



UD6604-H

Power MOSFET

20V COMPLEMENTARY MOSFET

DESCRIPTION

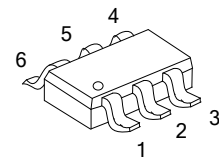
The UTC **UD6604-H** is a 20V complementary MOSFET, it uses UTC's advanced technology to provide the customers a minimum on state resistance, etc.

The UTC **UD6604-H** is suitable for load switch and battery protection applications.

FEATURES

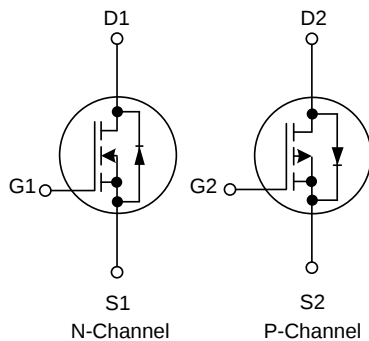
- * 3.4A, 20V, $R_{DS(ON)} \leq 40 \text{ m}\Omega$ @ $V_{GS}=4.5\text{V}$, $I_D=3.4\text{A}$
 $R_{DS(ON)} \leq 55 \text{ m}\Omega$ @ $V_{GS}=2.5\text{V}$, $I_D=3.0\text{A}$
 $R_{DS(ON)} \leq 80 \text{ m}\Omega$ @ $V_{GS}=1.8\text{V}$, $I_D=2.0\text{A}$
- 2.5A, -20V, $R_{DS(ON)} \leq 66\text{m}\Omega$ @ $V_{GS}=-4.5\text{V}$, $I_D=-2.5\text{A}$
 $R_{DS(ON)} \leq 83 \text{ m}\Omega$ @ $V_{GS}=-2.5\text{V}$, $I_D=-2.0\text{A}$
 $R_{DS(ON)} \leq 93 \text{ m}\Omega$ @ $V_{GS}=-1.8\text{V}$, $I_D=-1.0\text{A}$

* Low $R_{DS(ON)}$



SOT-26

SYMBOL



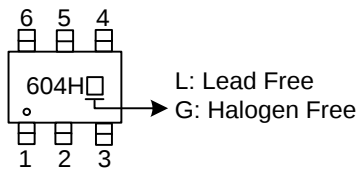
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment						Packing
Lead Free	Halogen Free		1	2	3	4	5	6	
UD6604G-AG6-R	UD6604G-AG6-R	SOT-26	G1	S2	G2	D2	S1	D1	Tape Reel

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

UD6604G-AG6-R	(1)Packing Type	(1) R: Tape Reel
	(2)Package Type	(2) AG6: SOT-26
	(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_A=25°C unless otherwise noted)

PARAMETER		SYMBOL	RATINGS		UNIT
			N-CHANNEL	P-CHANNEL	
Drain-Source Voltage		V _{DSS}	20	-20	V
Gate-Source Voltage		V _{GSS}	±8	±8	V
Continuous Drain Current	T _A =25°C	I _D	3.4	-2.5	A
	T _A =70°C		2.5	-2	A
Pulsed Drain Current (Note 3)		I _{DM}	13	-13	A
Power Dissipation (Note 2)	T _A =25°C	P _D	1.1	1.1	W
	T _A =70°C		0.7	0.7	W
Operating Temperature Range		T _J	-55 ~ +150		°C
Storage Temperature Range		T _{STG}	-55 ~ +150		°C

Note: 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.

■ THERMAL CHARACTERISTICS

PARAMETER		SYMBOL	TYP	MAX	UNIT
Junction-to-Ambient (Note 1)	t ≤ 10s	θ _{JA}	78	110	°C/W
Junction-to-Ambient (Note 1, 4)	Steady-State		106	150	°C/W

ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$ unless otherwise noted)

N-CHANNEL

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	20			V
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =20V, V _{GS} =0V			1	μA
			V _{DS} =20V, V _{GS} =0V, T _J =55°C			5	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =+8V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-8V, V _{DS} =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	0.4	0.7	1	V
On State Drain Current		I _{D(ON)}	V _{GS} =4.5V, V _{DS} =5V	13			A
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =4.5V, I _D =3.4A			40	mΩ
			V _{GS} =4.5V, I _D =3.4A, T _J =125°C			85	mΩ
			V _{GS} =2.5V, I _D =3.0A			55	mΩ
			V _{GS} =1.8V, I _D =2.0A			80	mΩ
Forward Transconductance		g _{FS}	V _{DS} =5V, I _D =3.4A		16		S
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =15V, f=1.0MHz		290		pF
Output Capacitance		C _{OSS}			45		pF
Reverse Transfer Capacitance		C _{RSS}			40		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{GS} =4.5V, V _{DS} =10V, I _D =4A		5.5		nC
Gate to Source Charge		Q _{GS}			1		nC
Gate to Drain Charge		Q _{GD}			0.6		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DS} =10V, V _{GS} =4.5V, I _D =1A R _G =25Ω		2.9		ns
Turn-ON Rise Time		t _R			8.4		ns
Turn-OFF Delay Time		t _{D(OFF)}			19.2		ns
Turn-OFF Fall-Time		t _F			5.6		ns
SOURCE TO DRAIN DIODE SPECIFICATIONS							
Diode Forward Voltage		V _{SD}	I _S =1A, V _{GS} =0V		0.7	1	V
Maximum Body-Diode Continuous Current		I _S				1.5	A
Body Diode Reverse Recovery Time		t _{rr}	I _F =3.4A, dI/dt=100A/μs		14	19	ns
Body Diode Reverse Recovery Charge		Q _{rr}			3.8		nC

Notes: 1. The value of θ_{JA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design.

2. The power dissipation P_D is based on $T_{J(MAX)}=150^\circ\text{C}$, using $\leq 10\text{s}$ junction-to-ambient thermal resistance.

3. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^\circ\text{C}$. Ratings are based on low frequency and duty cycles to keep initial $T_J=25^\circ\text{C}$.

4. The θ_{JA} is the sum of the thermal impedance from junction to lead θ_{JL} and lead to ambient.

ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$ unless otherwise noted)

P-CHANNEL

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =-250μA, V _{GS} =0V	-20			V
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =-20V, V _{GS} =0V			-1	μA
			V _{DS} =-20V, V _{GS} =0V, T _J =55°C			-5	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =+8V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-8V, V _{DS} =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =-250μA	-0.4	-0.65	-1	V
On State Drain Current		I _{D(ON)}	V _{GS} =-4.5V, V _{DS} =-5V	-13			A
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =-4.5V, I _D =-2.5A			66	mΩ
			V _{GS} =-4.5V, I _D =-2.5A, T _J =125°C			105	mΩ
			V _{GS} =-2.5V, I _D =-2.0A			83	mΩ
			V _{GS} =-1.8V, I _D =-1.0A			93	mΩ
Forward Transconductance		g _{FS}	V _{DS} =-5V, I _D =-2.5A		13		S
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =-15V, f=1.0MHz		290		pF
Output Capacitance		C _{OSS}			45		pF
Reverse Transfer Capacitance		C _{RSS}			40		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{GS} =-4.5V, V _{DS} =-10V, I _D =-3A		5.5		nC
Gate to Source Charge		Q _{GS}			1		nC
Gate to Drain Charge		Q _{GD}			0.6		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DS} =-10V, V _{GS} =-4.5V, I _D =1A R _G =25Ω		5		ns
Turn-ON Rise Time		t _R			17.4		ns
Turn-OFF Delay Time		t _{D(OFF)}			40.7		ns
Turn-OFF Fall-Time		t _F			11.4		ns
SOURCE TO DRAIN DIODE SPECIFICATIONS							
Diode Forward Voltage		V _{SD}	I _S =-1A, V _{GS} =0V		-0.7	-1	V
Maximum Body-Diode Continuous Current		I _S				-1.5	A
Body Diode Reverse Recovery Time		t _{rr}	I _F =-2.5A, dI/dt=100A/μs		37	49	ns
Body Diode Reverse Recovery Charge		Q _{rr}			27		nC

Notes: 1. The value of θ_{JA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design.

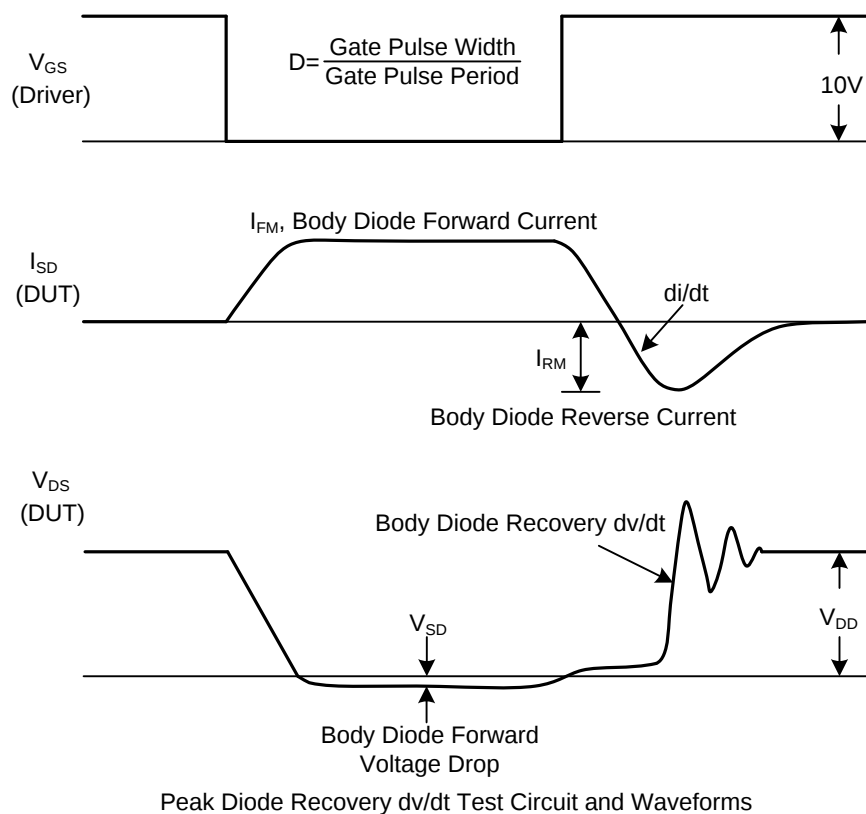
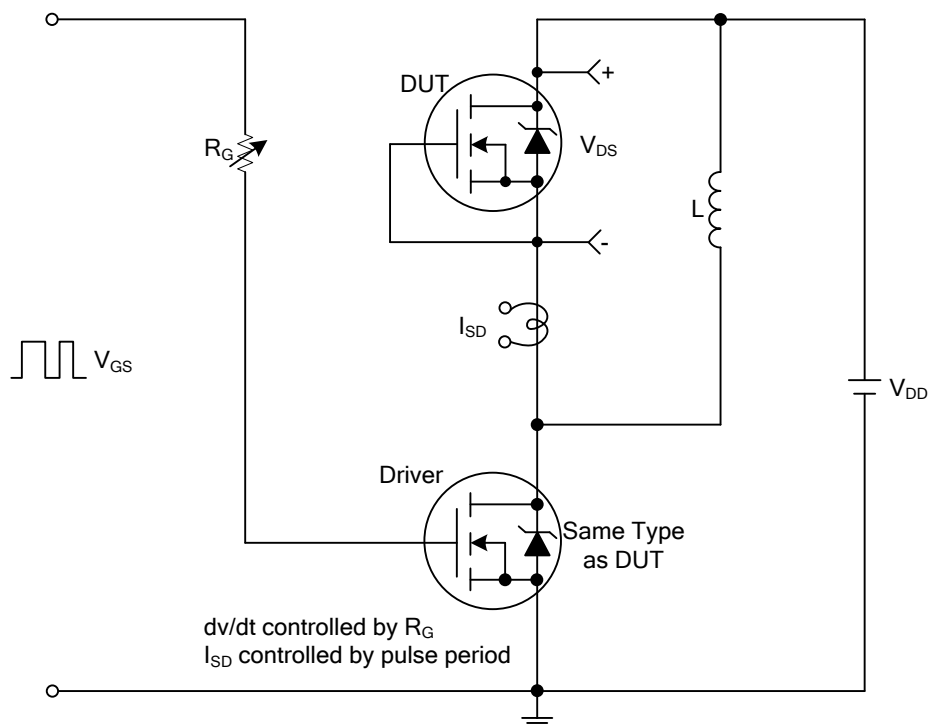
2. The power dissipation P_D is based on $T_{J(MAX)}=150^\circ\text{C}$, using $\leq 10\text{s}$ junction-to-ambient thermal resistance.

3. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^\circ\text{C}$. Ratings are based on low frequency and duty cycles to keep initial $T_J=25^\circ\text{C}$.

4. The θ_{JA} is the sum of the thermal impedance from junction to lead θ_{JL} and lead to ambient.

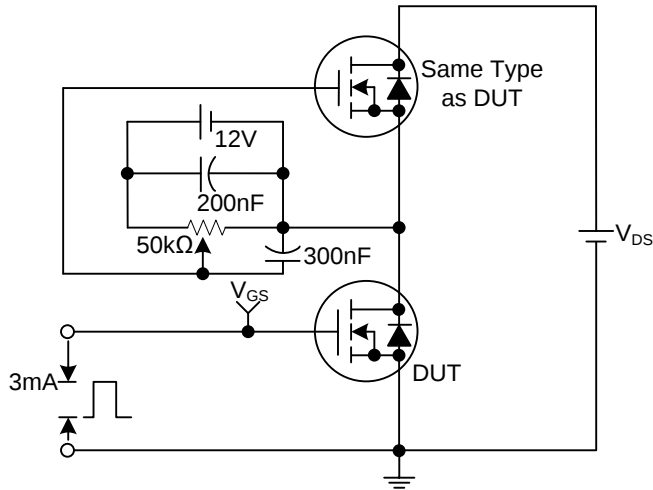
■ TEST CIRCUITS AND WAVEFORMS

N-CHANNEL

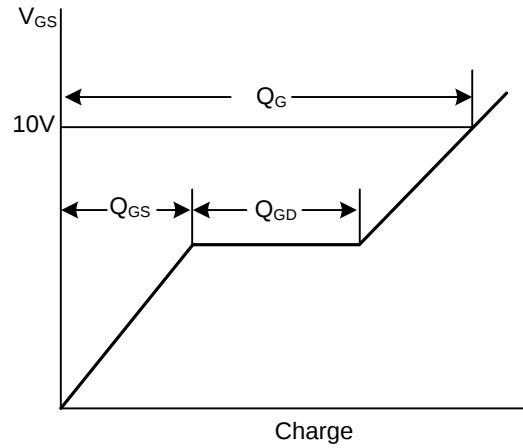


■ TEST CIRCUITS AND WAVEFORMS

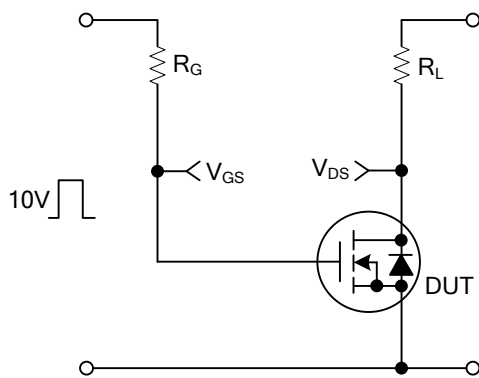
N-CHANNEL



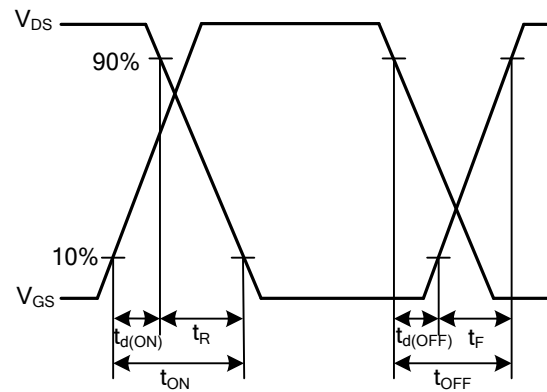
Gate Charge Test Circuit



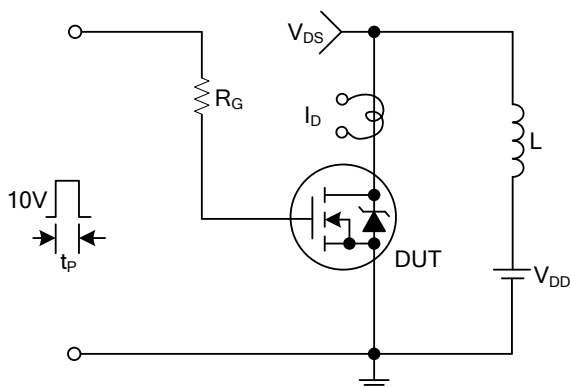
Gate Charge Waveforms



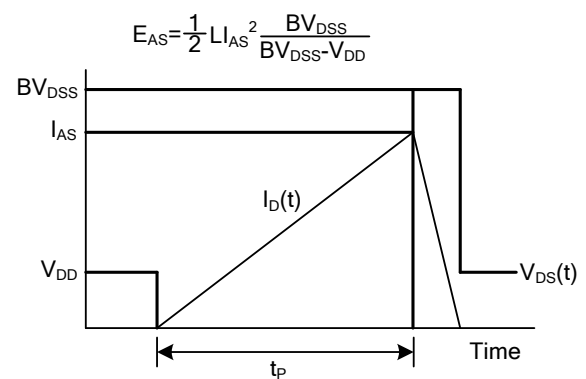
Resistive Switching Test Circuit



Resistive Switching Waveforms



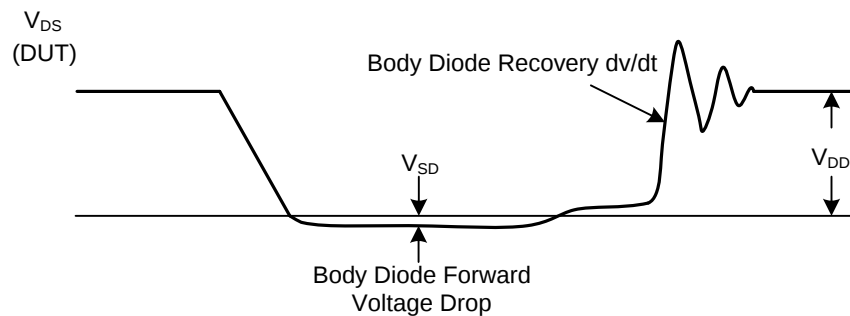
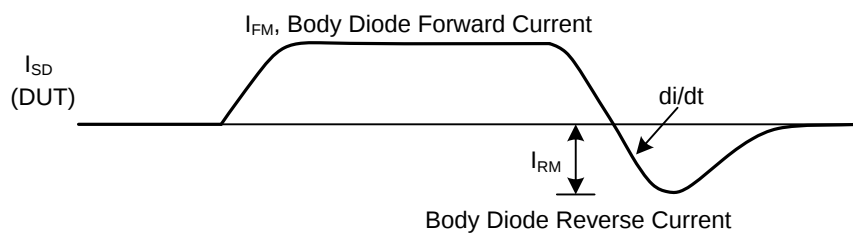
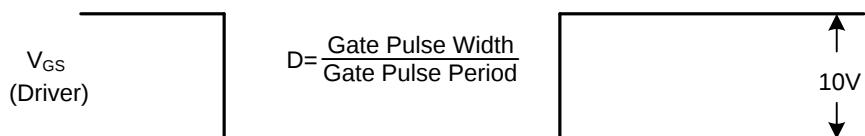
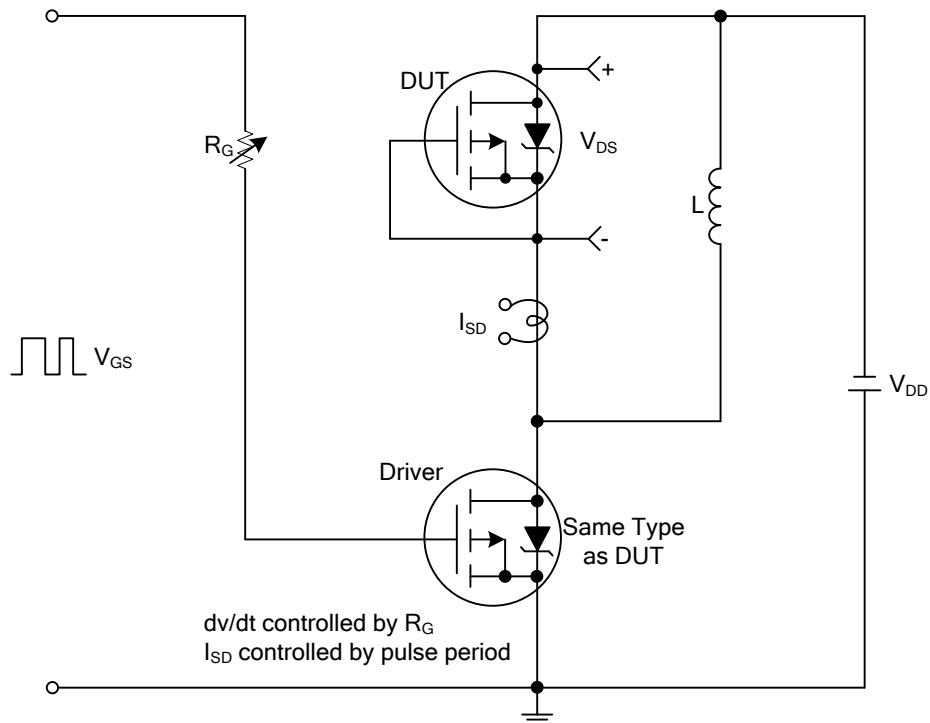
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS

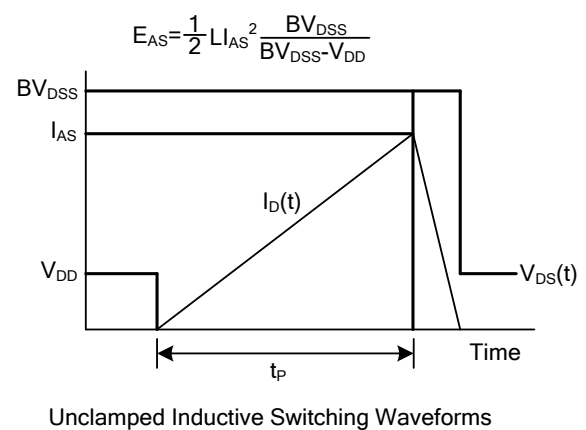
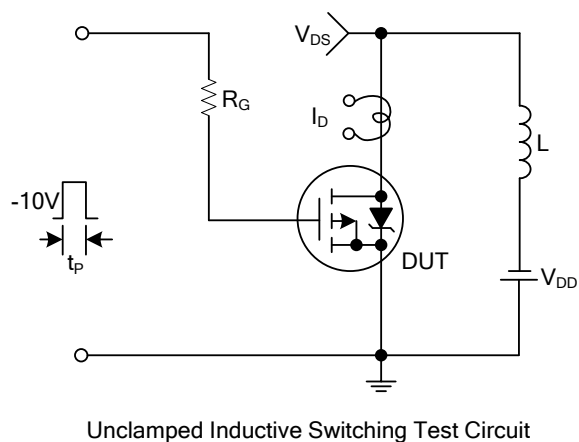
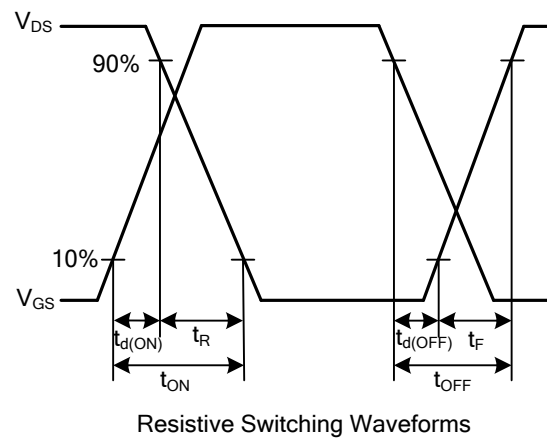
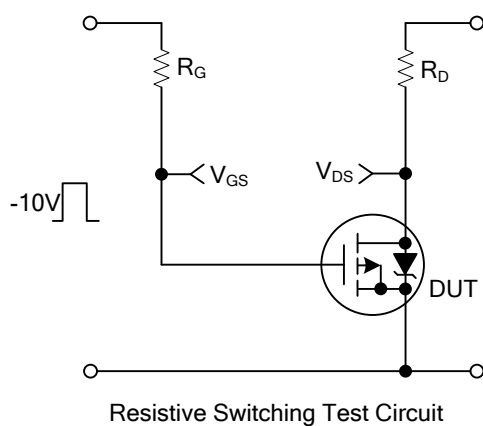
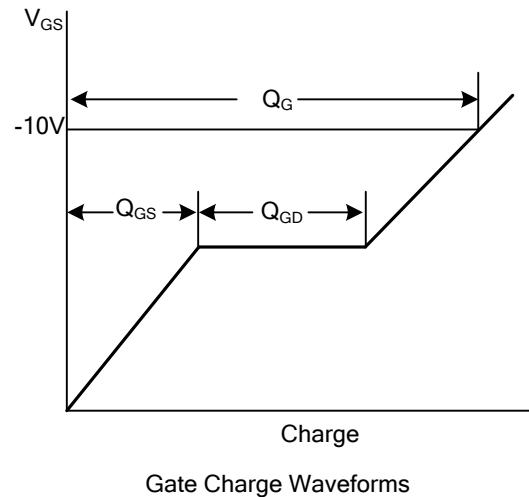
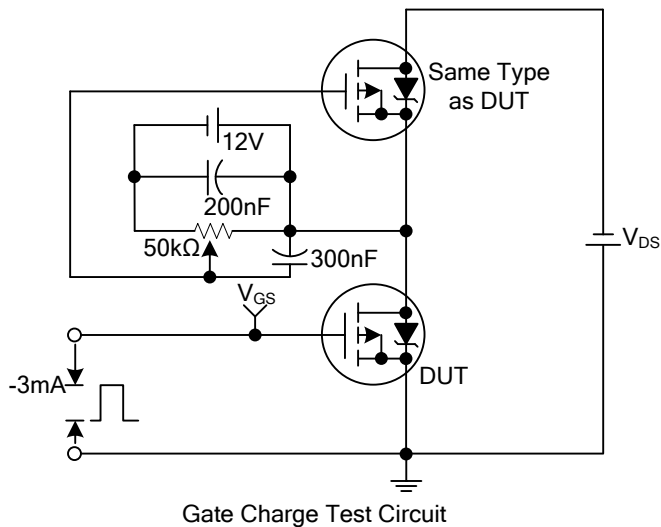
P-CHANNEL



Peak Diode Recovery dv/dt Test Circuit and Waveforms

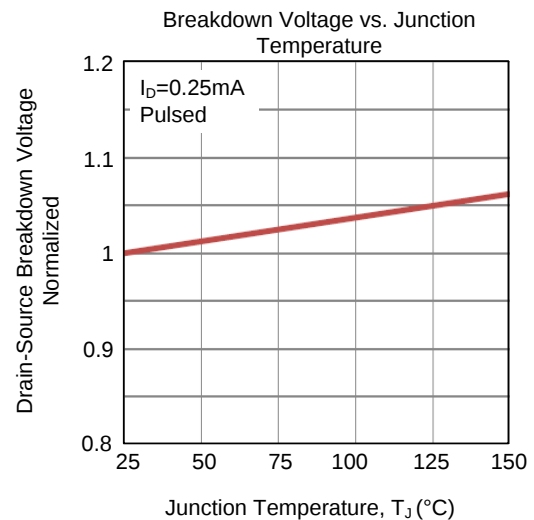
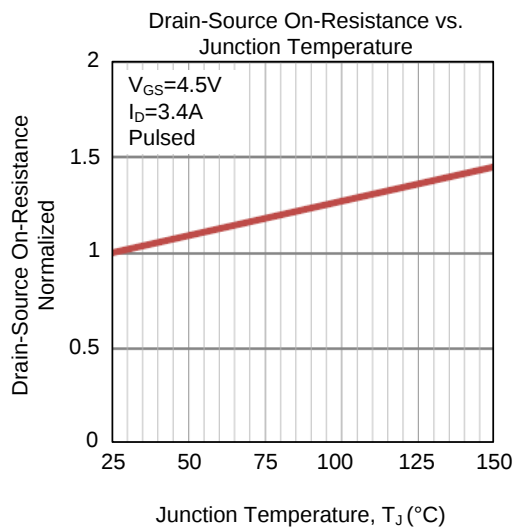
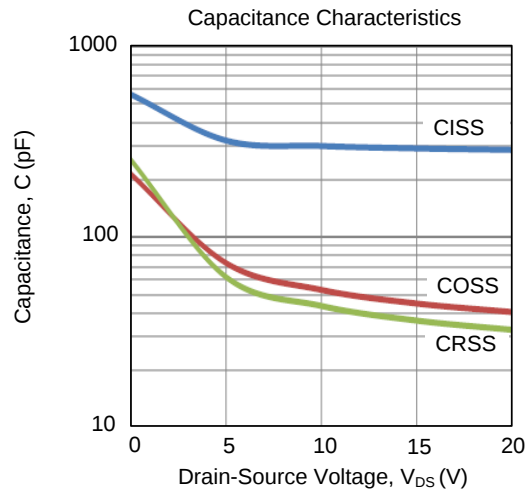
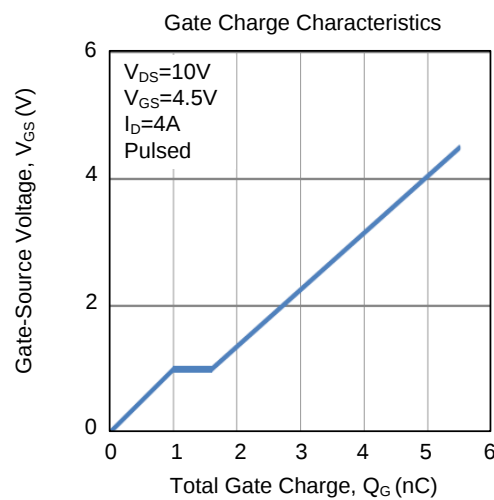
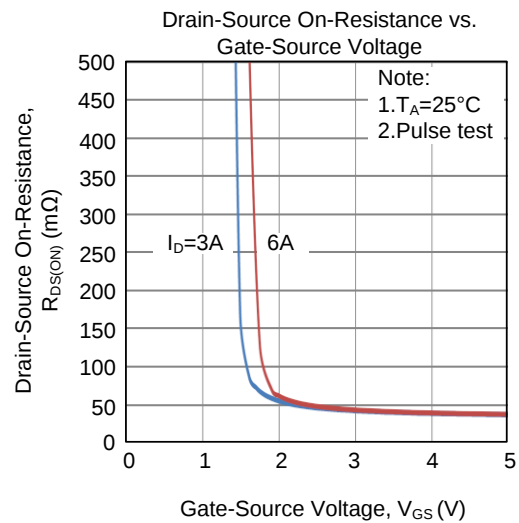
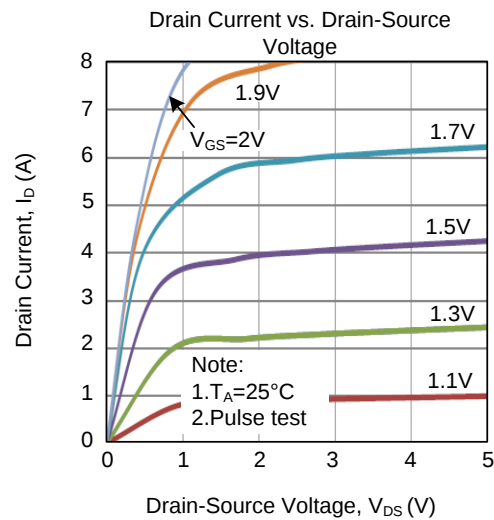
■ TEST CIRCUITS AND WAVEFORMS

P-CHANNEL



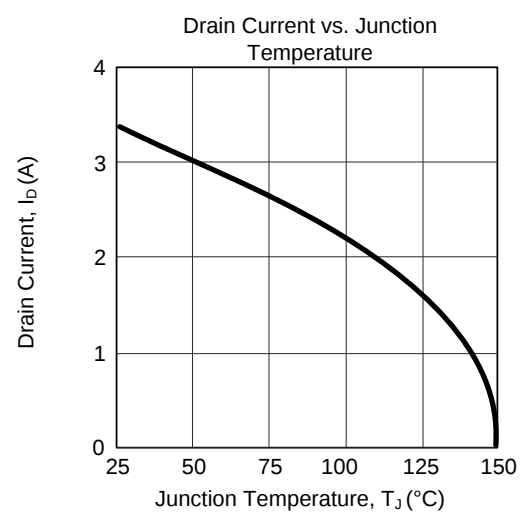
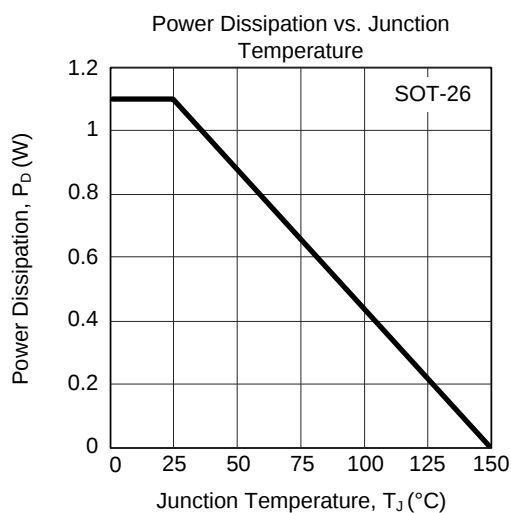
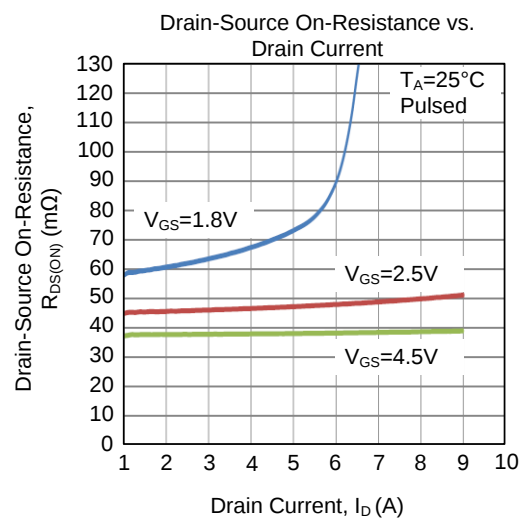
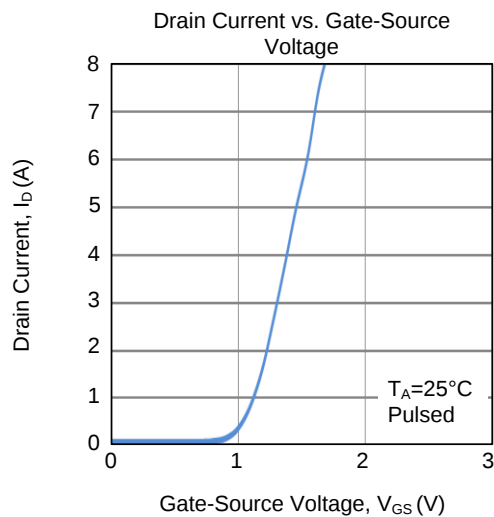
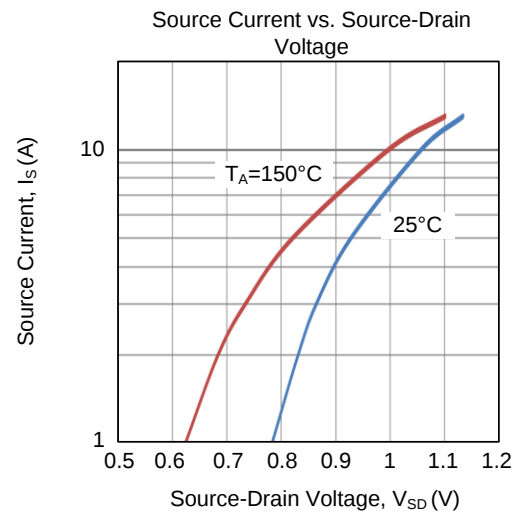
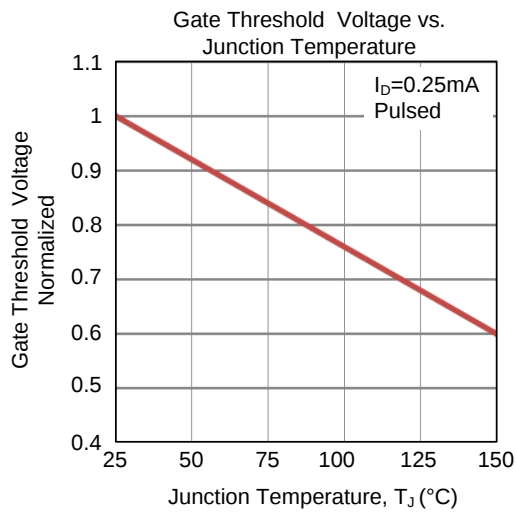
TYPICAL CHARACTERISTICS

N-CHANNEL



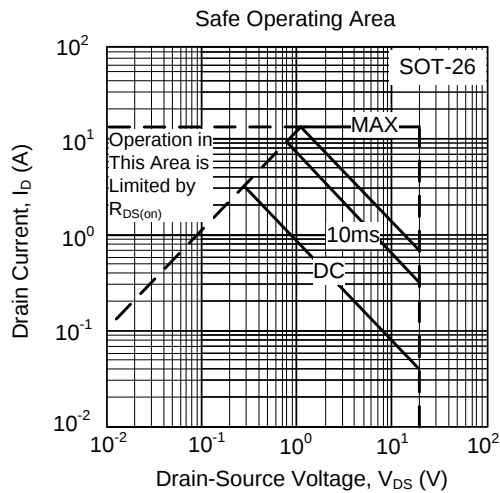
TYPICAL CHARACTERISTICS (Cont.)

N-CHANNEL

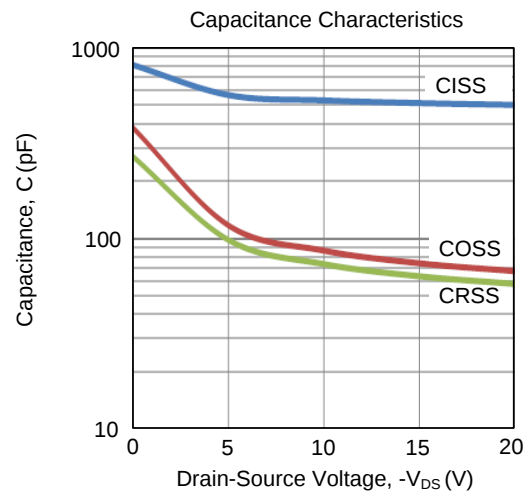
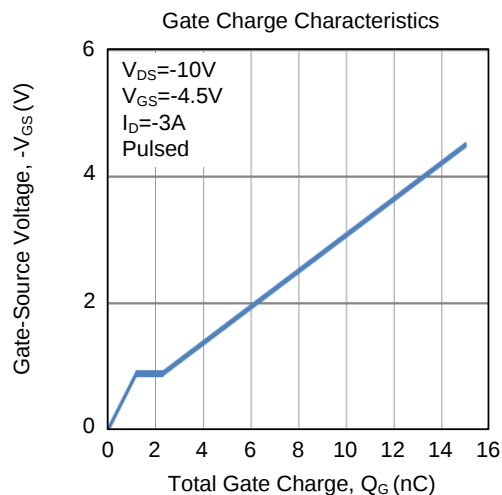
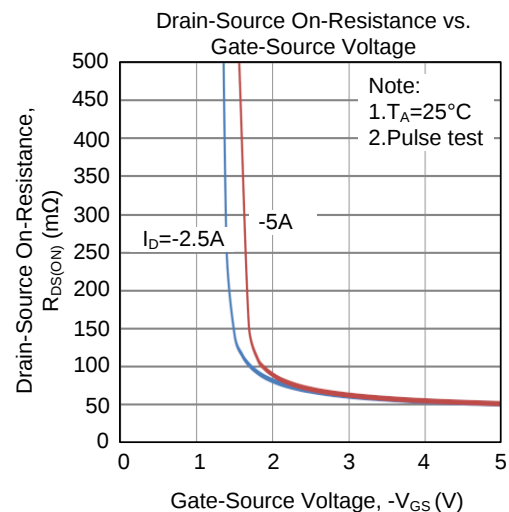
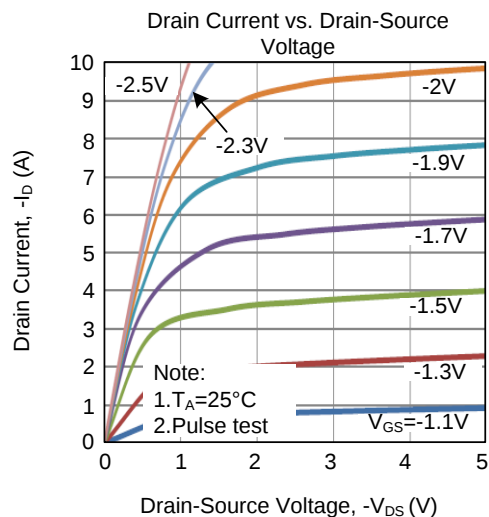


■ TYPICAL CHARACTERISTICS (Cont.)

N-CHANNEL

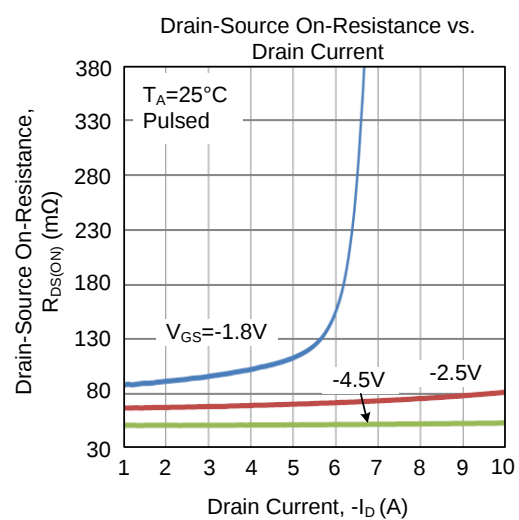
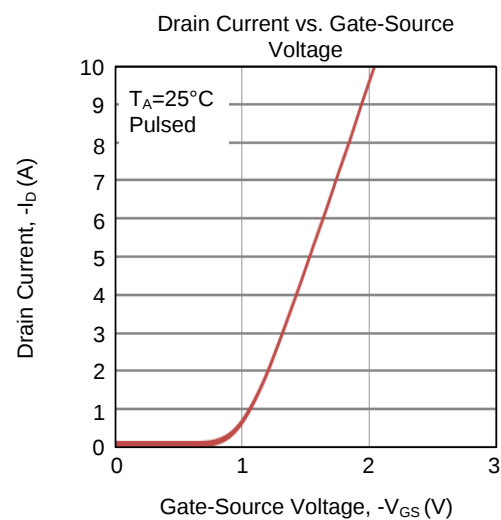
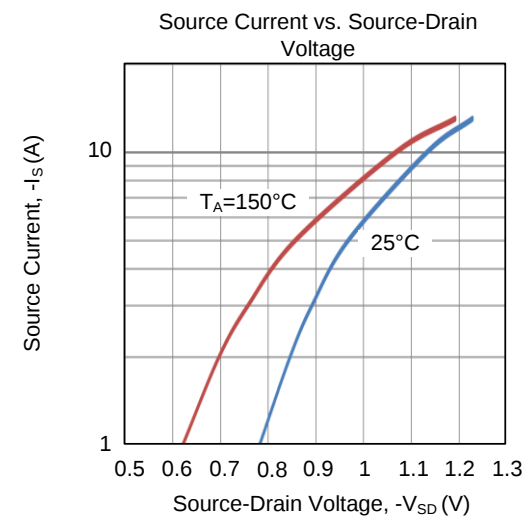
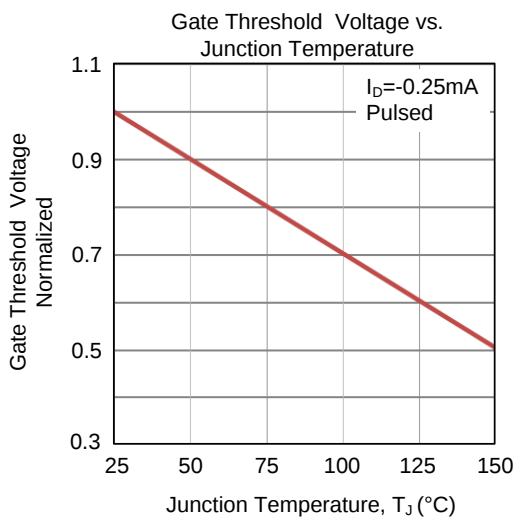
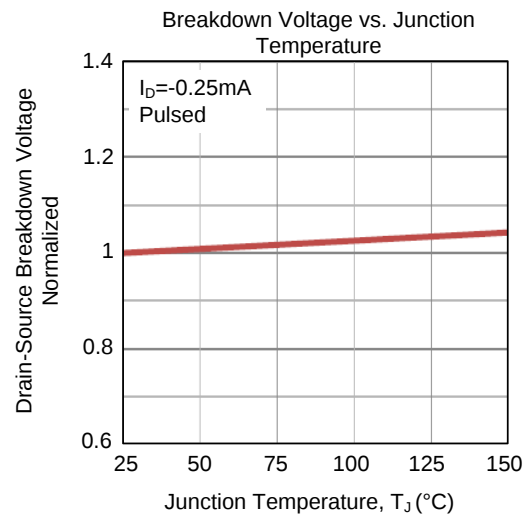
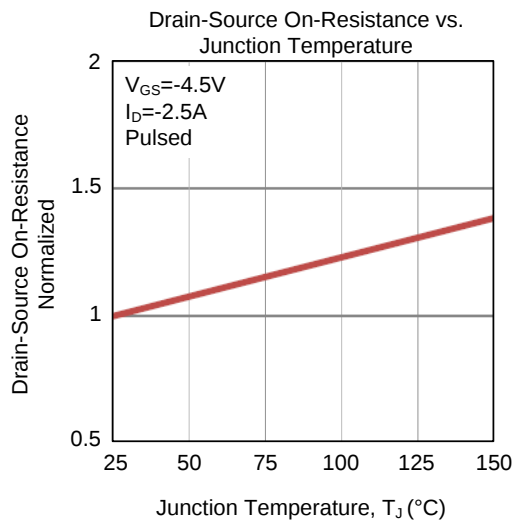


P-CHANNEL



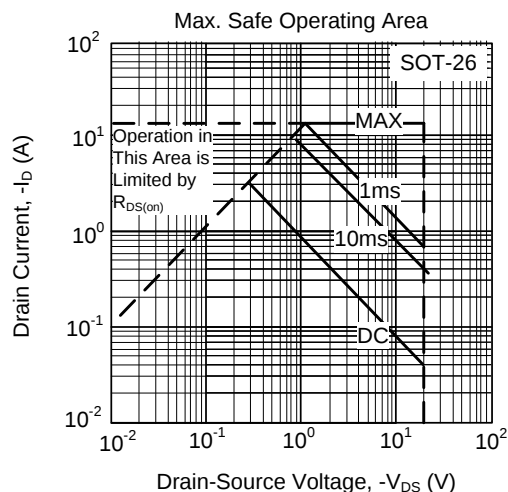
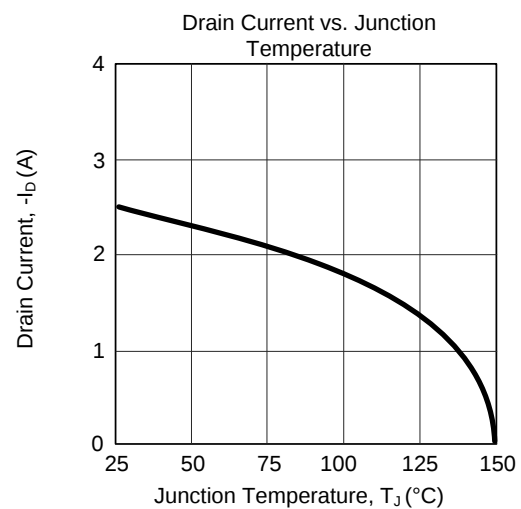
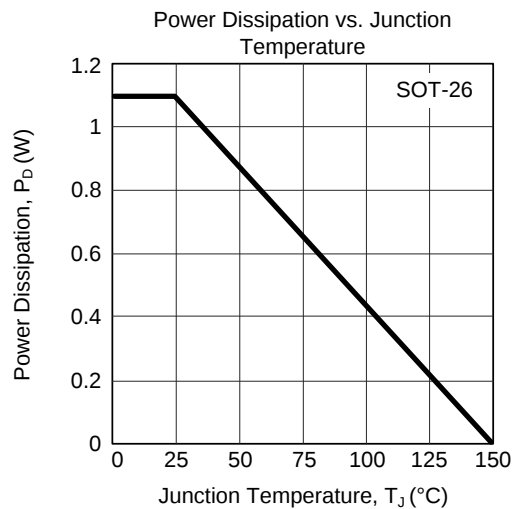
■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL



■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL



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