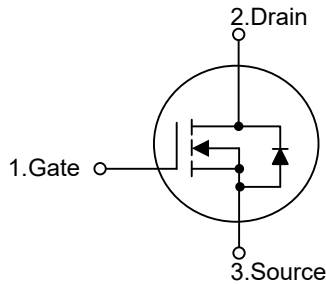


**50NM60****Power MOSFET****50A, 600V N-CHANNEL
SUPER-JUNCTION MOSFET****DESCRIPTION**

The **UTC 50NM60** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at DC-DC, AC-DC converters for power applications.

FEATURES

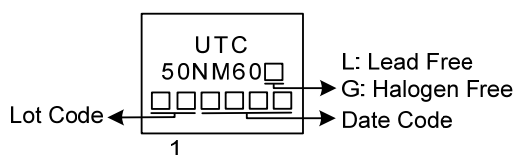
- * $R_{DS(ON)} \leq 85 \text{ m}\Omega$ @ $V_{GS}=10\text{V}$, $I_D=25\text{A}$
- * High Switching Speed
- * 100% Avalanche Tested

SYMBOL**ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
50NM60L-T47-T	50NM60G-T47-T	TO-247	G	D	S	Tube
50NM60L-T47S-T	50NM60G-T47S-T	TO-247S	G	D	S	Tube

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

50NM60G-T47-T	(1)Packing Type	(1) T: Tube
	(2)Package Type	(2) T47: TO-247, T47S: TO-247S
	(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

MARKING

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V _{DSS}	600	V
Gate-Source Voltage		V _{GSS}	±30	V
Drain Current	Continuous	I _D	50	A
	Pulsed (Note 2)	I _{DM}	200	A
Avalanche Current (Note 2)		I _{AR}	10	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	1800	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	50	V/ns
Power Dissipation		P _D	310	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 = 36mH, I_{AS} = 10A, V_{DD} = 50V, R_G = 25Ω, 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}	40	°C/W
Junction to Case	θ _{JC}	0.4	°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	600			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =600V, V _{GS} =0V			50	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 =25A			85	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		3900		pF
Output Capacitance		C _{OSS}			2850		pF
Reverse Transfer Capacitance		C _{RSS}			220		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} =300V, V _{GS} =10V, I _D =50A, (Note 1, 2)		100		nC
Gate to Source Charge		Q _{GS}			26		nC
Gate to Drain Charge		Q _{GD}			11		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DD} =30V, V _{GS} =10V, I _D =0.5A, R _G =25Ω (Note 1, 2)		140		ns
Rise Time		t _R			430		ns
Turn-OFF Delay Time		t _{D(OFF)}			1000		ns
Fall-Time		t _F			640		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				50	A
Maximum Body-Diode Pulsed Current		I _{SM}				200	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =50A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time		t _{rr}	I _S =30A, V _{GS} =0V, V _R =200V		630		ns
Body Diode Reverse Recovery Charge		Q _{rr}	dI _F /dt=100A/μs (Note 1)		13.7		μC

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating ambient temperature.

D.U.T.

V_{DS}

I_{SD}

L

R_G

Driver

Same Type as D.U.T.

V_{GS}

V_{DD}

- * dv/dt controlled by R_G
- * I_{SD} controlled by pulse period
- * D.U.T.-Device Under Test

The diagram shows three waveforms over time:

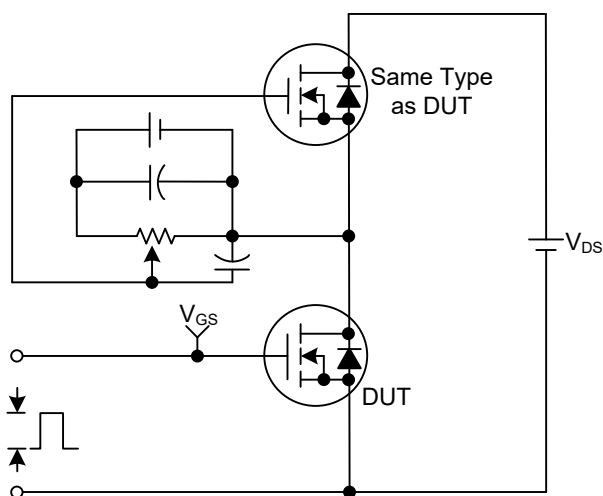
- V_{GS} (Driver):** A square wave with pulse width (P.W.) and period. The duty cycle is defined as $D = \frac{P.W.}{Period}$. The peak voltage is $V_{GS} = 10V$.
- I_{SD} (D.U.T.):** The source-drain current. It shows a negative reverse current during the MOSFET's off-time, labeled as I_{RM} (Body Diode Reverse Current). The slope of the reverse current is labeled di/dt .
- V_{DS} (D.U.T.):** The drain-source voltage. It shows a voltage drop during the MOSFET's on-time, labeled as V_{DD} (Body Diode Forward Voltage Drop). The slope of the recovery voltage is labeled dv/dt .



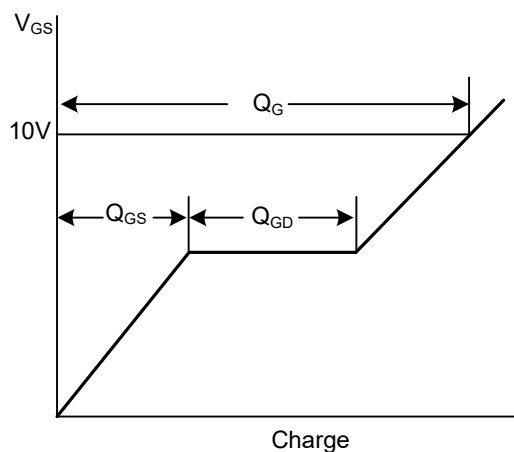
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■ TEST CIRCUITS AND WAVEFORMS

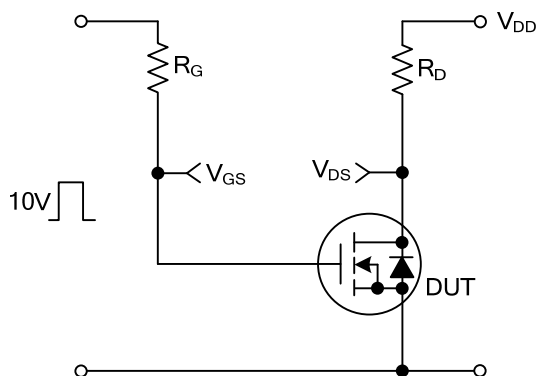
Gate Charge Test Circuit



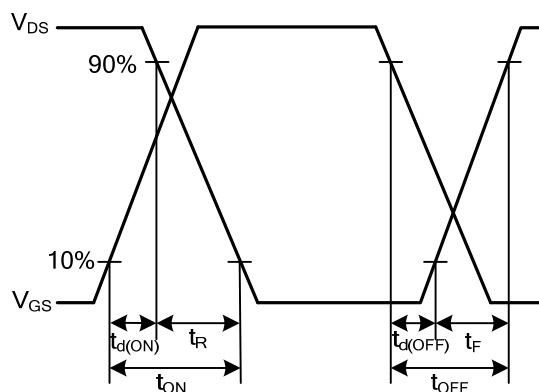
Gate Charge Waveforms



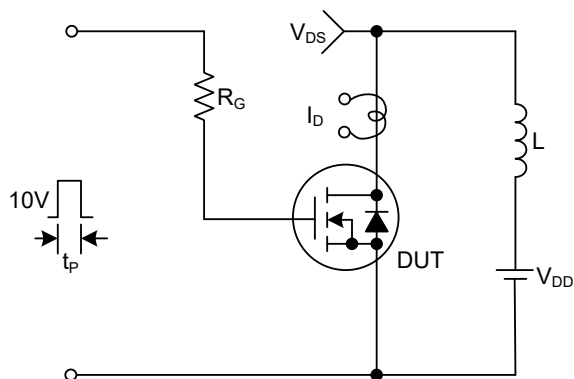
Resistive Switching Test Circuit



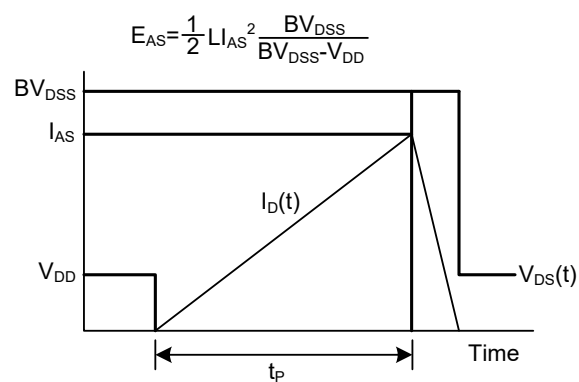
Resistive Switching Waveforms



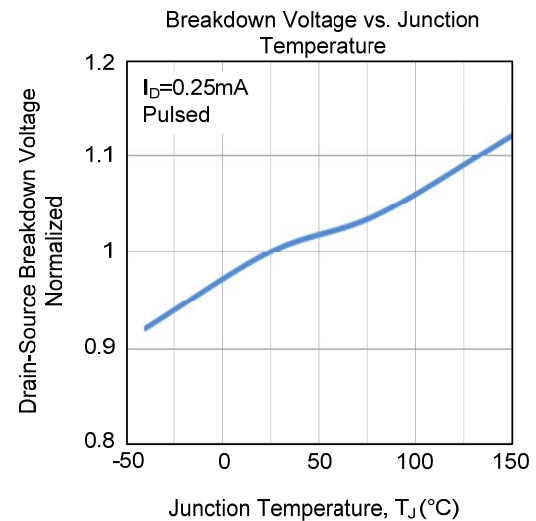
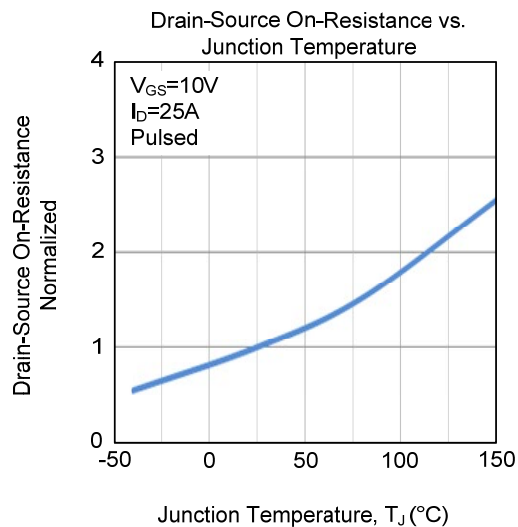
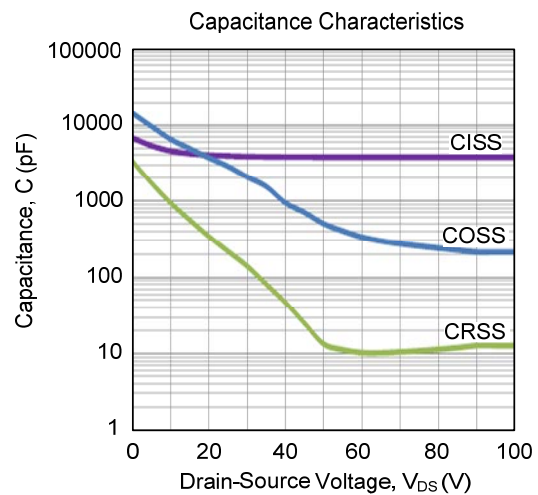
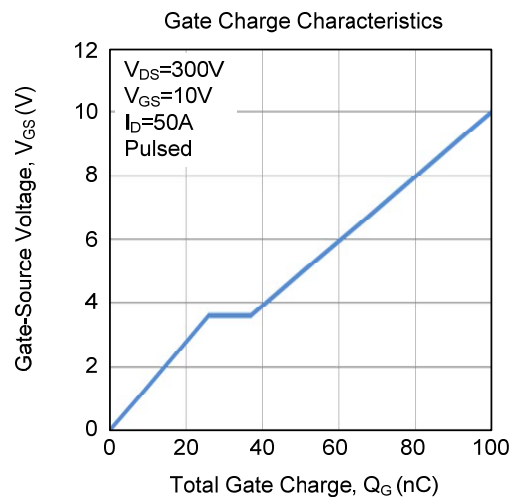
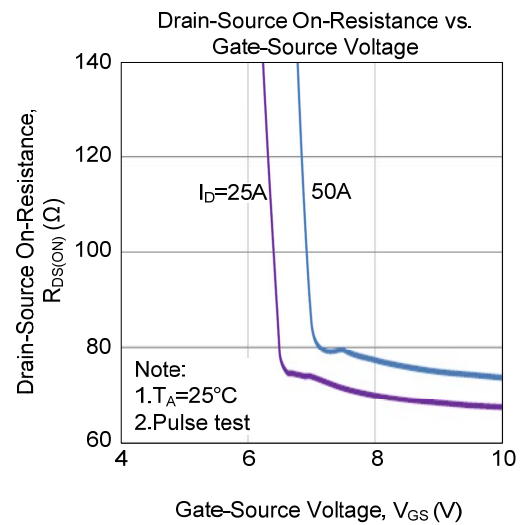
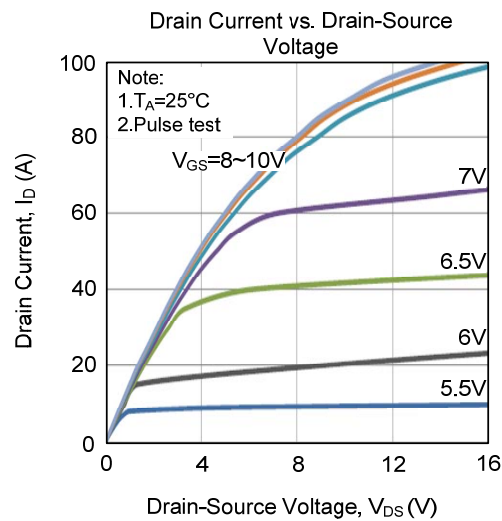
Unclamped Inductive Switching Test Circuit



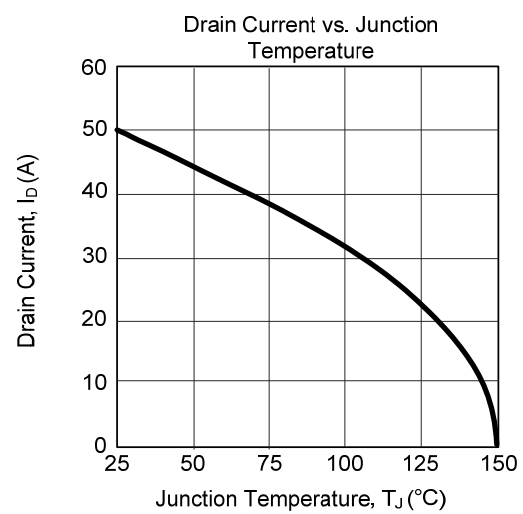
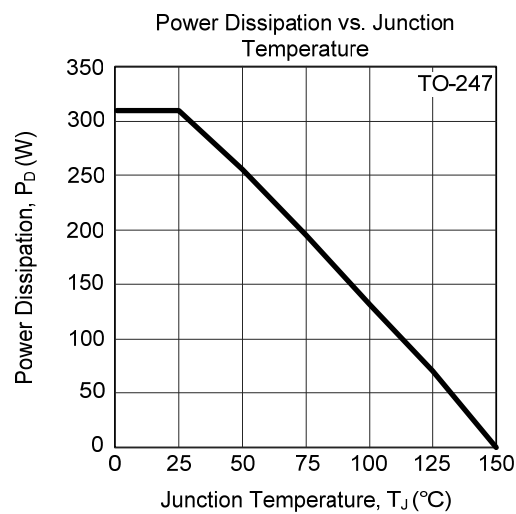
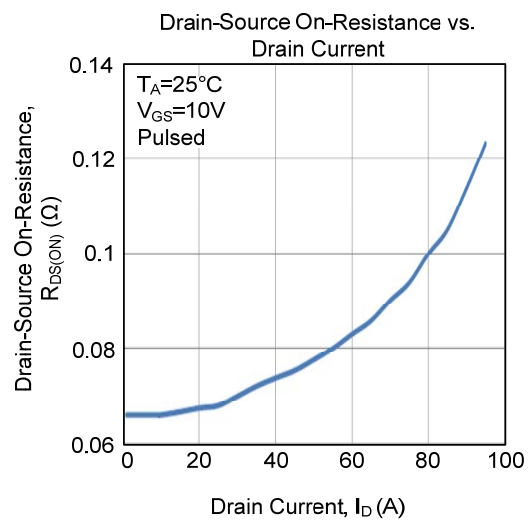
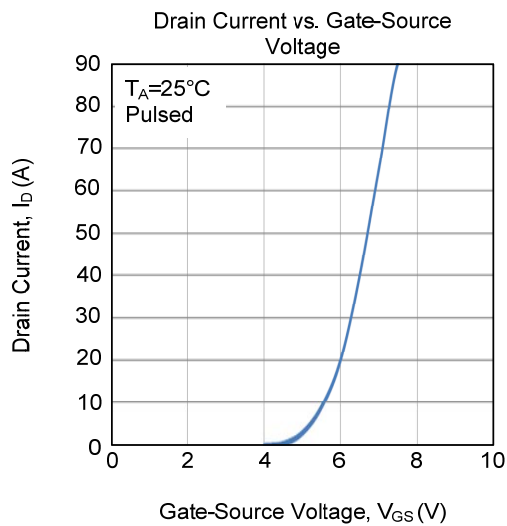
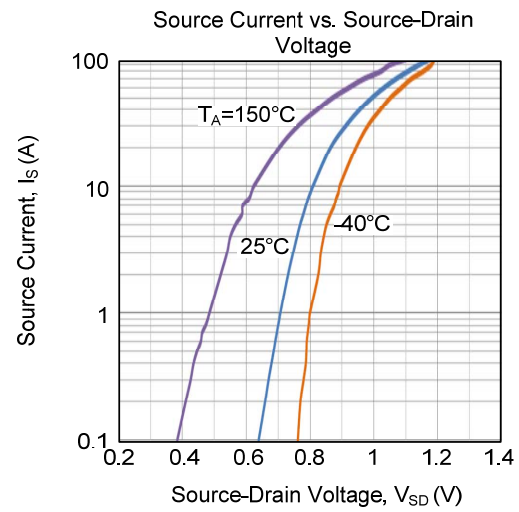
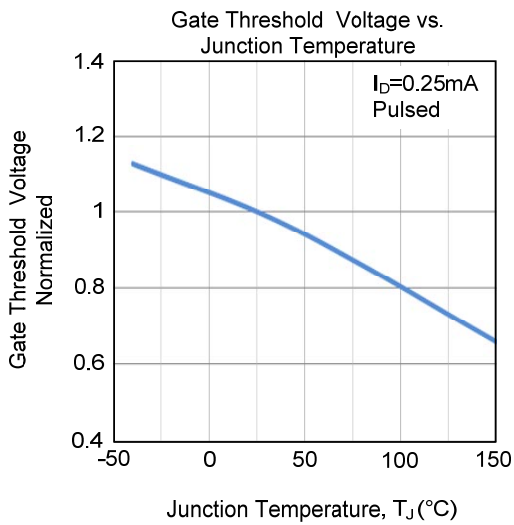
Unclamped Inductive Switching Waveforms



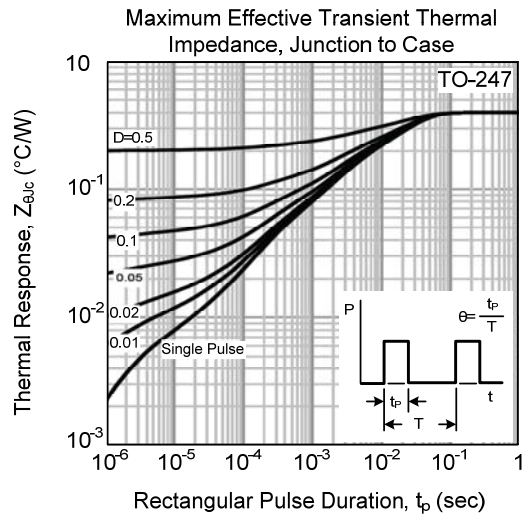
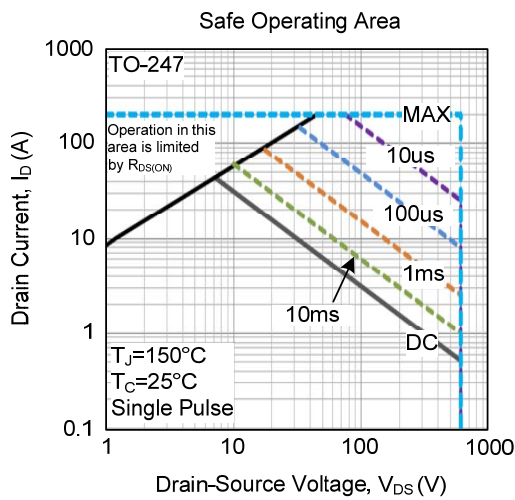
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



TYPICAL CHARACTERISTICS (Cont.)



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