



13NM80-Q

Power MOSFET

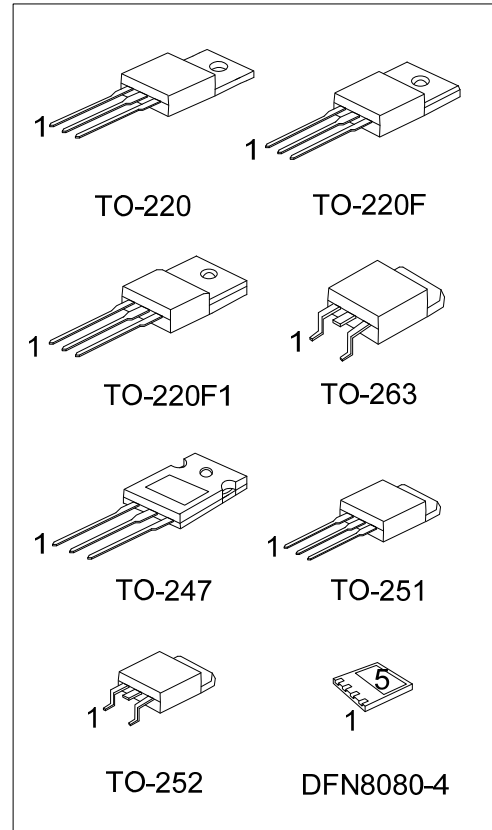
13A, 800V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

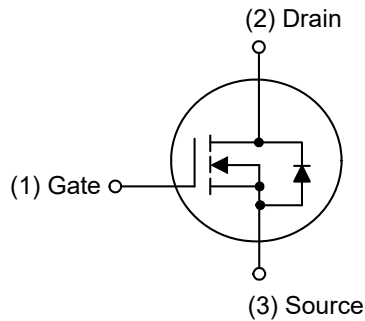
The **UTC 13NM80-Q** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

FEATURES

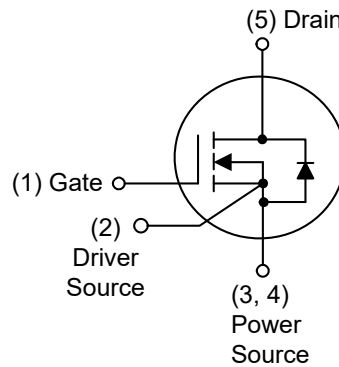
- * $R_{DS(ON)} \leq 0.52 \Omega$ @ $V_{GS}=10V$, $I_D=5.0A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness



SYMBOL



TO-220 / TO-220F / TO-220F1
TO-247 / TO-251 / TO-252 / TO-263

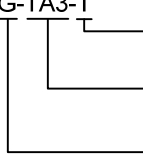


DFN8080-4

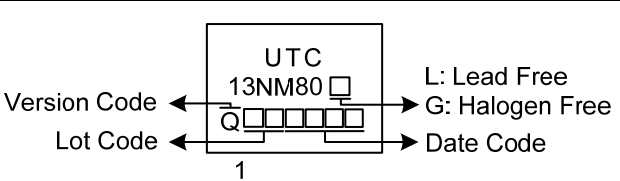
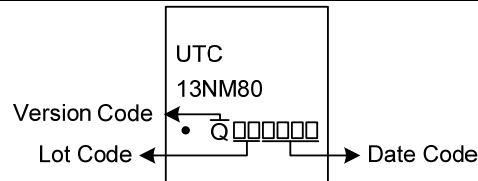
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment					Packing
Lead Free	Halogen Free		1	2	3	4	5	
13NM80L-TA3-T	13NM80G-TA3-T	TO-220	G	D	S	-	-	Tube
13NM80L-TF1-T	13NM80G-TF1-T	TO-220F1	G	D	S	-	-	Tube
13NM80L-TF3-T	13NM80G-TF3-T	TO-220F	G	D	S	-	-	Tube
13NM80L-TM3-T	13NM80G-TM3-T	TO-251	G	D	S	-	-	Tube
13NM80L-TN3-R	13NM80G-TN3-R	TO-252	G	D	S	-	-	Tape Reel
13NM80L-TQ2-T	13NM80G-TQ2-T	TO-263	G	D	S	-	-	Tube
13NM80L-TQ2-R	13NM80G-TQ2-R	TO-263	G	D	S	-	-	Tape Reel
13NM80L-T47-T	13NM80G-T47-T	TO-247	G	D	S	-	-	Tube
13NM80L-K04-8080-R	13NM80G-K04-8080-R	DFN8080-4	G	S	S	S	D	Tape Reel

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

13NM80G-TA3-T  (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F T47: TO-247, TM3: TO-251, TN3: TO-252, TQ2: TO-263, K04-8080: DFN8080-4 (3) G: Halogen Free and Lead Free, L: Lead Free
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■ MARKING

TO-220 / TO-220F / TO-220F1 TO-247 / TO-251 / TO-252 / TO-263	DFN8080-4
 UTC 13NM80 Version Code ← Q □ □ □ □ □ → Date Code Lot Code ← □ □ □ □ □ 1 L: Lead Free G: Halogen Free	 UTC 13NM80 Version Code ← Q □ □ □ □ □ → Date Code Lot Code ← □ □ □ □ □

■ **ABSOLUTE MAXIMUM RATINGS** ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage			V _{DSS}	800	V
Gate-Source Voltage			V _{GSS}	±30	V
Drain Current	Continuous	T _C =25°C	I _D	13	A
		T _C =100°C		8.4	A
	Pulsed (Note 2)		I _{DM}	39	A
Avalanche Energy	Single Pulsed (Note 3)		E _{AS}	480	mJ
Peak Diode Recovery dv/dt (Note 4)			dv/dt	2.3	V/ns
Power Dissipation	TO-220/TO-263		P _D	85	W
	TO-220F/TO-220F1			25	W
	TO-247			110	W
	TO-251/TO-252			34	W
	DFN8080-4			54	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. $L = 100\text{mH}$, $I_{AS} = 3.1\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 13\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-263	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-247		40	$^{\circ}\text{C}/\text{W}$
	TO-251/TO-252		110	$^{\circ}\text{C}/\text{W}$
	DFN8080-4		35	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220/TO-263	θ_{JC}	1.47	$^{\circ}\text{C}/\text{W}$
	TO-220F/TO-220F1		4.46	$^{\circ}\text{C}/\text{W}$
	TO-247		1.14	$^{\circ}\text{C}/\text{W}$
	TO-251/TO-252		3.67 (Note)	$^{\circ}\text{C}/\text{W}$
	DFN8080-4		2.31 (Note)	$^{\circ}\text{C}/\text{W}$

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

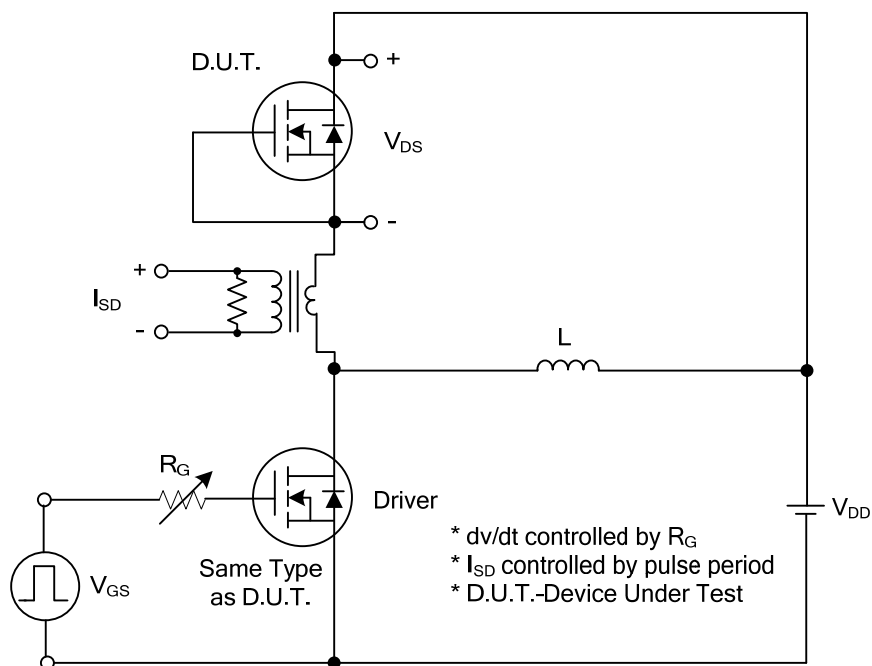
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	800			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =800V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	I _{GSS}	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 =5.0A			0.52	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =50V, f=1MHz		900		pF
Output Capacitance	C _{OSS}			120		pF
Reverse Transfer Capacitance	C _{RSS}			3.4		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q _G	V _{DS} =640V, V _{GS} =10V, I _D =13A (Note 1, 2)		48		nC
Gate-Source Charge	Q _{GS}			12		nC
Gate-Drain Charge	Q _{DD}			18		nC
Turn-On Delay Time	t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =13A, R _G =25Ω (Note 1, 2)		13		ns
Turn-On Rise Time	t _R			24		ns
Turn-Off Delay Time	t _{D(OFF)}			105		ns
Turn-Off Fall Time	t _F			42		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I _S				13	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				39	A
Drain-Source Diode Forward Voltage	V _{SD}	I _S =13A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time	t _{rr}	I _S =13A, V _{GS} =0V,		440		nS
Body Diode Reverse Recovery Charge	Q _{rr}	dI _F /dt=100A/μs		7.3		μC

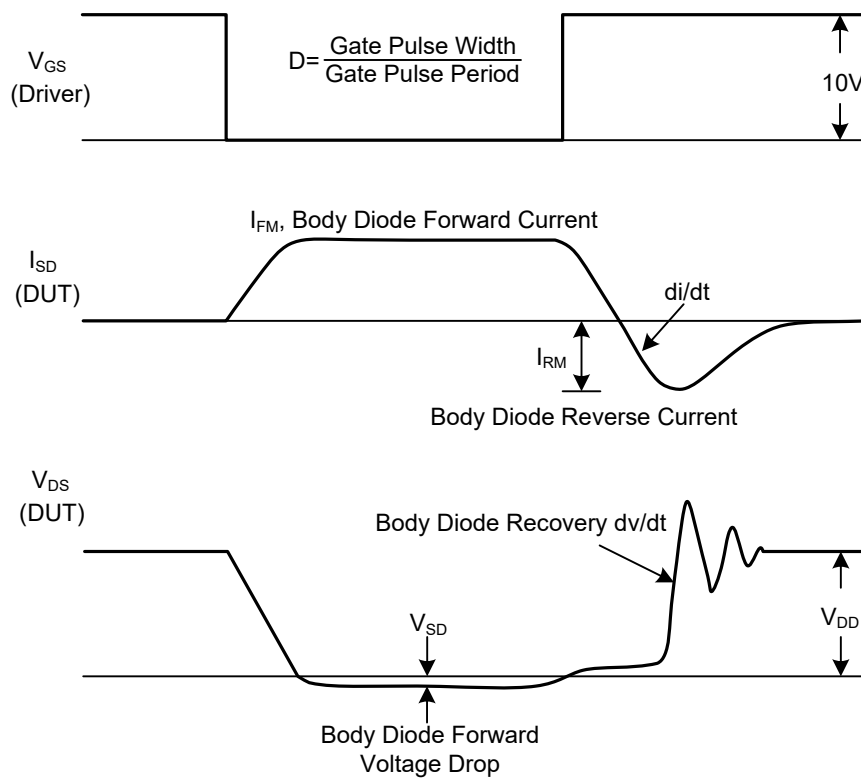
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

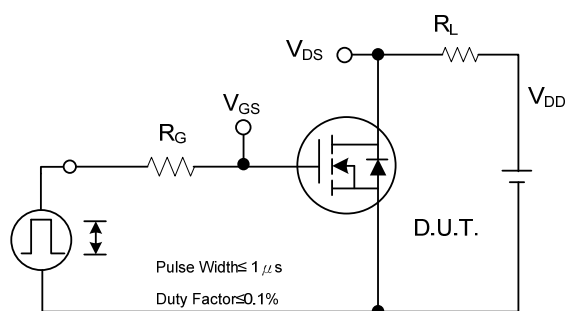


Peak Diode Recovery dv/dt Test Circuit

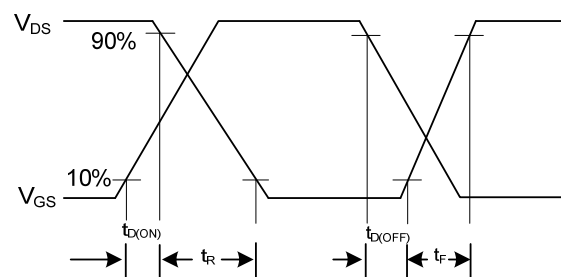


Peak Diode Recovery dv/dt Waveforms

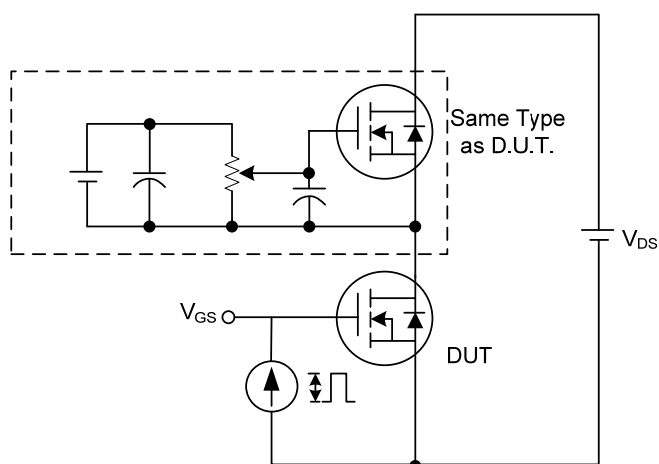
■ TEST CIRCUITS AND WAVEFORMS



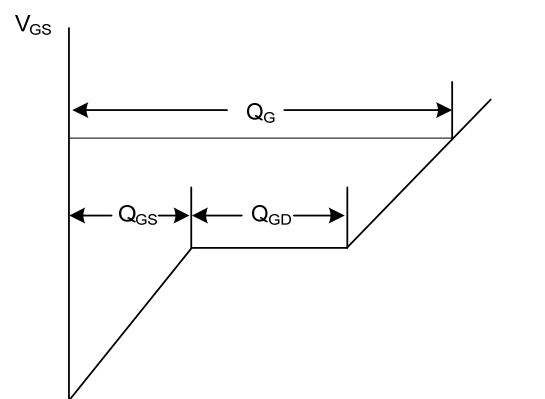
Switching Test Circuit



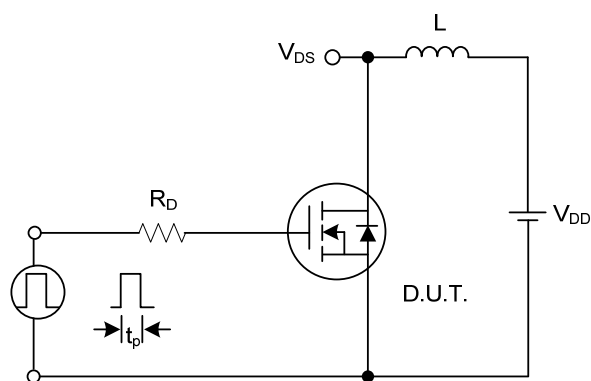
Switching Waveforms



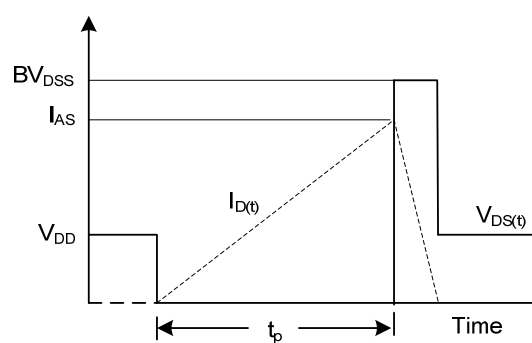
Gate Charge Test Circuit



Charge
Gate Charge Waveform

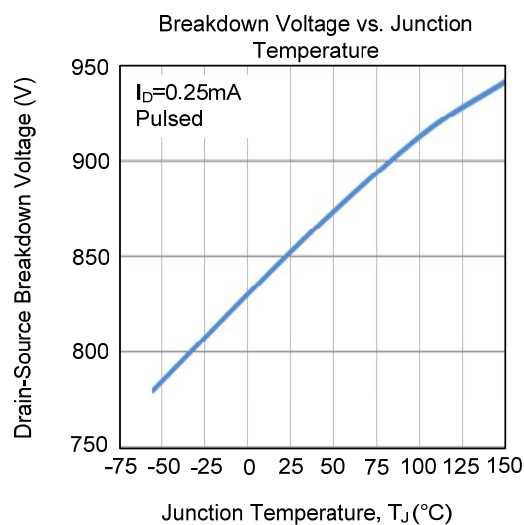
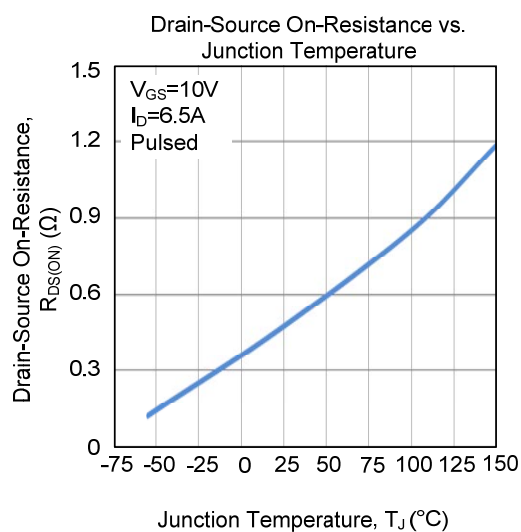
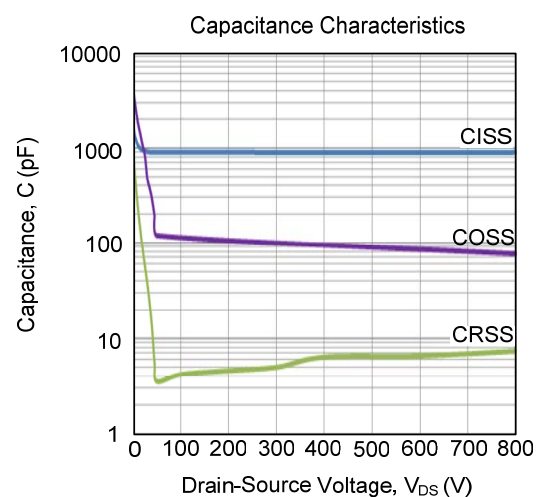
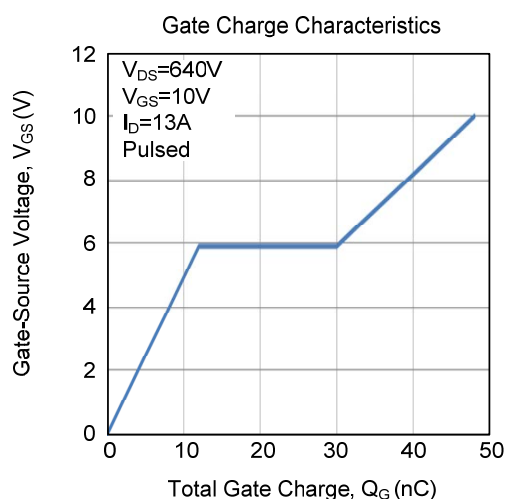
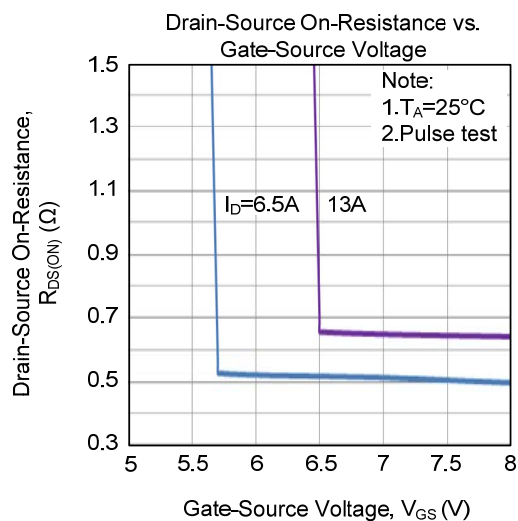
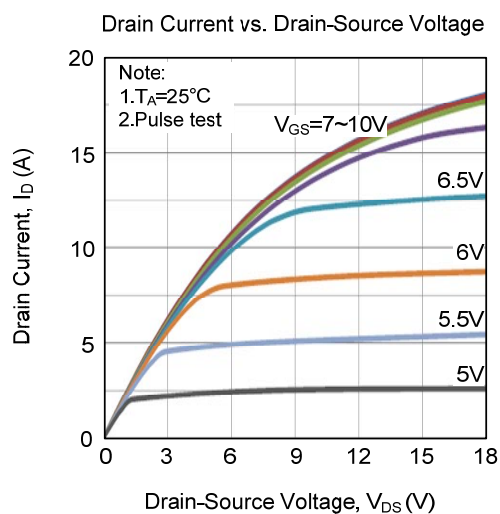


Unclamped Inductive Switching Test Circuit

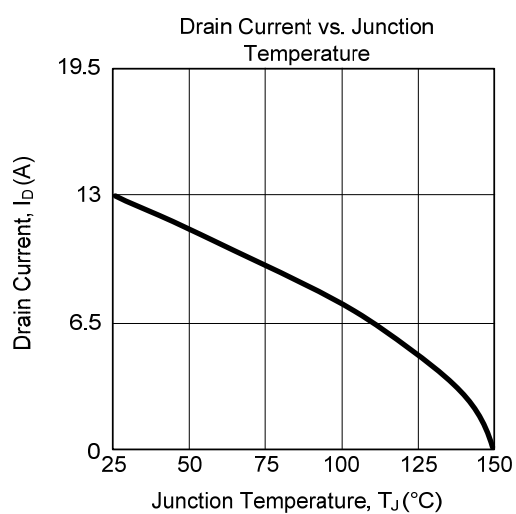
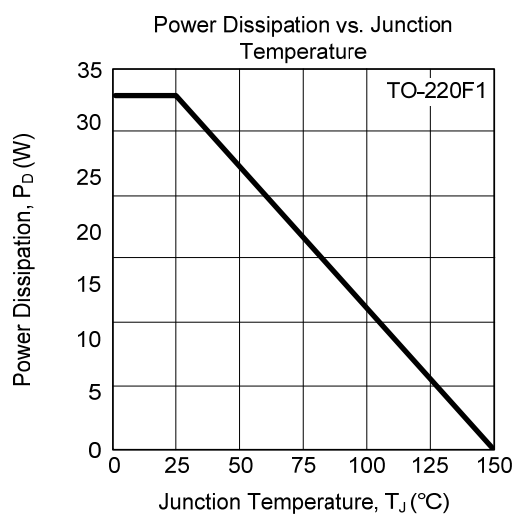
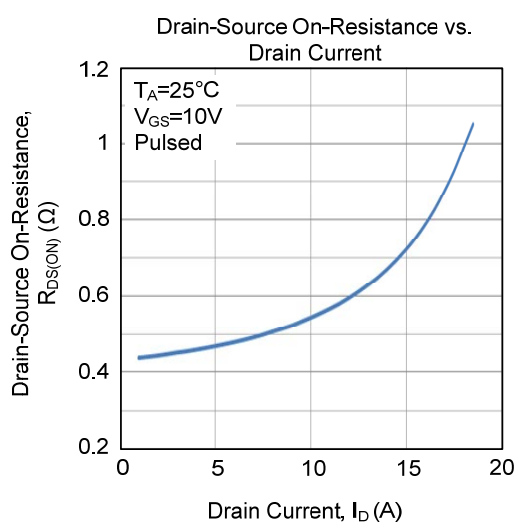
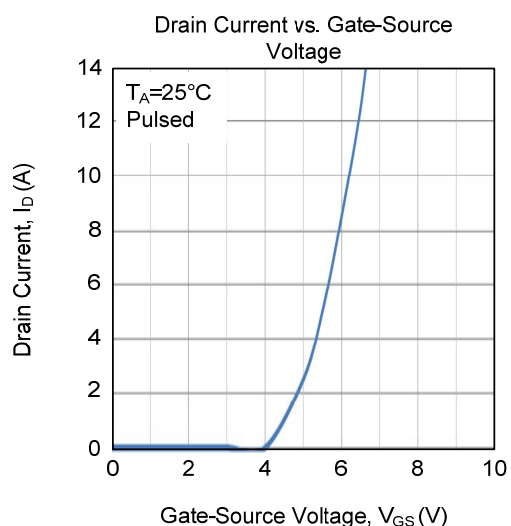
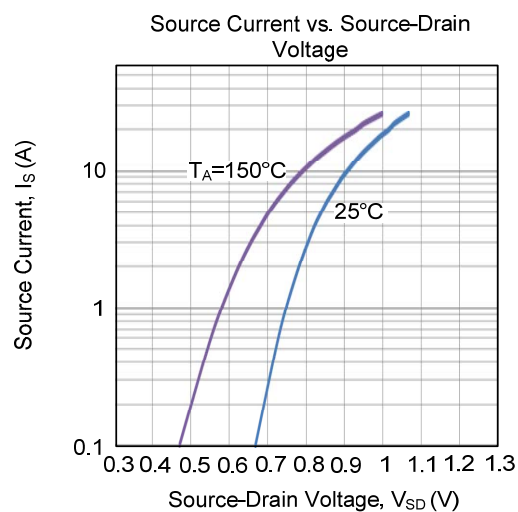
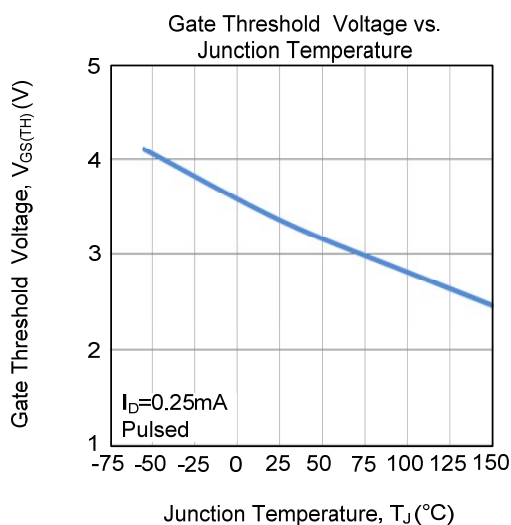


Unclamped Inductive Switching Waveforms

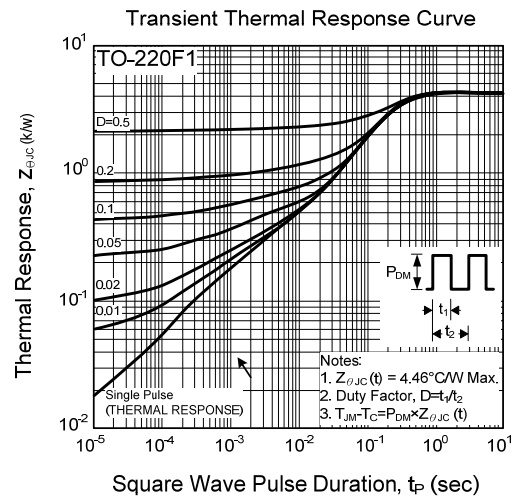
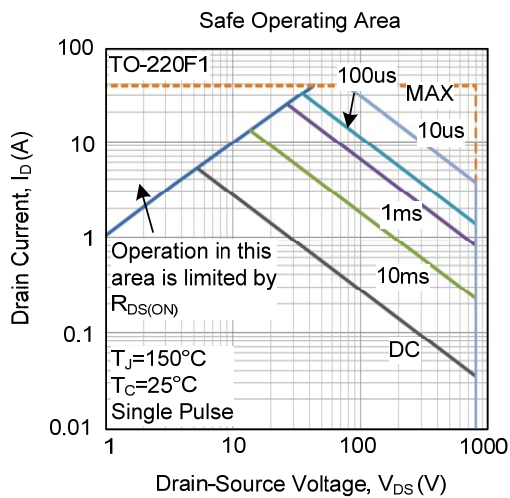
TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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