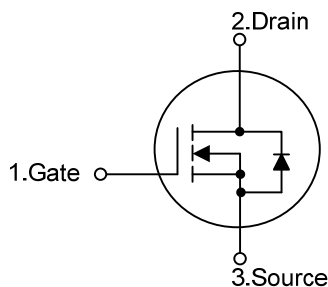


**10NM60-U2****Power MOSFET****10A, 600V N-CHANNEL
SUPER-JUNCTION MOSFET****DESCRIPTION**

The UTC 10NM60-U2 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

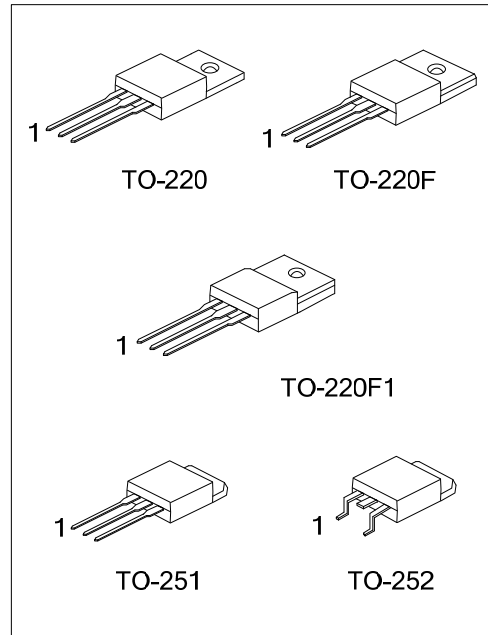
- * $R_{DS(ON)} < 0.55\Omega$ @ $V_{GS}=10V$, $I_D=5.0A$
- * By using Super Junction Structure
- * Fast Switching
- * With 100% Avalanche Tested

SYMBOL**ORDERING INFORMATION**

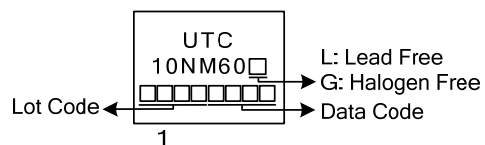
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
10NM60L-TA3-T	10NM60G-TA3-T	TO-220	G	D	S	Tube
10NM60L-TF3-T	10NM60G-TF3-T	TO-220F	G	D	S	Tube
10NM60L-TF1-T	10NM60G-TF1-T	TO-220F1	G	D	S	Tube
10NM60L-TM3-T	10NM60G-TM3-T	TO-251	G	D	S	Tube
10NM60L-TN3-R	10NM60G-TN3-R	TO-252	G	D	S	Tape Reel

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

10NM60G-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, TM3: TO-251, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free
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■ 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	10	A
	Pulsed (Note 2)	I _{DM}	40	A
Avalanche Current (Note 2)		I _{AR}	1.9	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	238	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5.6	V/ns
Power Dissipation	TO-220	P _D	156	W
	TO-220F/TO-220F1		25	W
	TO-251/TO-252		60	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=132mH, I_{AS}=1.9A, V_{DD}= 50V, R_G=25Ω, Starting T_J=25°C

4. I_{SD} ≤10A, 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	θ _{JA}	62.5	°C/W
	TO-220F1			
	TO-251/TO-252		110	
Junction to Case	TO-220	θ _{JC}	0.8	°C/W
	TO-220F/TO-220F1		5.0	
	TO-251/TO-252		2.08	

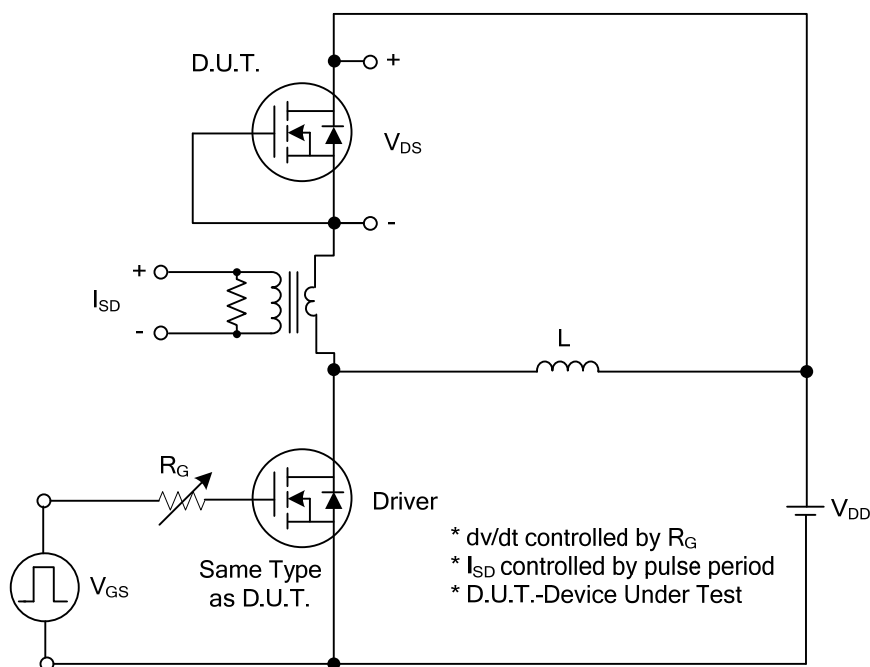
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	600			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =600V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{DS} =0V ,V _{GS} =30V			100	nA
	Reverse		V _{DS} =0V ,V _{GS} =-30V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} = V _{GS} , I _D =250μA	2.5		4.5	V
Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =5.0A			0.55	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		650		pF
Output Capacitance		C _{OSS}			820		pF
Reverse Transfer Capacitance		C _{RSS}			100		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =150V, V _{GS} =10V, I _D =6.0A (Note 1, 2)		29		nC
Gate to Source Charge		Q _{GS}			11		nC
Gate to Drain Charge		Q _{GD}			10		nC
Turn-ON Delay Time (Note 1)		t _{D(ON)}	V _{DD} =300V, V _{GS} =10V, I _D =8.0A, R _G =25Ω (Note 1, 2)		20		ns
Rise Time		t _R			23		ns
Turn-OFF Delay Time		t _{D(OFF)}			78		ns
Fall-Time		t _F			32		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				10	A
Maximum Body-Diode Pulsed Current		I _{SM}				40	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =10A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t _{rr}	I _S =10A, V _{GS} =0V,		320		ns
Body Diode Reverse Recovery Charge		Q _{rr}	dl _F /dt=100A/μs		4.1		μC

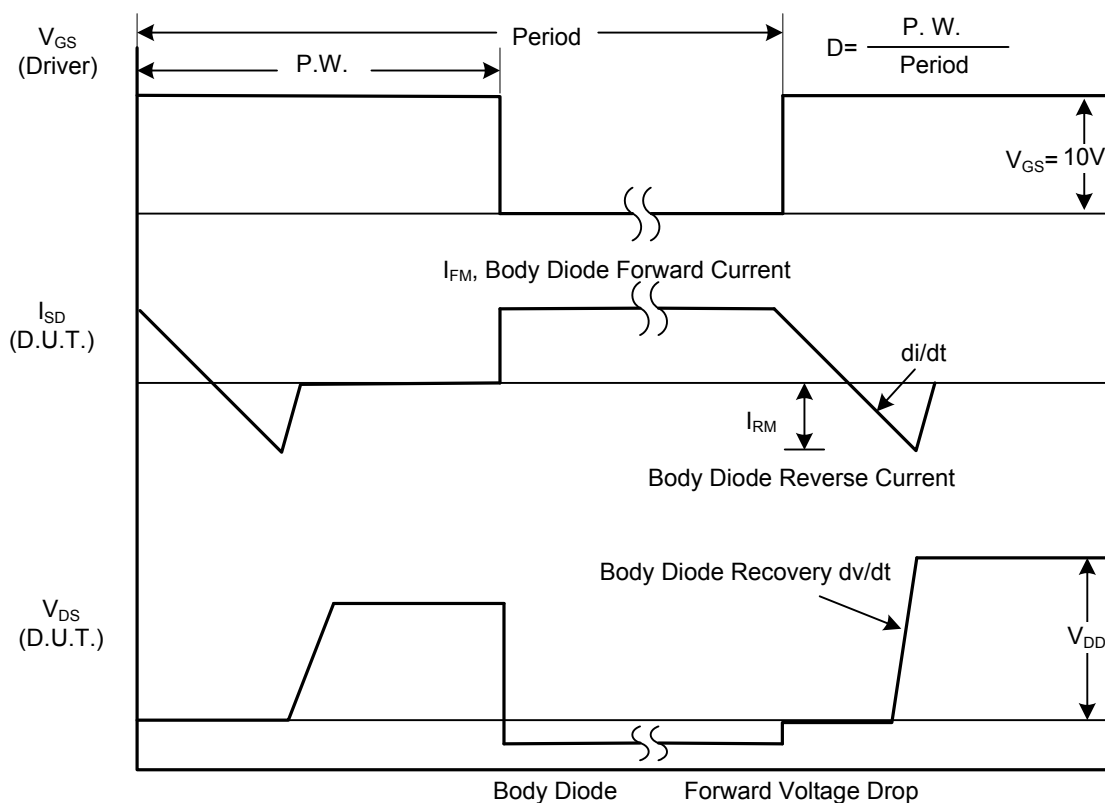
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

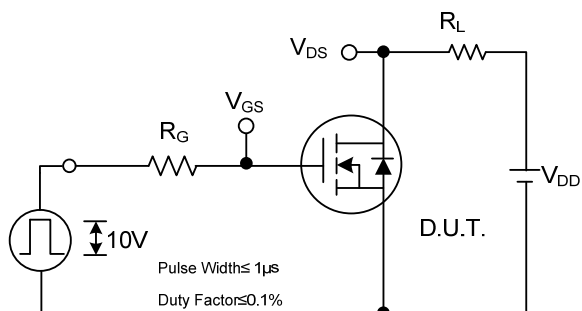


Peak Diode Recovery dv/dt Test Circuit

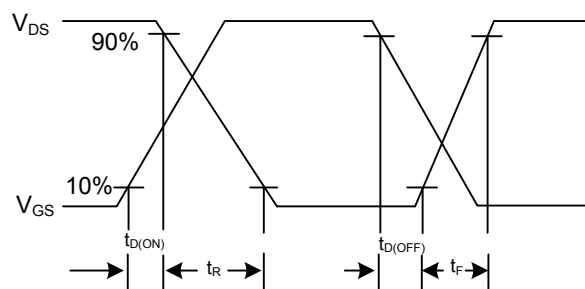


Peak Diode Recovery dv/dt Waveforms

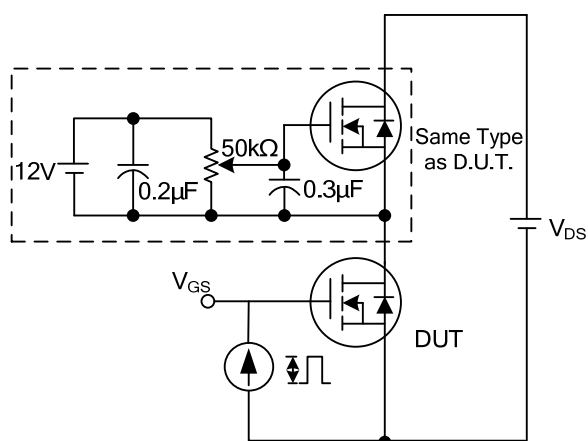
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



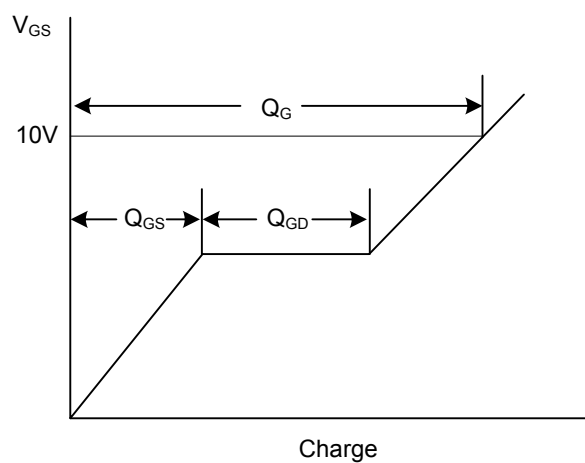
Switching Test Circuit



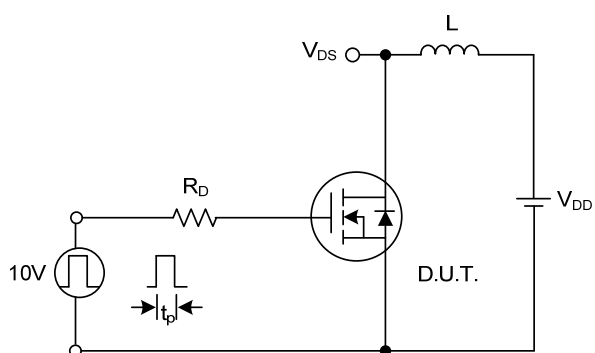
Switching Waveforms



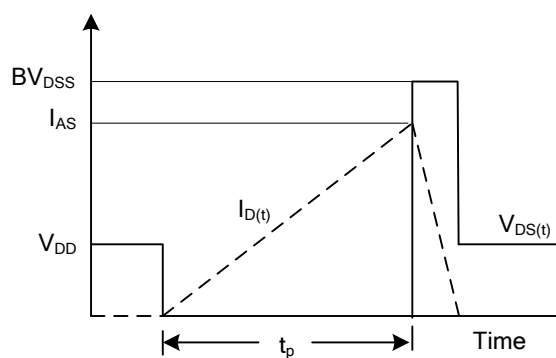
Gate Charge Test Circuit



Gate Charge Waveform

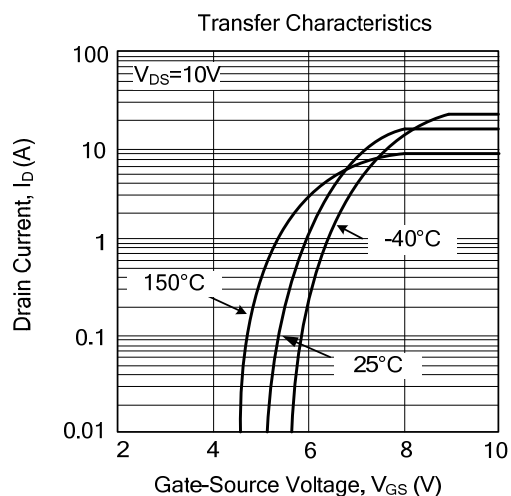
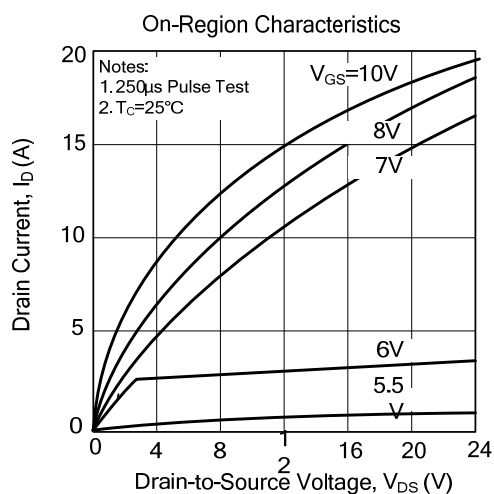
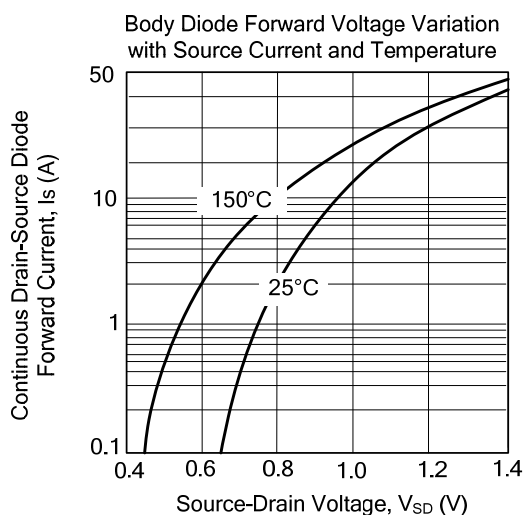
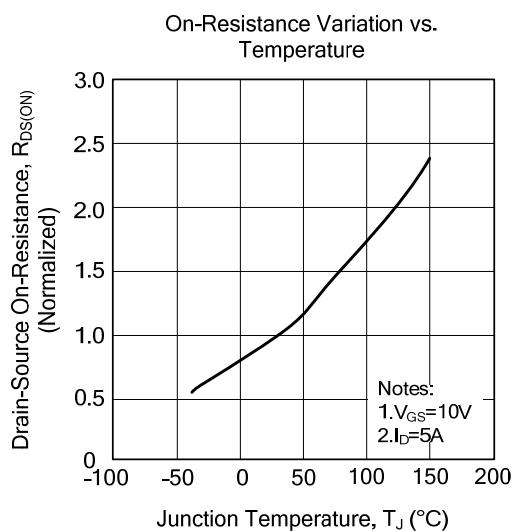
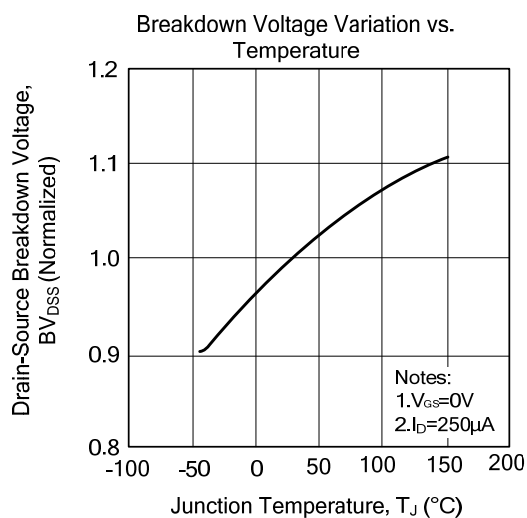
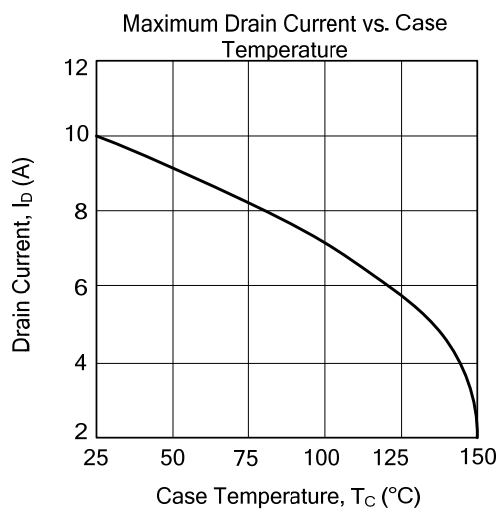


Unclamped Inductive Switching Test Circuit

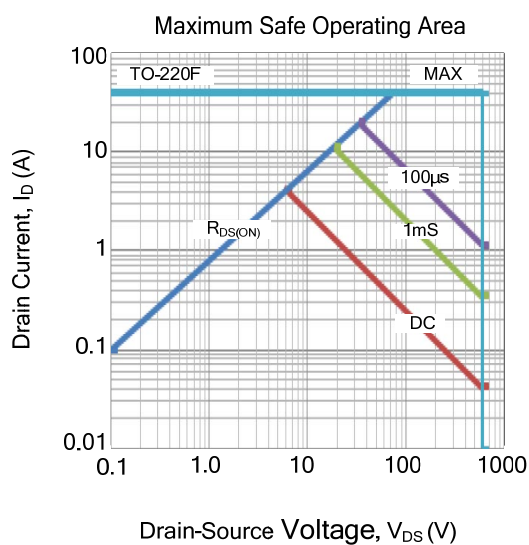
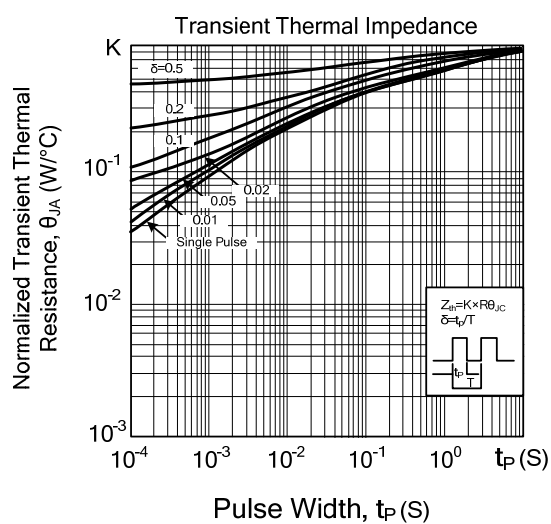
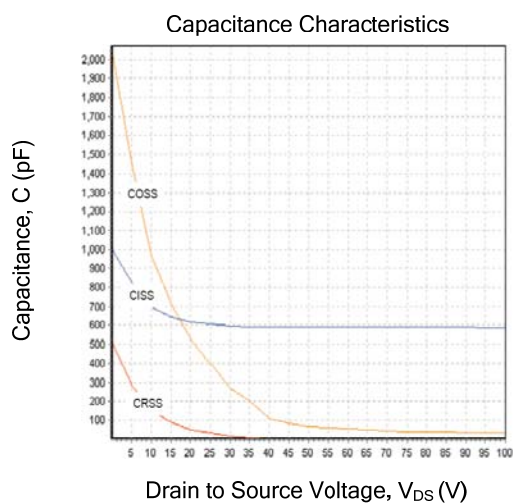
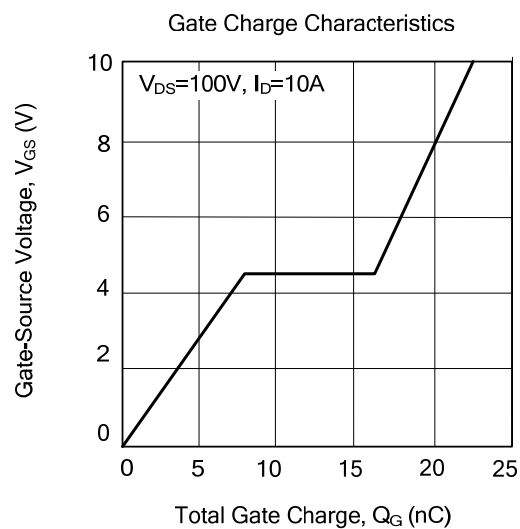
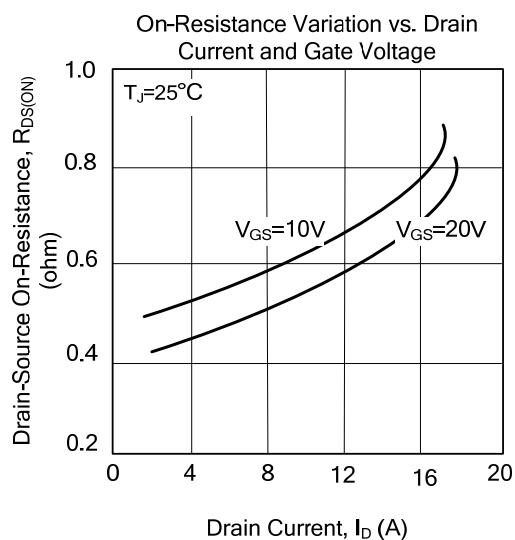


Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



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