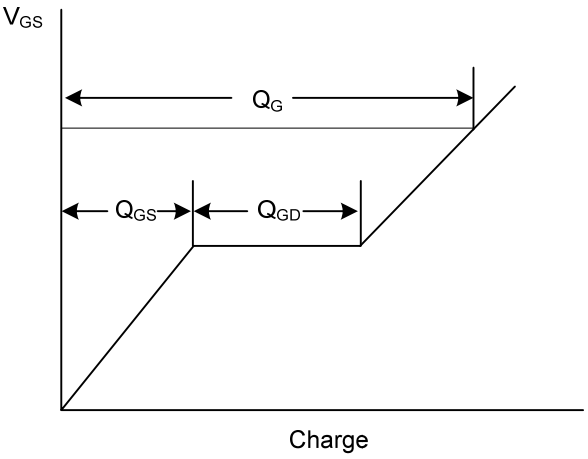
Switching Test Circuit



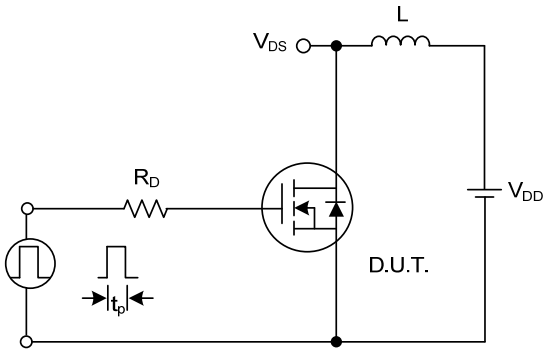
Switching Waveforms



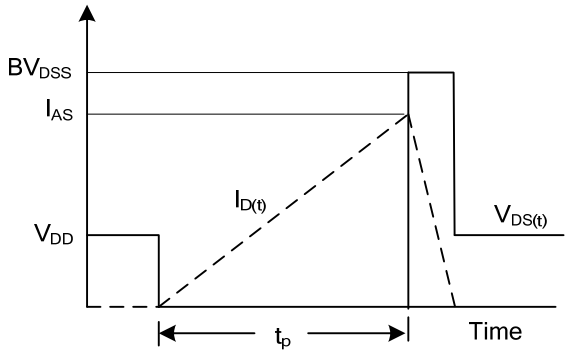
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms