



UD6604

Power MOSFET

20V COMPLEMENTARY MOSFET

DESCRIPTION

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

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

FEATURES

* N-channel (3.4A, 20V)

$R_{DS(ON)} \leq 45 \text{ m}\Omega$ @ $V_{GS}=4.5\text{V}$, $I_D=3.4\text{A}$

$R_{DS(ON)} \leq 58 \text{ m}\Omega$ @ $V_{GS}=2.5\text{V}$, $I_D=3.0\text{A}$

$R_{DS(ON)} \leq 80 \text{ m}\Omega$ @ $V_{GS}=1.8\text{V}$, $I_D=2.0\text{A}$

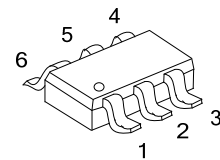
* P-channel (-2.5A, -20V)

$R_{DS(ON)} \leq 95 \text{ m}\Omega$ @ $V_{GS}=-4.5\text{V}$, $I_D=-2.5\text{A}$

$R_{DS(ON)} \leq 128 \text{ m}\Omega$ @ $V_{GS}=-2.5\text{V}$, $I_D=-2.0\text{A}$

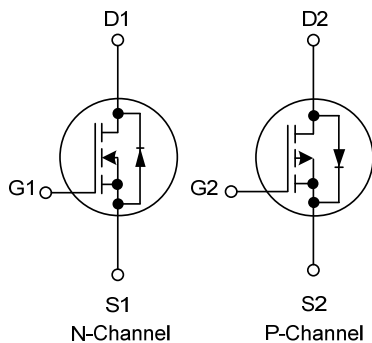
$R_{DS(ON)} \leq 190 \text{ m}\Omega$ @ $V_{GS}=-1.8\text{V}$, $I_D=-1.0\text{A}$

* Low $R_{DS(ON)}$



SOT-26

SYMBOL



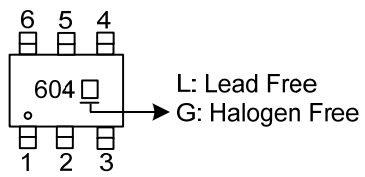
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment						Packing
Lead Free	Halogen Free		1	2	3	4	5	6	
UD6604L-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 ($T_A=25^\circ\text{C}$ unless otherwise noted)

PARAMETER	SYMBOL	RATINGS		UNIT
		N-CHANNEL	P-CHANNEL	
Drain-Source Voltage	V_{DS}	20	-20	V
Gate-Source Voltage	V_{GS}	± 8	± 8	V
Continuous Drain Current	I_D	3.4	-2.5	A
Pulsed Drain Current (Note 3)	I_{DM}	13	-13	A
Avalanche Energy, Single Pulse	E_{AS}	2.2	4.6	
Power Dissipation (Note 2)	P_D	0.5	0.5	W
Operating Temperature Range	T_J	-55 ~ +150		$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 ~ +150		$^\circ\text{C}$

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. N-Channel: $L = 0.1\text{mH}$, $I_{AS} = 6.65\text{A}$, $V_{DD} = 20\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

P-Channel: $L = 0.1\text{mH}$, $I_{AS} = -9.6\text{A}$, $V_{DD} = -20\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 12\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	θ_{JA}	240	$^\circ\text{C}/\text{W}$

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 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
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	1.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =4.5V, I _D =3.4A			45	mΩ
			V _{GS} =2.5V, I _D =3.0A			58	mΩ
			V _{GS} =1.8V, I _D =2.0A			80	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =10V, f=1.0MHz		250		pF
Output Capacitance		C _{OSS}			68		pF
Reverse Transfer Capacitance		C _{RSS}			54		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} =16V, V _{GS} =10V, I _D =3.4A		17		nC
Gate to Source Charge		Q _{GS}			1.3		nC
Gate to Drain Charge		Q _{GD}			1.7		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DS} =10V, V _{GS} =10V, I _D =3.4A R _G =3.3Ω		2		ns
Turn-ON Rise Time		t _R			15		ns
Turn-OFF Delay Time		t _{D(OFF)}			17		ns
Turn-OFF Fall-Time		t _F			16		ns
SOURCE TO DRAIN DIODE SPECIFICATIONS							
Maximum Body-Diode Continuous Current		I _S				1.5	A
Diode Forward Voltage		V _{SD}	I _S =1.0A, V _{GS} =0V		0.7	1	V

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

2. Essentially independent of operating temperature.

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

P-CHANNEL

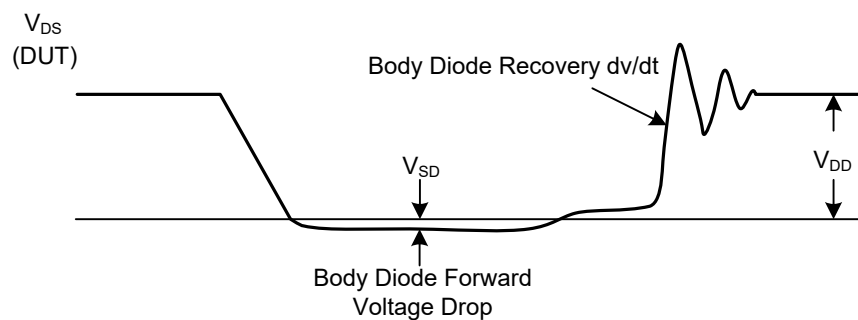
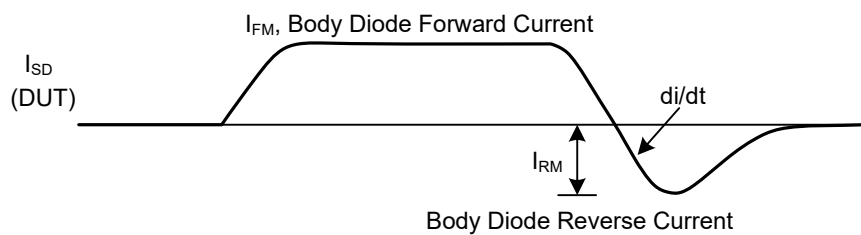
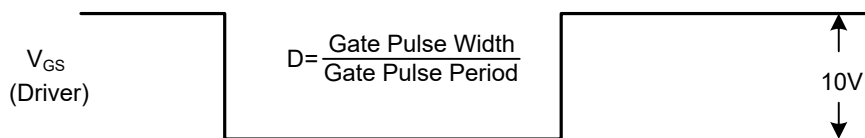
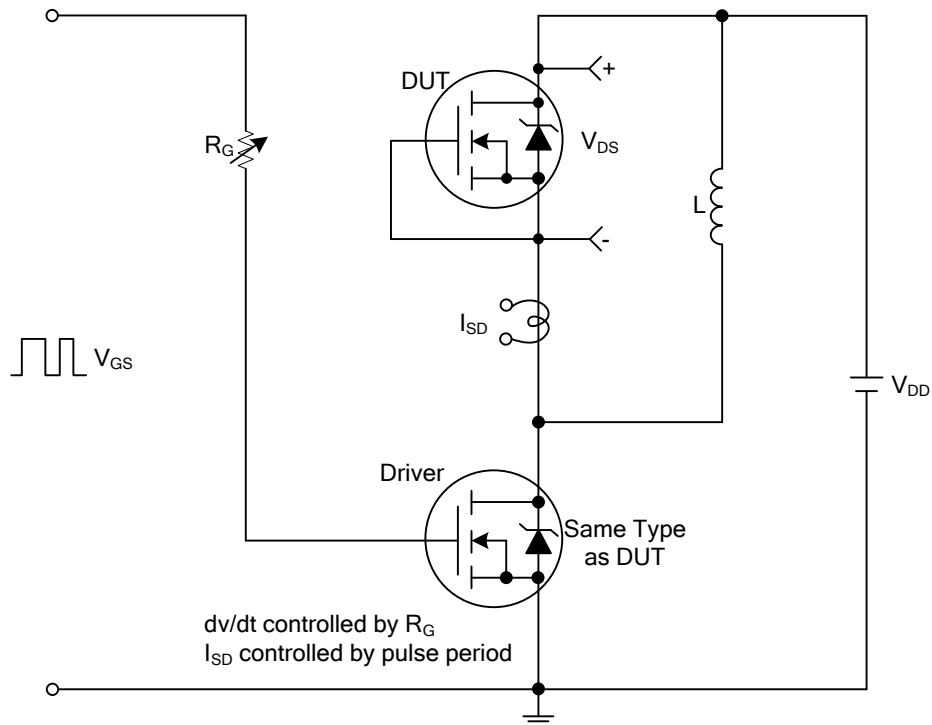
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =-250μA, V _{GS} =0V	-20			V
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =-20V, V _{GS} =0V			-1	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =+8V, V _{DS} =0V			+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	-1.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =-4.5V, I _D =-2.5A			95	mΩ
			V _{GS} =-2.5V, I _D =-2.0A			128	mΩ
			V _{GS} =-1.8V, I _D =-1.0A			190	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =-10V, f=1.0MHz		479		pF
Output Capacitance		C _{OSS}			100		pF
Reverse Transfer Capacitance		C _{RSS}			85		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} =-16V, V _{GS} =-10V, I _D =-2.5A		20		nC
Gate to Source Charge		Q _{GS}			1.6		nC
Gate to Drain Charge		Q _{GD}			2.8		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DS} =-10V, V _{GS} =-10V, I _D =-2.5A R _G =3.3Ω		3		ns
Turn-ON Rise Time		t _r			16		ns
Turn-OFF Delay Time		t _{D(OFF)}			29		ns
Turn-OFF Fall-Time		t _f			20		ns
SOURCE TO DRAIN DIODE SPECIFICATIONS							
Maximum Body-Diode Continuous Current		I _S				-1.5	A
Diode Forward Voltage		V _{SD}	I _S =-1.0A, V _{GS} =0V		-0.7	-1	V

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

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

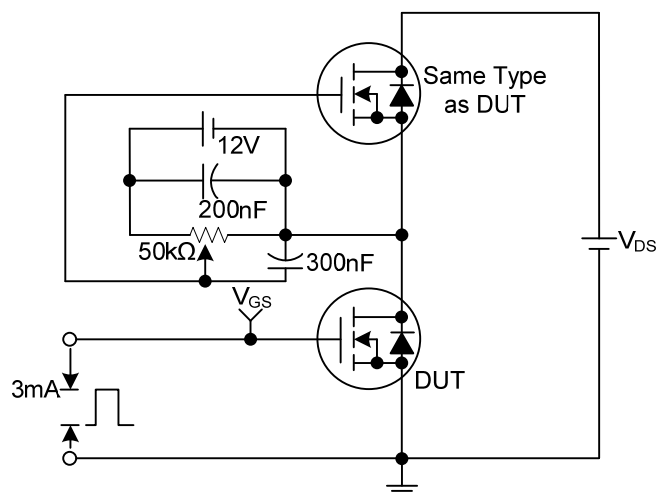
N-CHANNEL



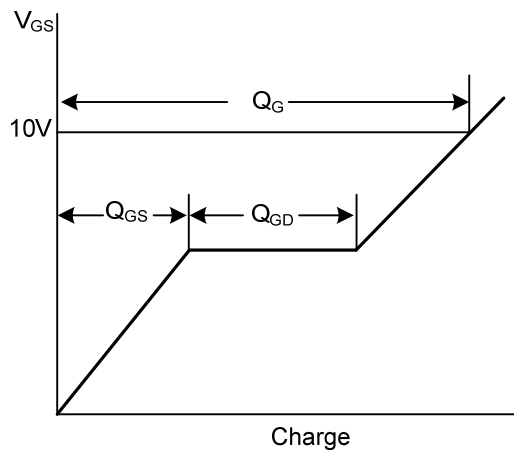
Peak Diode Recovery $d v / d t$ Test Circuit and Waveforms

■ TEST CIRCUITS AND WAVEFORMS

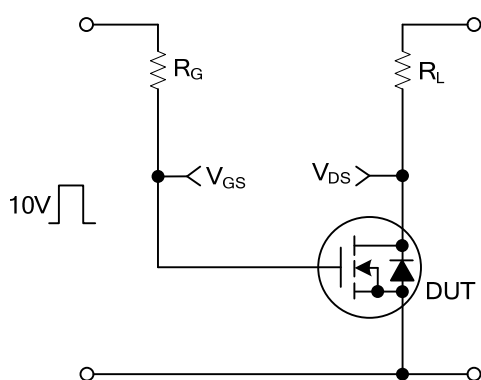
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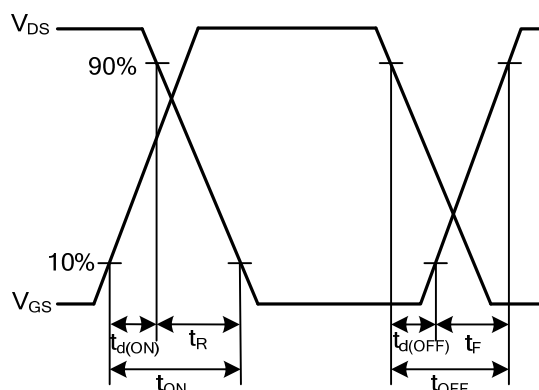
Gate Charge Test Circuit



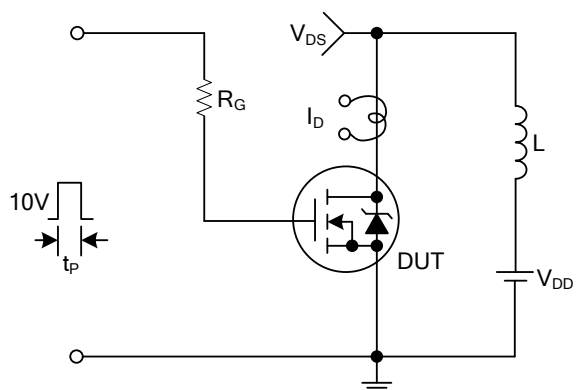
Gate Charge Waveforms



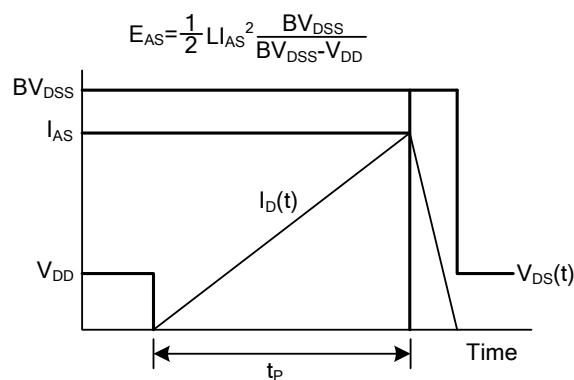
Resistive Switching Test Circuit



Resistive Switching Waveforms



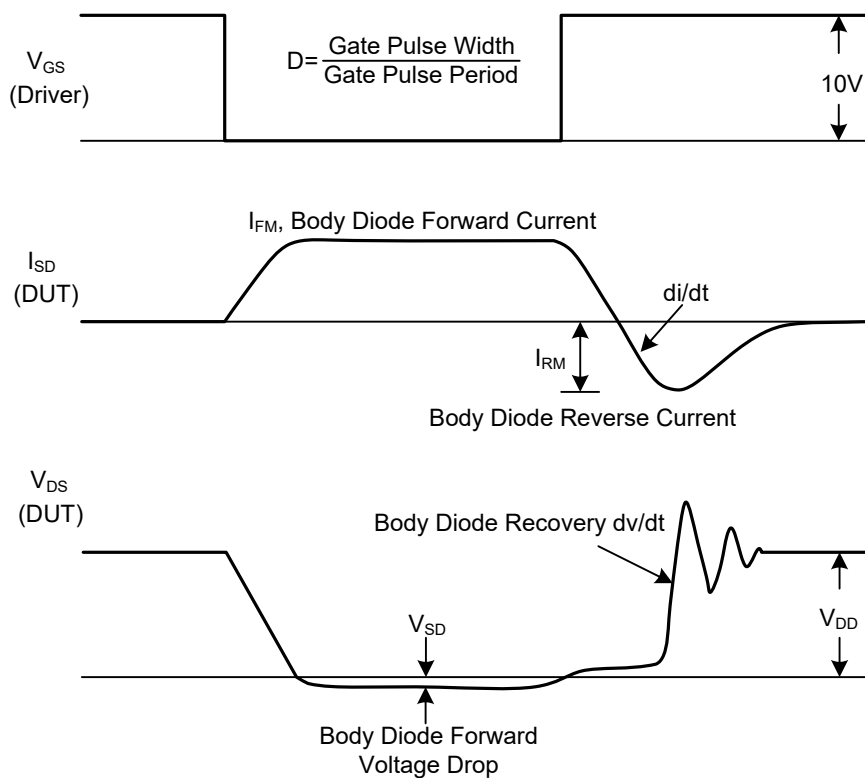
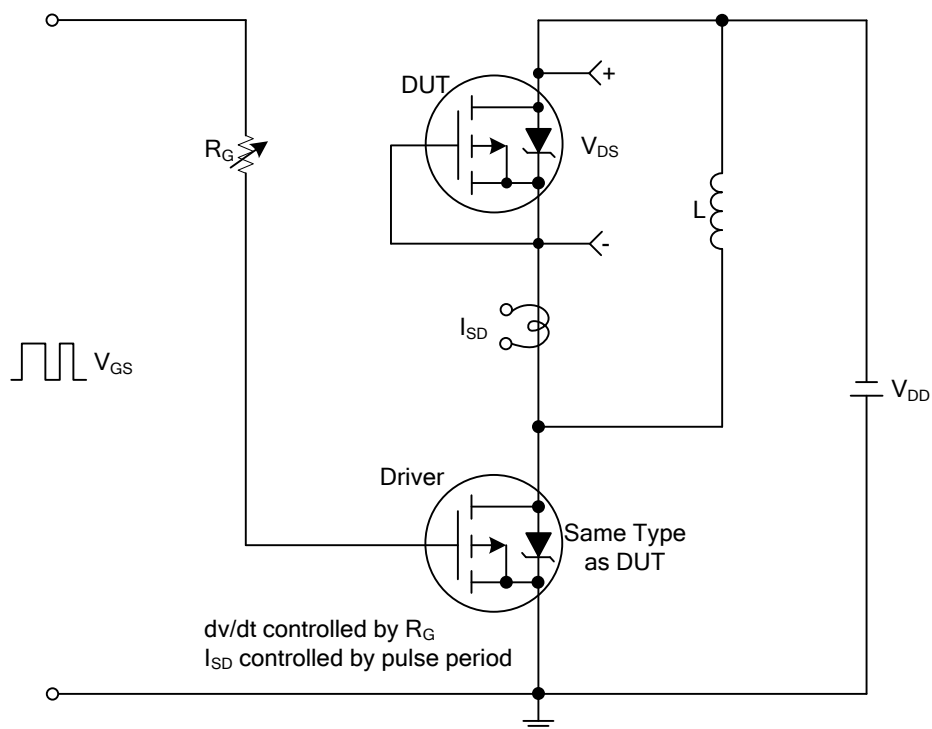
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS

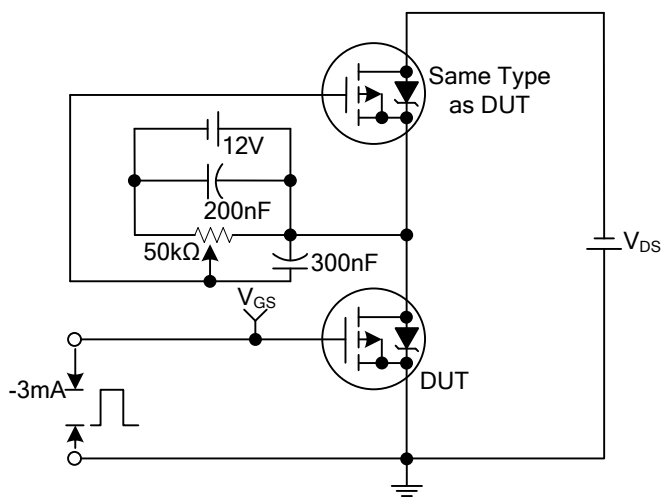
P-CHANNEL



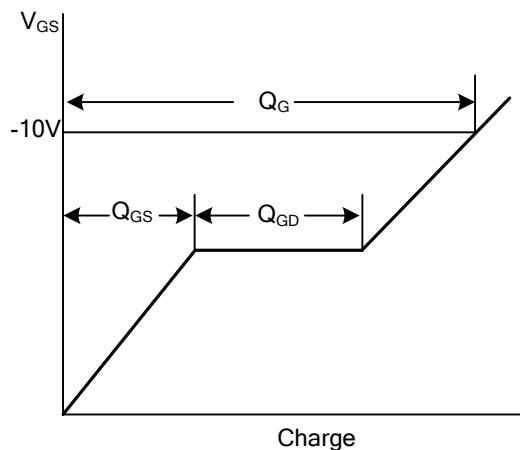
Peak Diode Recovery dv/dt Test Circuit and Waveforms

■ TEST CIRCUITS AND WAVEFORMS

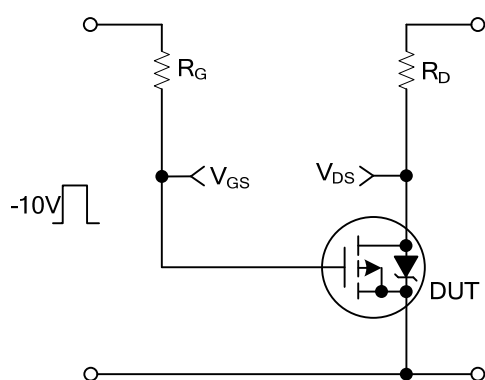
P-CHANNEL



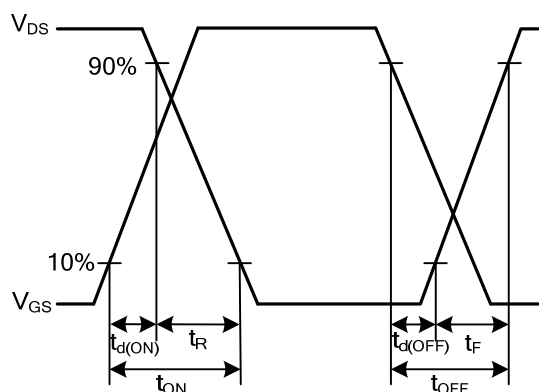
Gate Charge Test Circuit



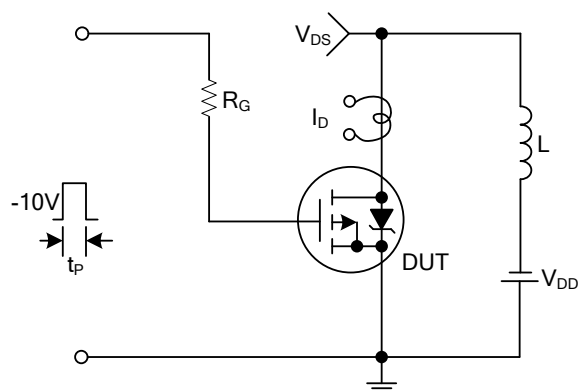
Gate Charge Waveforms



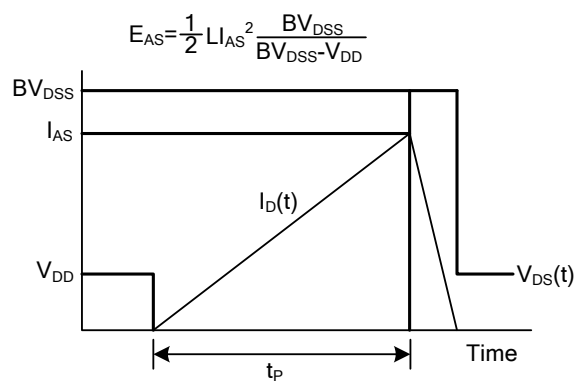
Resistive Switching Test Circuit



Resistive Switching Waveforms



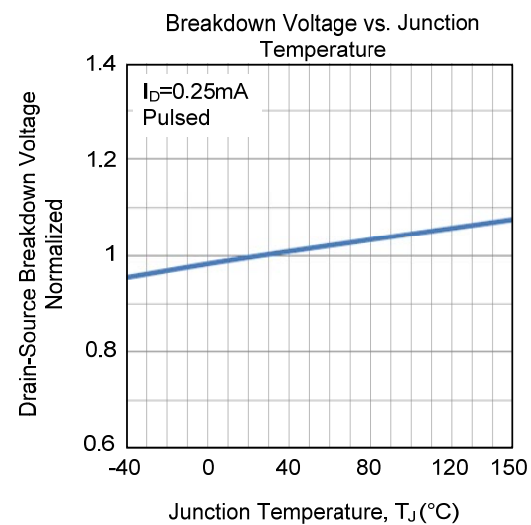
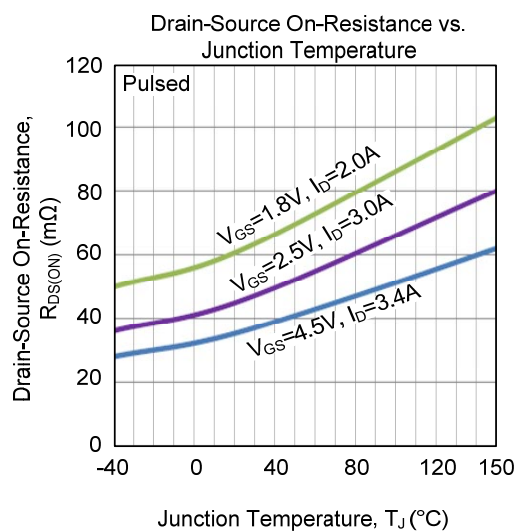
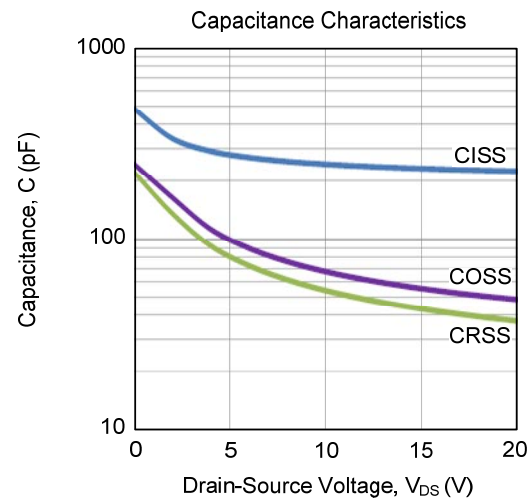
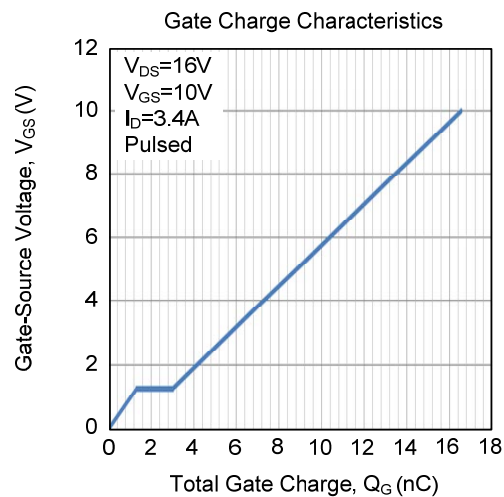
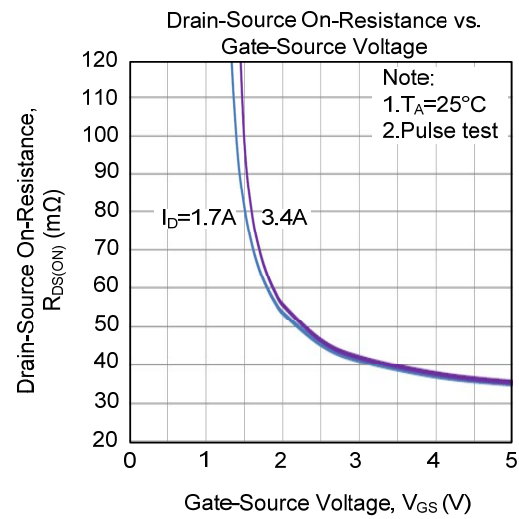
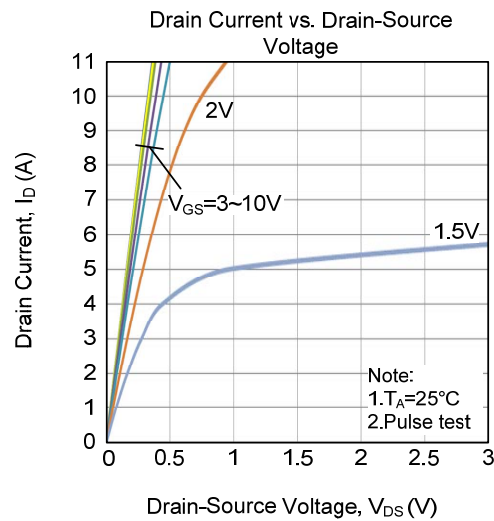
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

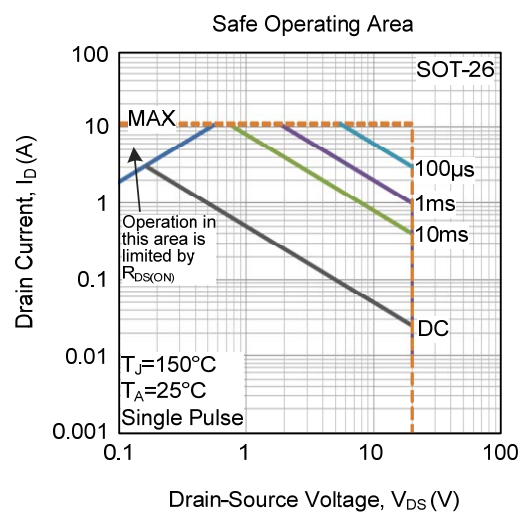
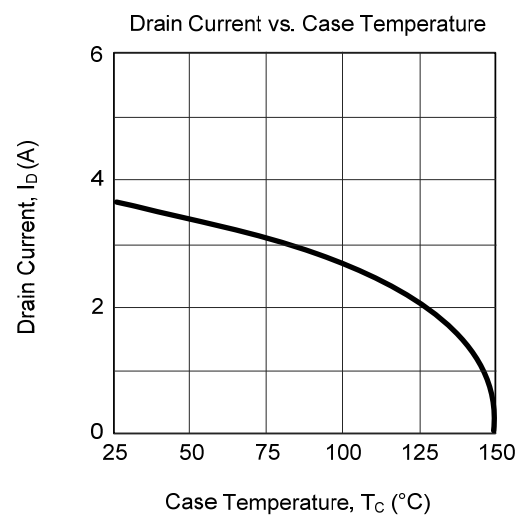
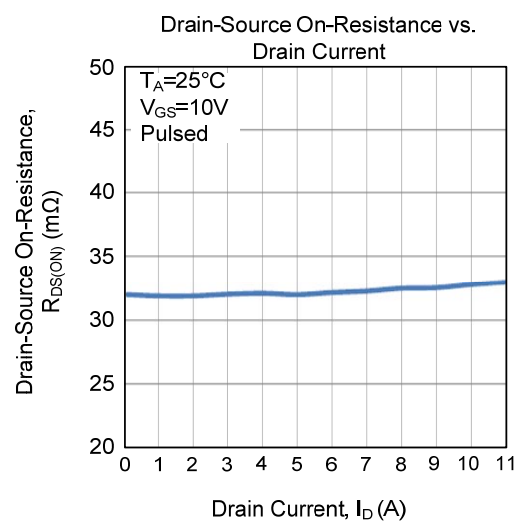
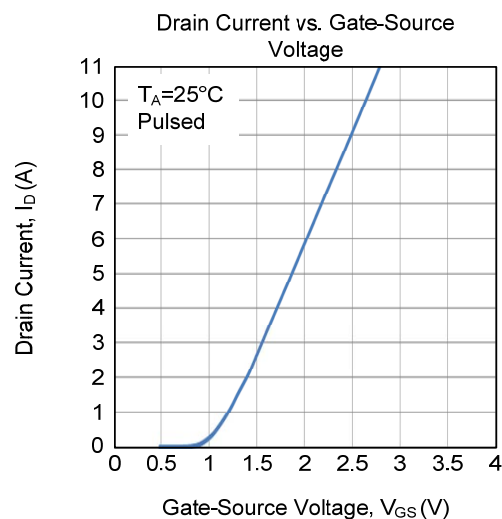
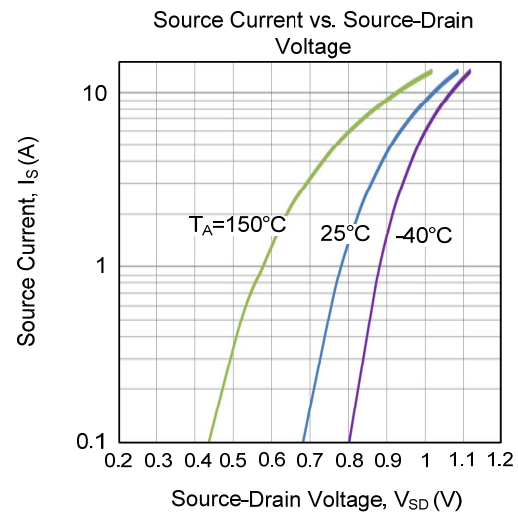
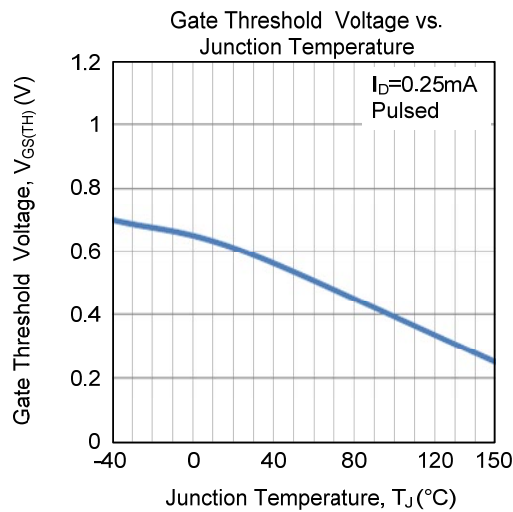
■ TYPICAL CHARACTERISTICS

N-CHANNEL



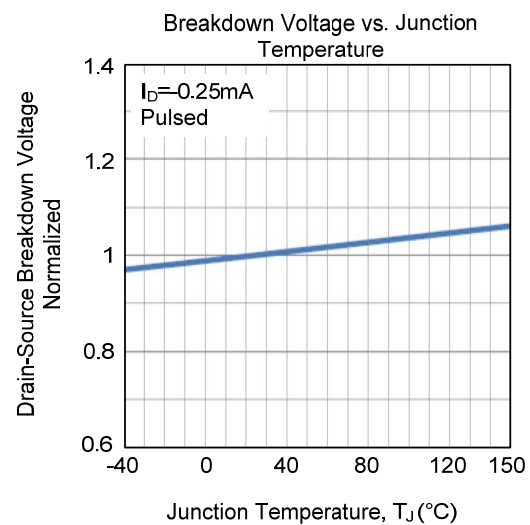
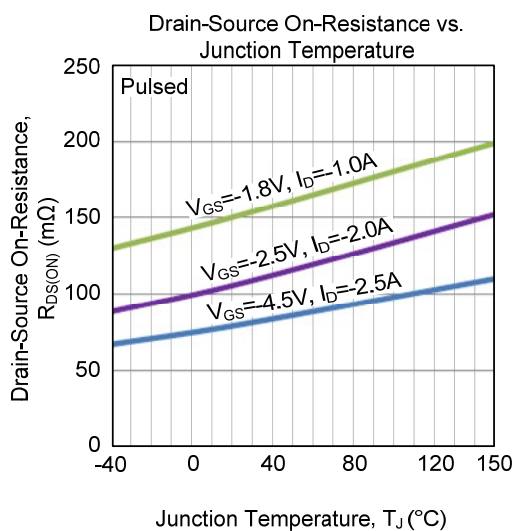
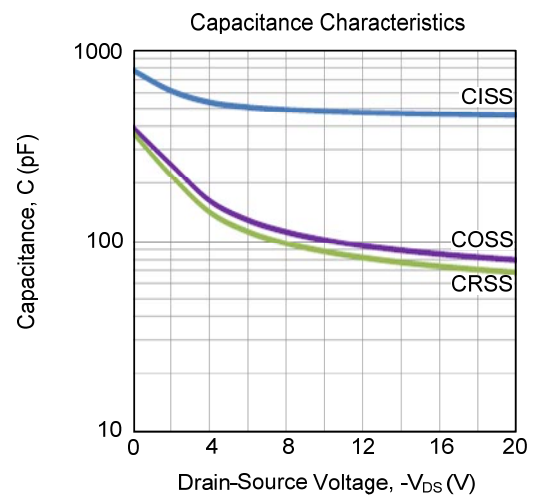
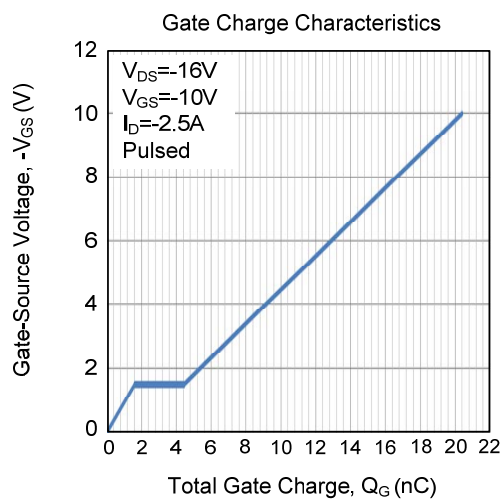
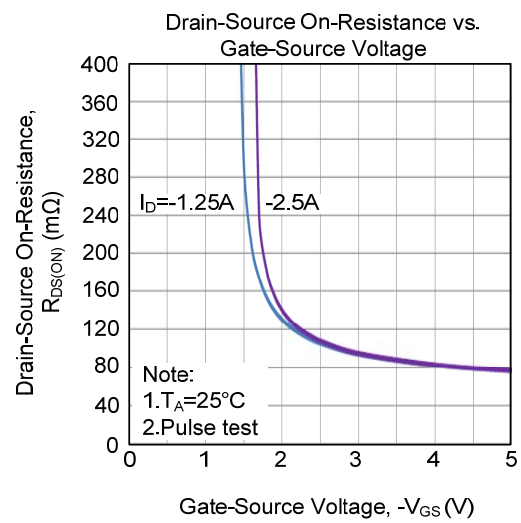
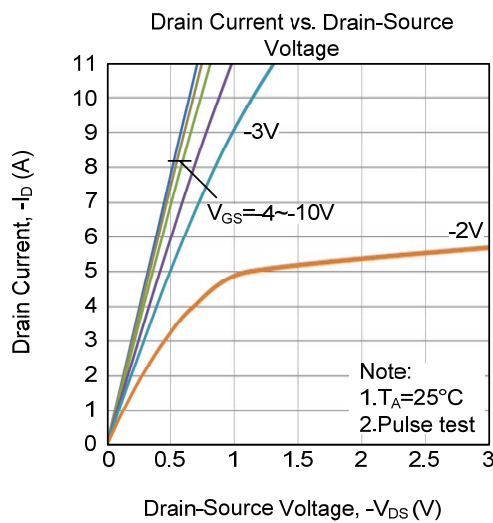
TYPICAL CHARACTERISTICS (Cont.)

N-CHANNEL



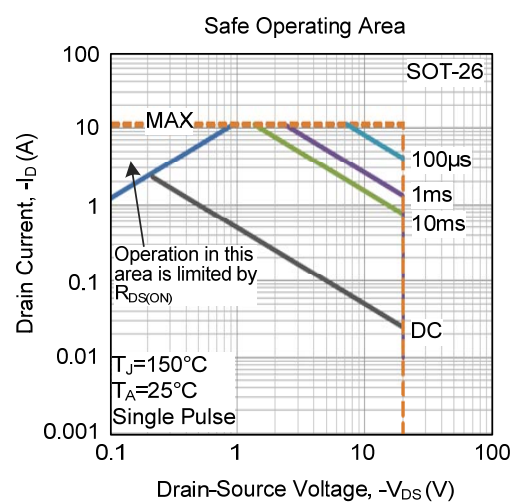
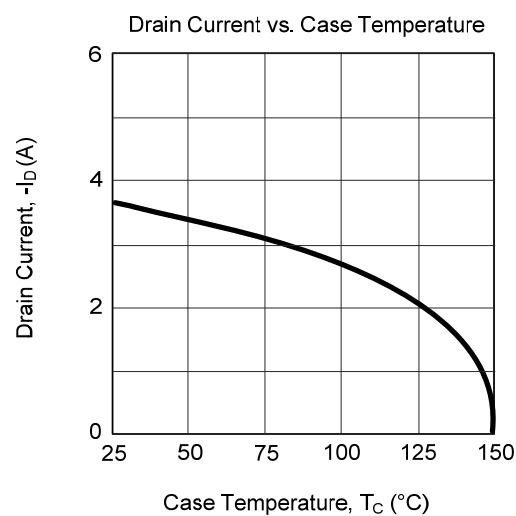
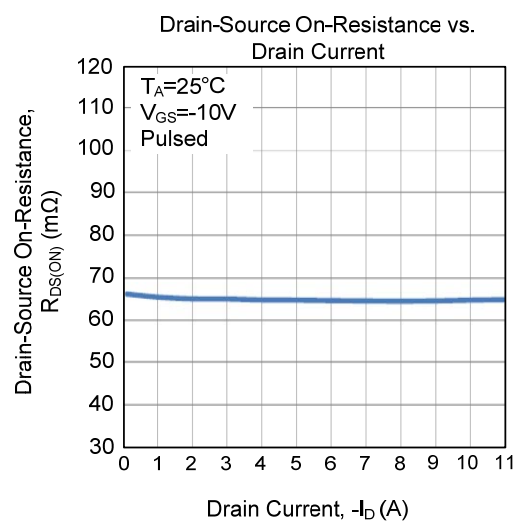
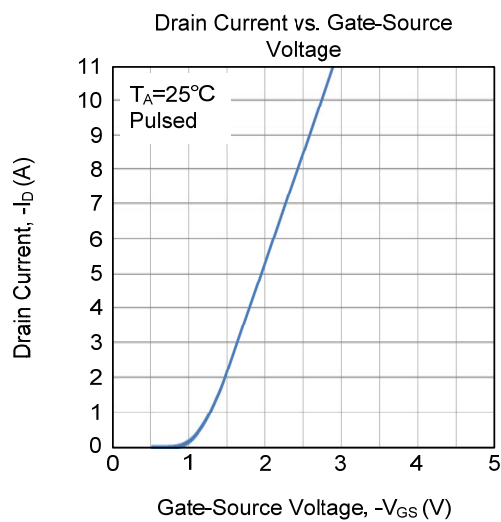
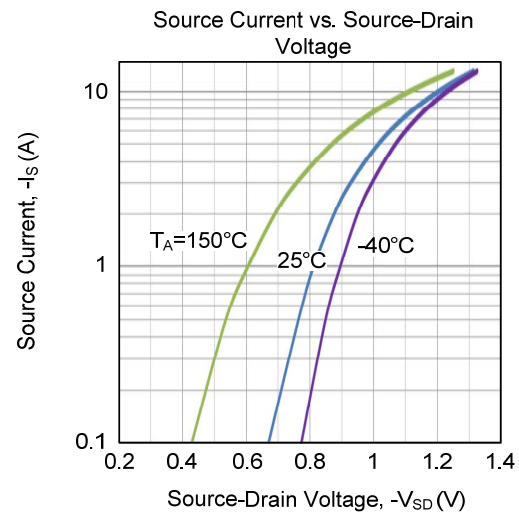
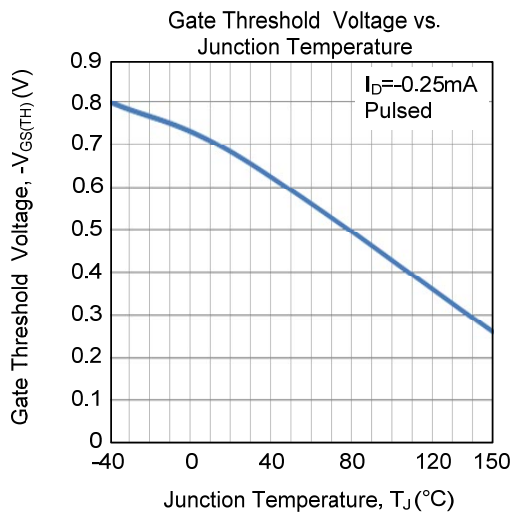
TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL

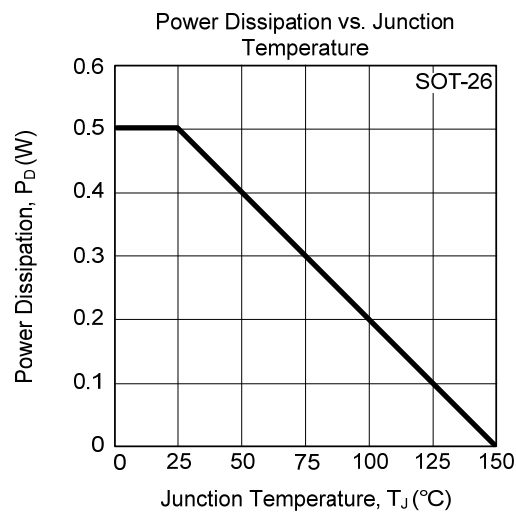


TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL



■ TYPICAL CHARACTERISTICS (Cont.)



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