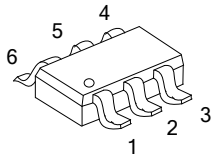
UD6604-H

Power MOSFET

20V COMPLEMENTARY MOSFET



SOT-26

■ DESCRIPTION

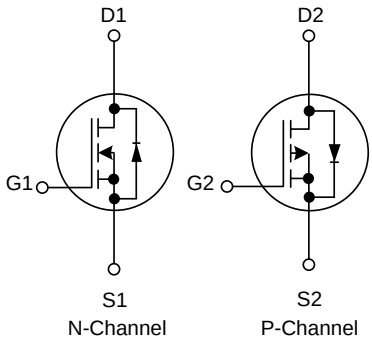
The UTC **UD6604-H** is a 20V complementary MOSFET, it uses UTC's advanced technology to provide the customers a minimum on state resistance, etc.

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

■ FEATURES

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

■ SYMBOL



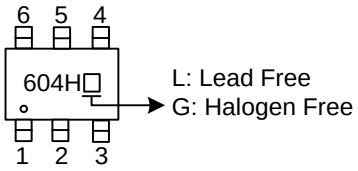
■ ORDERING INFORMATION

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 (2)Package Type (3)Green Package	(1) R: Tape Reel (2) AG6: SOT-26 (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°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 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°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°C, using≤10s junction-to-ambient thermal resistance.
3. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and duty cycles to keep initial T_J=25°C.
4. The θ_{JA} is the sum of the thermal impedence from junction to lead θ_{JL} and lead to ambient.

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

P-CHANNEL

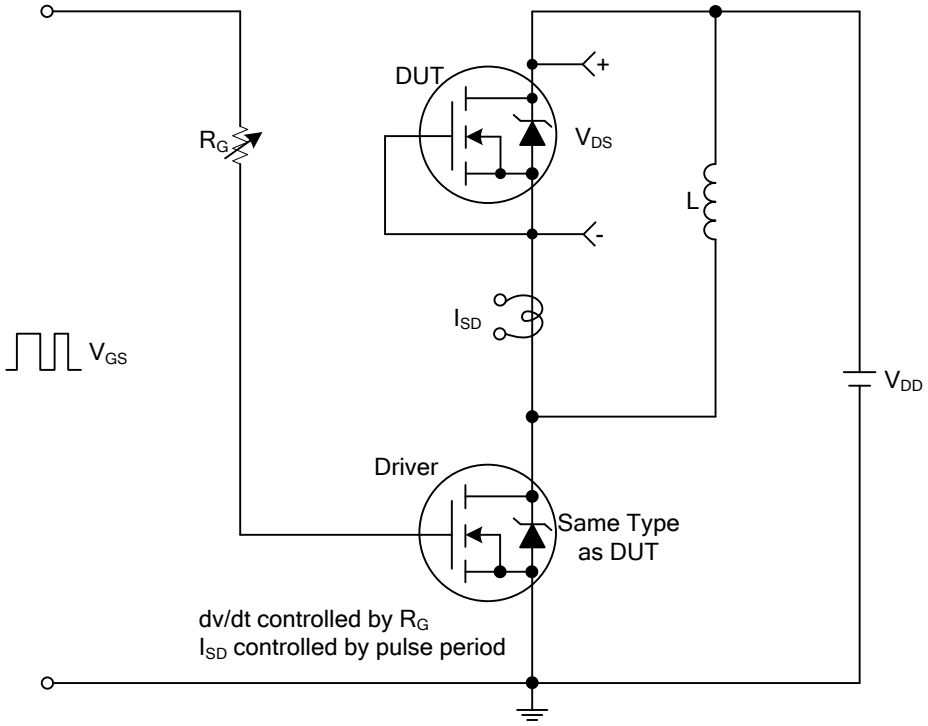
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=-250μA, V_{GS}=0V	-20			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=-20V, V_{GS}=0V			-1	μA
			V_{DS}=-20V, V_{GS}=0V, T_J=55°C			-5	μA
Gate-Source Leakage Current	Forward	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

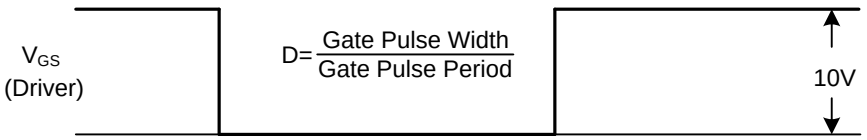
Notes: 1. The value of θ_{JA} is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design.

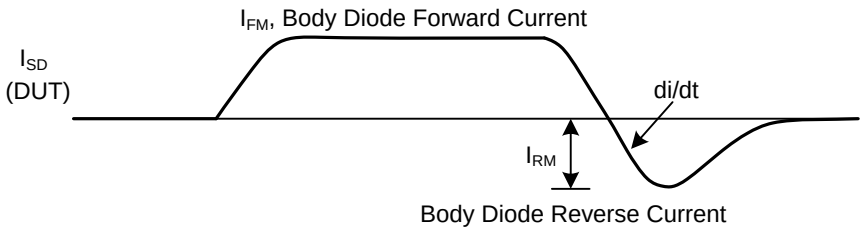
2. The power dissipation P_D is based on $T_{J(MAX)}$=150°C, using≤10s junction-to-ambient thermal resistance.
3. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and duty cycles to keep initial T_J=25°C.
4. The θ_{JA} is the sum of the thermal impedence from junction to lead θ_{JL} and lead to ambient.

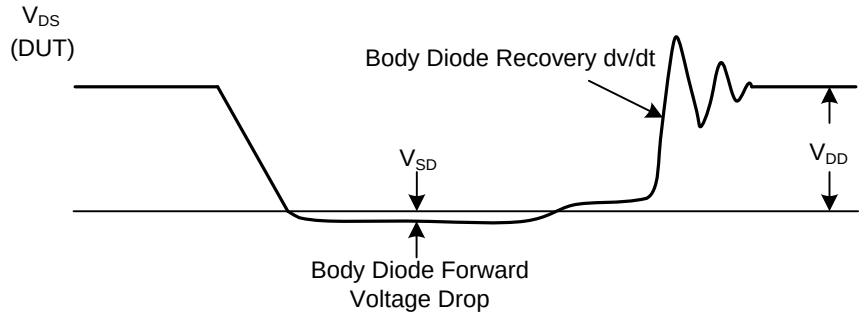
■ TEST CIRCUITS AND WAVEFORMS

N-CHANNEL





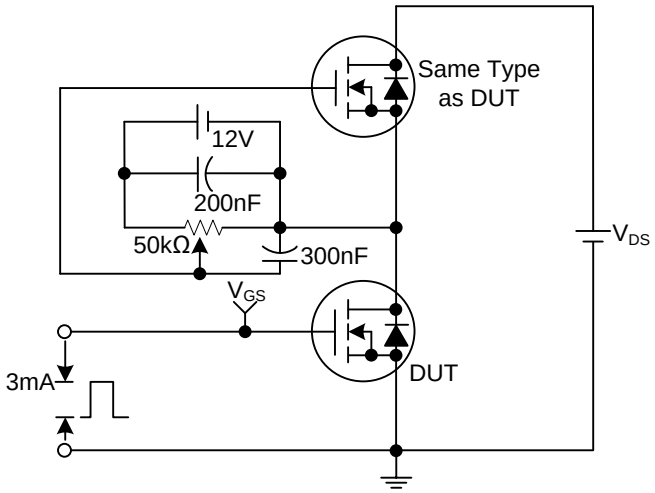




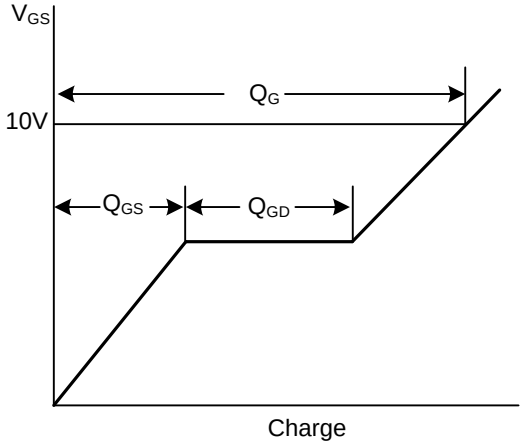
Peak Diode Recovery dv/dt Test Circuit and Waveforms

■ TEST CIRCUITS AND WAVEFORMS

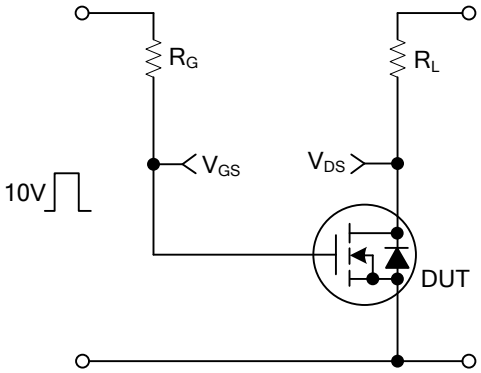
N-CHANNEL



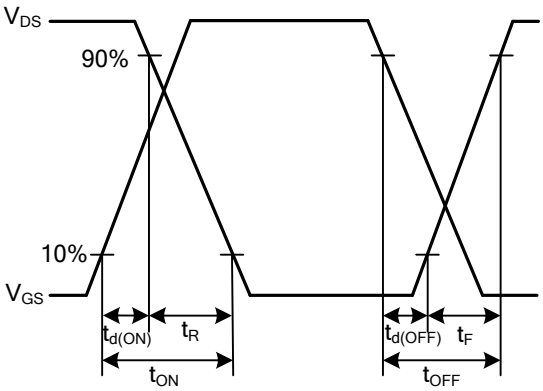
Gate Charge Test Circuit



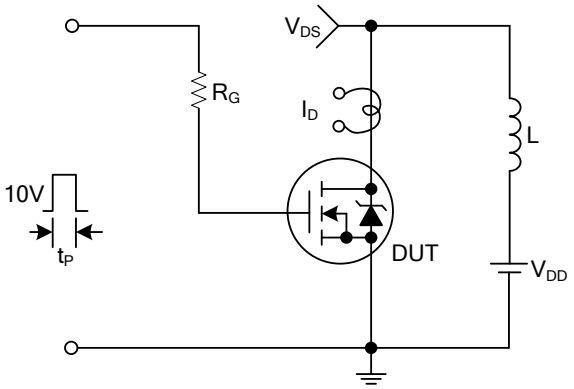
Gate Charge Waveforms



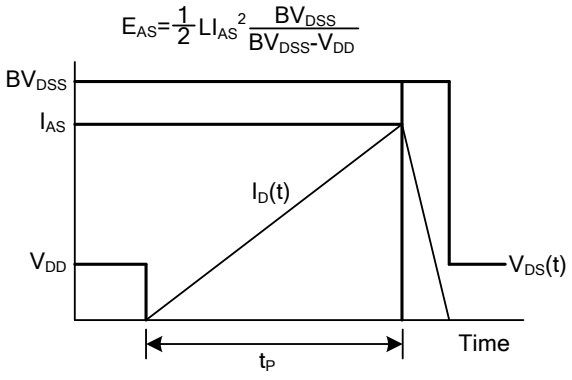
Resistive Switching Test Circuit



Resistive Switching Waveforms



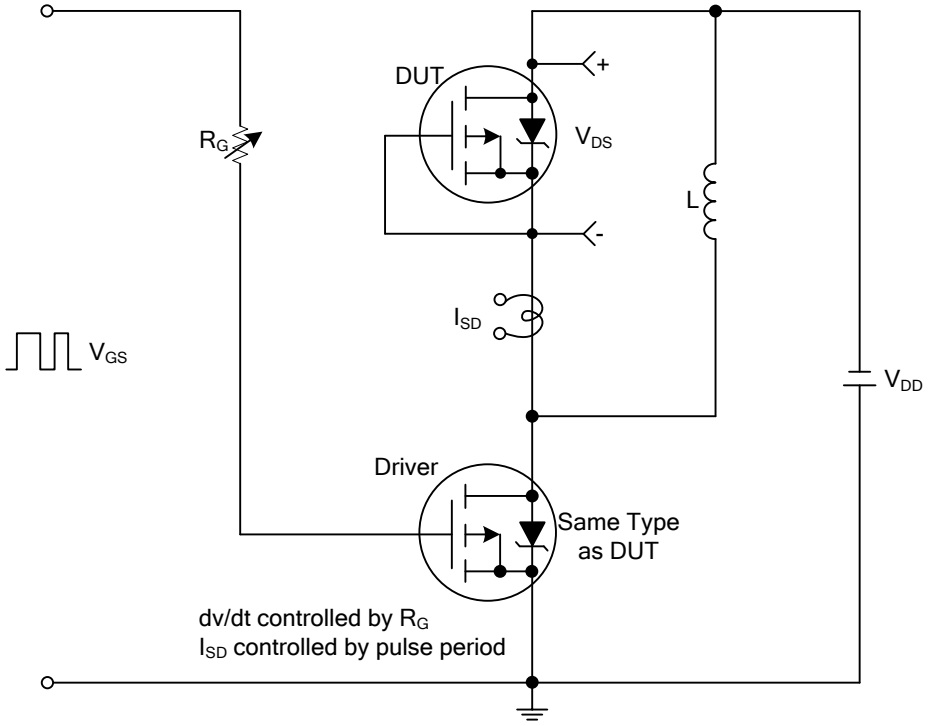
Unclamped Inductive Switching Test Circuit

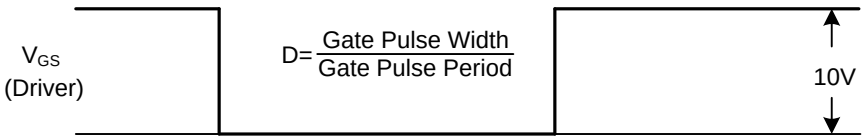


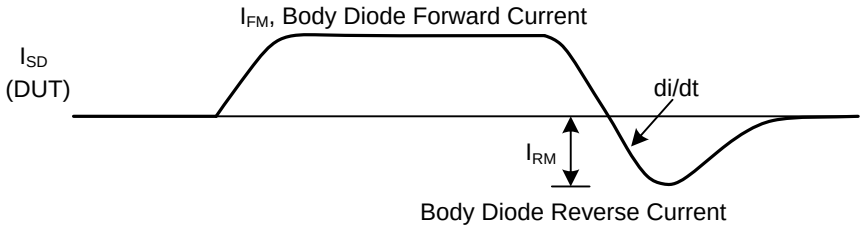
Unclamped Inductive Switching Waveforms

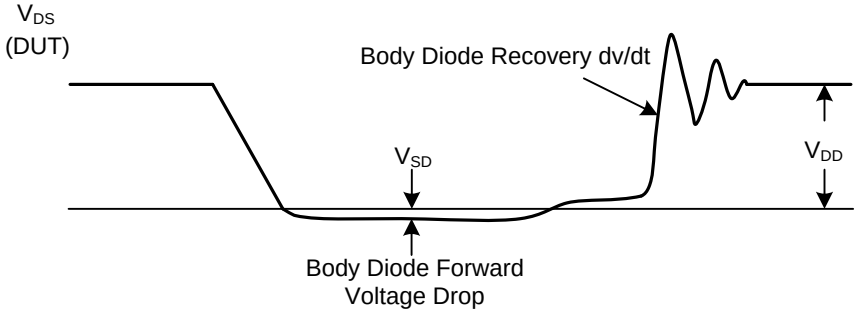
■ TEST CIRCUITS AND WAVEFORMS

P-CHANNEL





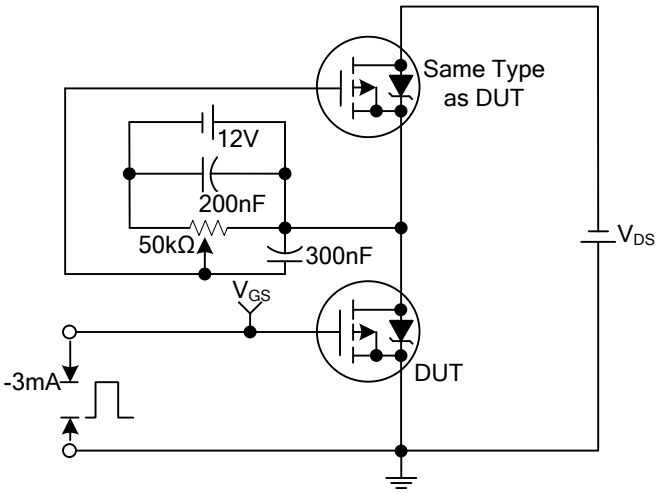




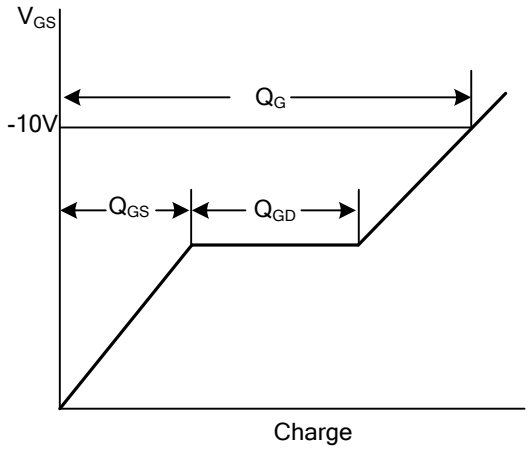
Peak Diode Recovery dv/dt Test Circuit and Waveforms

■ TEST CIRCUITS AND WAVEFORMS

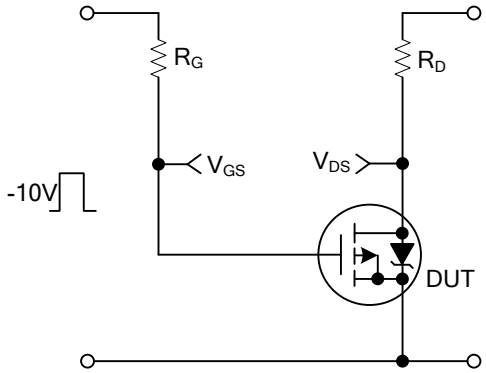
P-CHANNEL



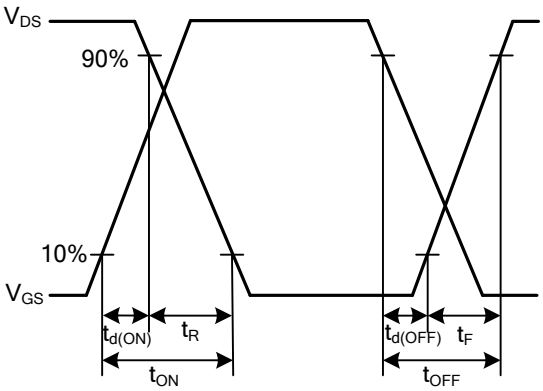
Gate Charge Test Circuit



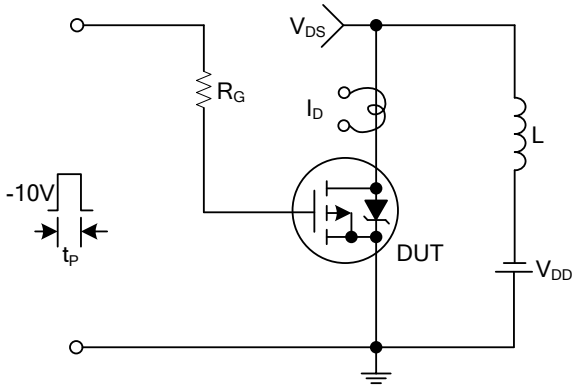
Gate Charge Waveforms



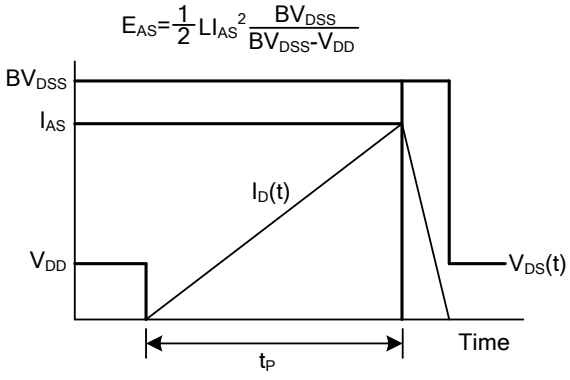
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit

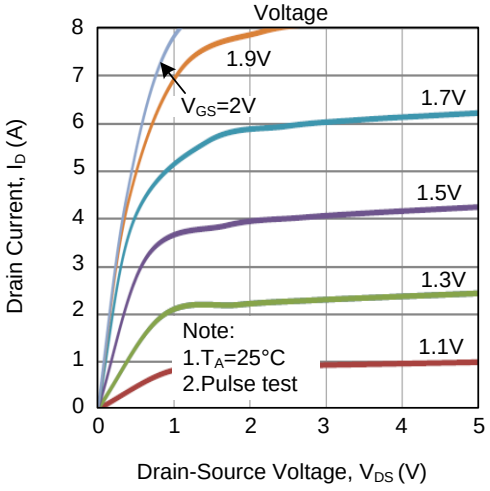


Unclamped Inductive Switching Waveforms

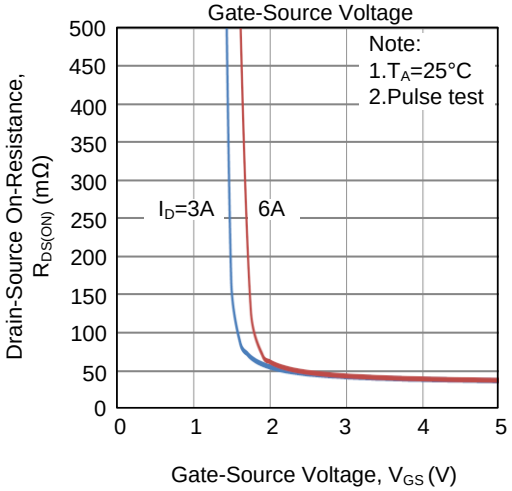
■ TYPICAL CHARACTERISTICS

N-CHANNEL

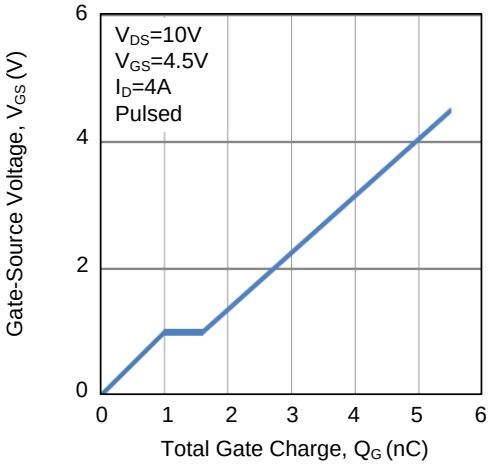
Drain Current vs. Drain-Source Voltage



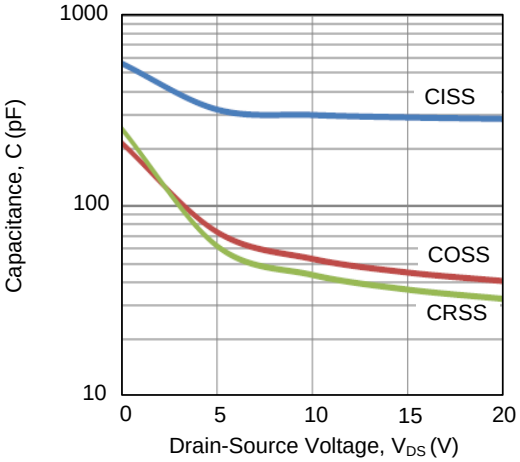
Drain-Source On-Resistance vs. Gate-Source Voltage



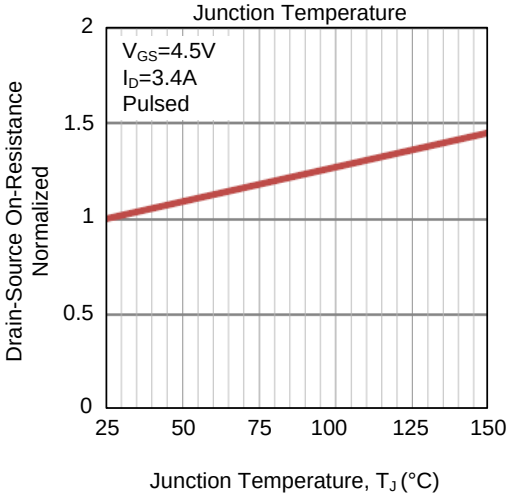
Gate Charge Characteristics



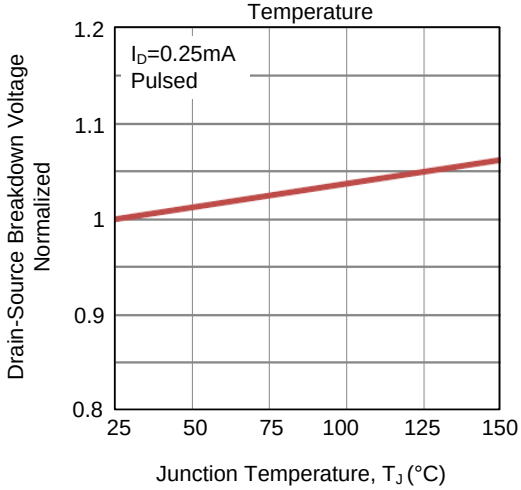
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature



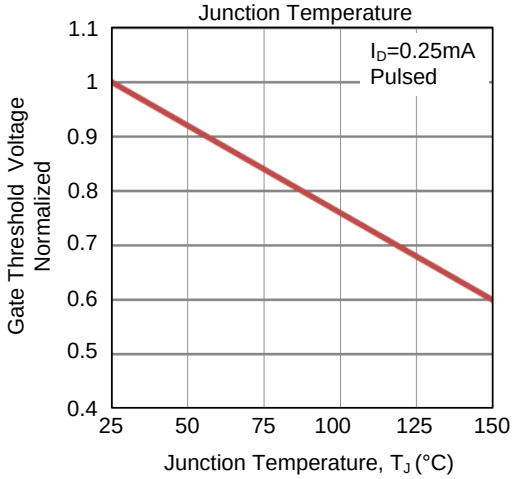
Breakdown Voltage vs. Junction Temperature



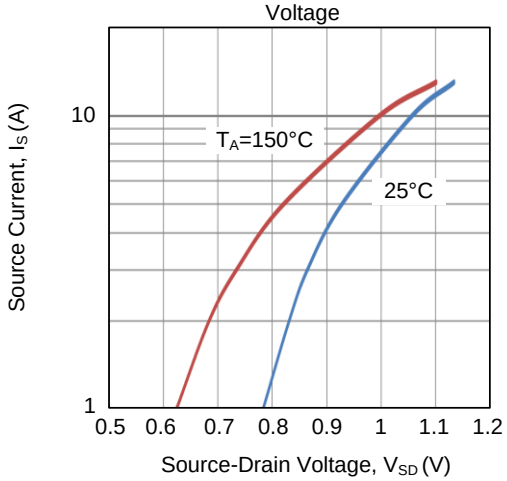
■ TYPICAL CHARACTERISTICS (Cont.)

N-CHANNEL

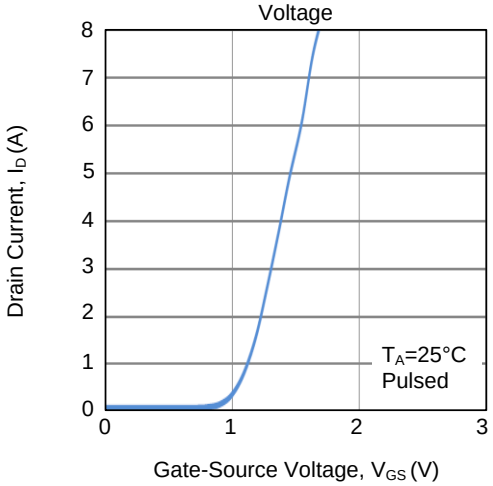
Gate Threshold Voltage vs. Junction Temperature



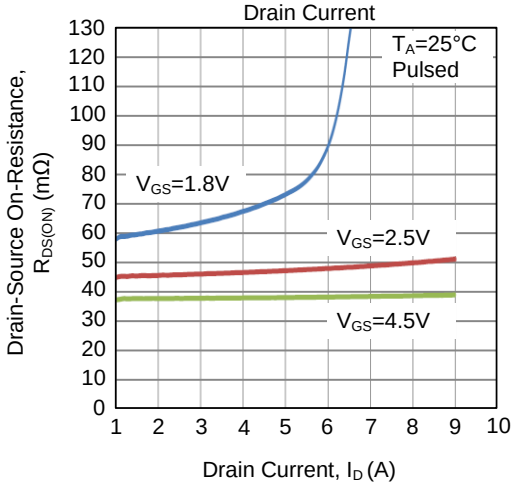
Source Current vs. Source-Drain Voltage



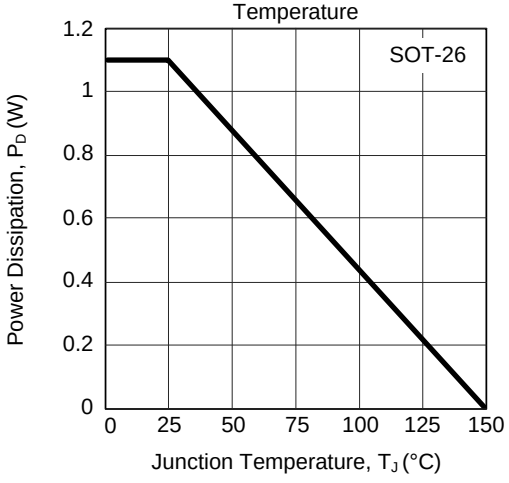
Drain Current vs. Gate-Source Voltage



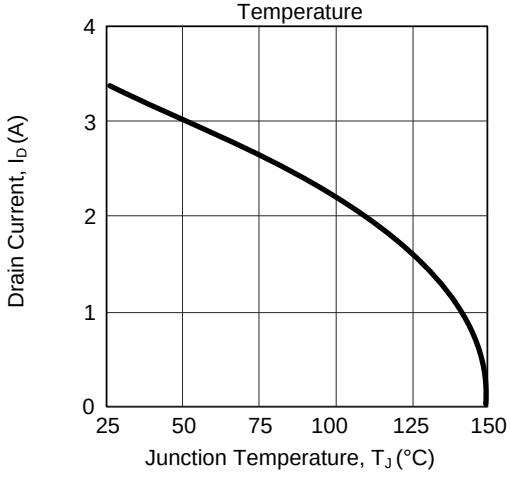
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature

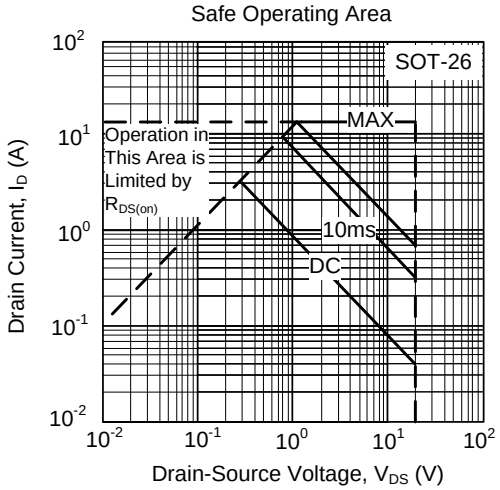


Drain Current vs. Junction Temperature

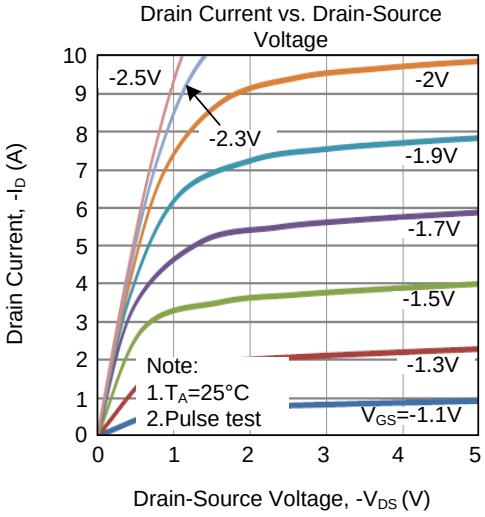


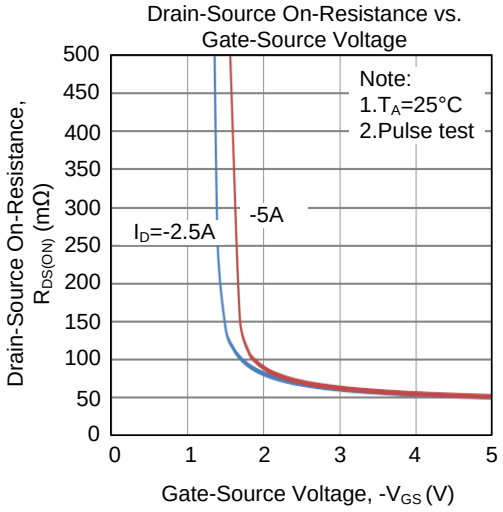
■ TYPICAL CHARACTERISTICS (Cont.)

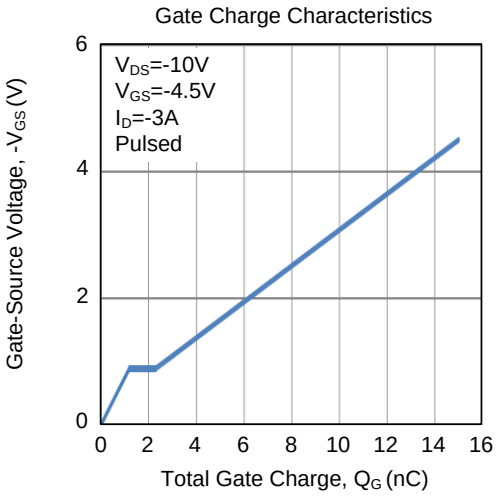
N-CHANNEL

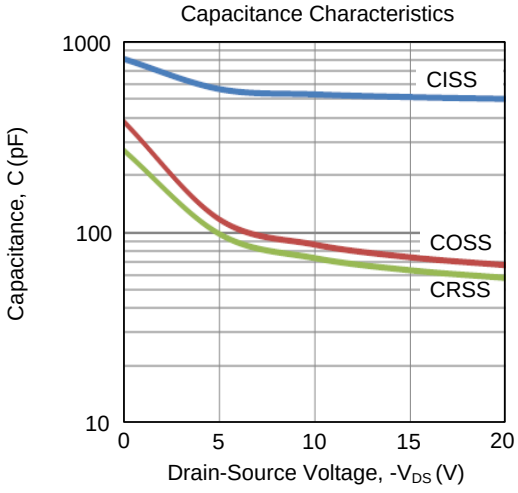


P-CHANNEL





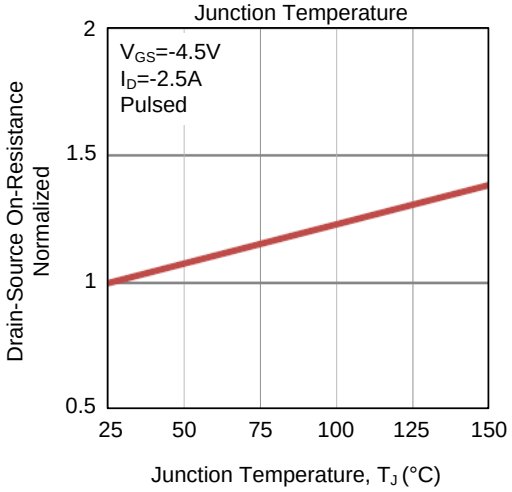




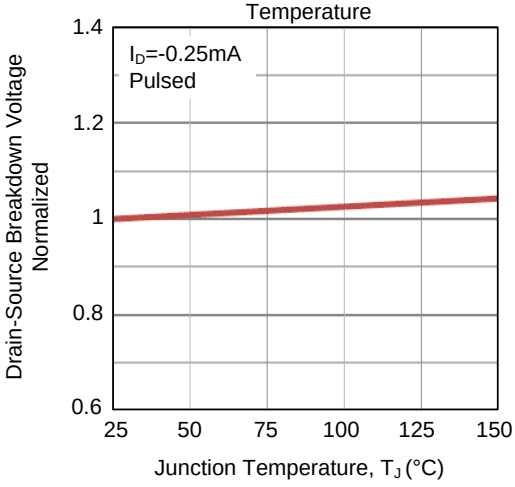
■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL

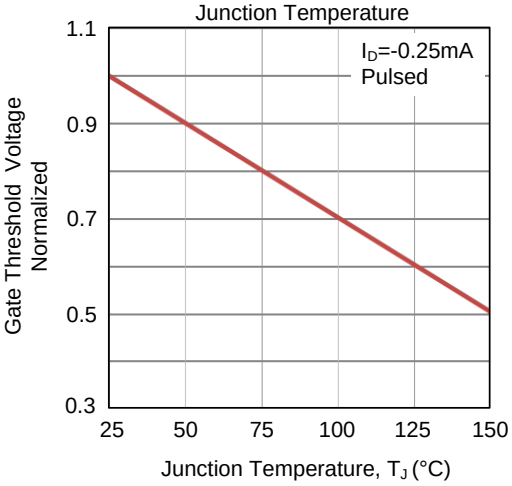
Drain-Source On-Resistance vs. Junction Temperature



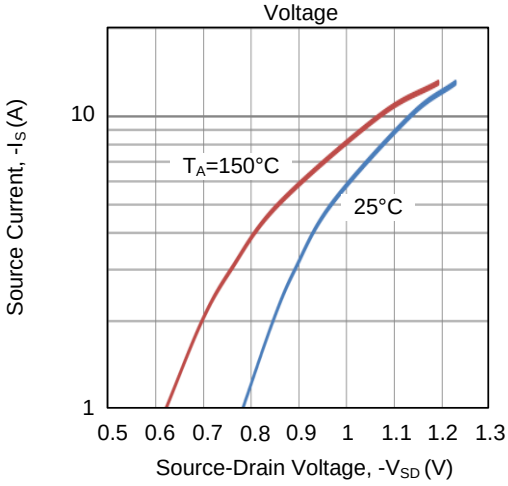
Breakdown Voltage vs. Junction Temperature



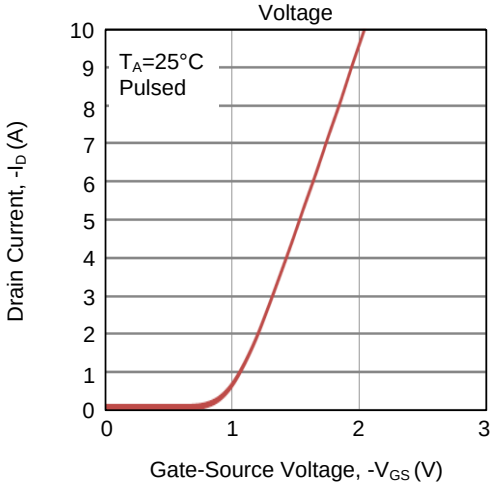
Gate Threshold Voltage vs. Junction Temperature



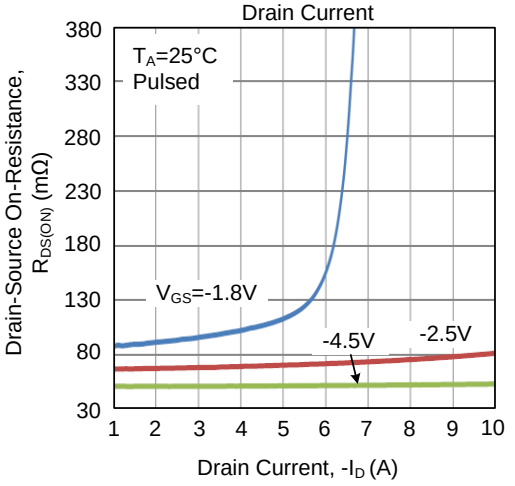
Source Current vs. Source-Drain Voltage



Drain Current vs. Gate-Source Voltage



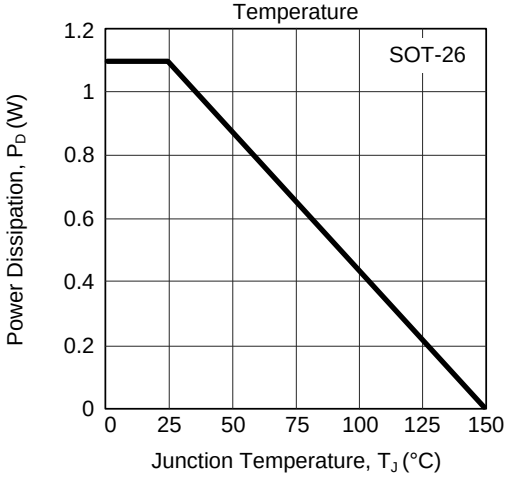
Drain-Source On-Resistance vs. Drain Current



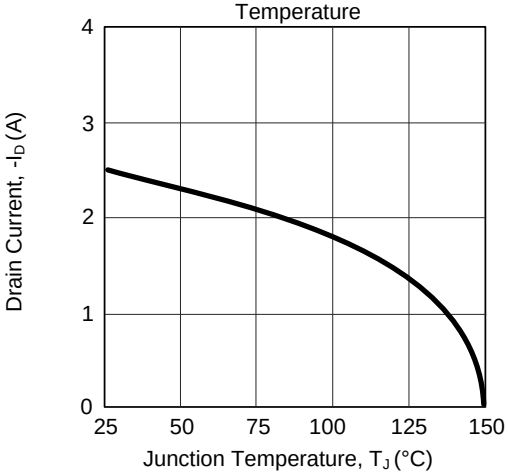
■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL

Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



Max. Safe Operating Area