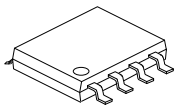
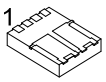
UD4509-H

Power MOSFET

DUAL ENHANCEMENT MODE (N-CHANNEL/P-CHANNEL)



SOP-8



DFN5060-8

■ DESCRIPTION

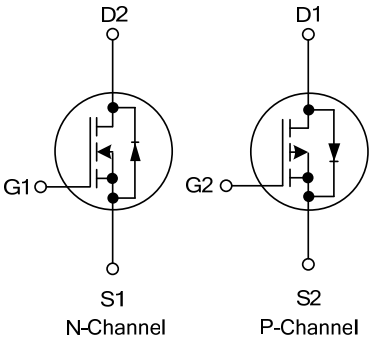
The UTC **UD4509-H** is an N & P-channel Power MOSFET, it uses UTC's advanced technology to provide the customers with a minimum on-state resistance, high switching speed and low gate charge.

The UTC **UD4509-H** is suitable for low voltage applications such as DC/DC converters.

■ FEATURES

* N-channel: 30V/28A
  $R_{DS(on)}$ ≤ 10 mΩ @ V_{GS}=10V, I_D=10A
  $R_{DS(on)}$ ≤ 16 mΩ @ V_{GS}=4.5V, I_D=7.0A
* P-channel: -30V/-25A
  $R_{DS(on)}$ ≤ 21 mΩ @ V_{GS}=-10V, I_D=-7.0A
  $R_{DS(on)}$ ≤ 32 mΩ @ V_{GS}=-4.5V, I_D=-5.0A
* High switching speed
* Low gate charge

■ SYMBOL



■ ORDERING INFORMATION

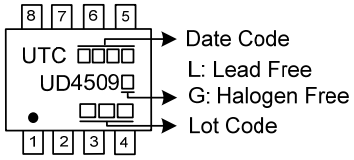
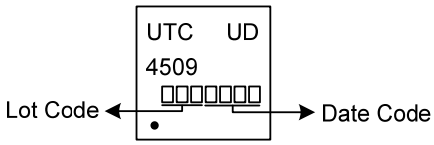
Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1.	2.	3.	4.	5.	6.	7.	8.	
UD4509L-S08-R	UD4509G-S08-R	SOP-8	S1	G1	S2	G2	D2	D2	D1	D1	Tape Reel
UD4509L-K08-5060-R	UD4509G-K08-5060-R	DFN5060-8	S1	G1	S2	G2	D2	D2	D1	D1	Tape Reel

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

UD4509G-S08-R
(1)Packing Type
(2)Package Type
(3)Green Package

(1) R: Tape Reel
(2) S08: SOP-8, K08-5060: DFN5060-8
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

SOP-8	DFN5060-8
	

■ ABSOLUTE MAXIMUM RATINGS (T_J=25°C unless otherwise specified)

PARAMETER			SYMBOL	RATINGS		UNIT
				N-channel	P-channe	
Drain-Source Voltage			V_{DSS}	30	-30	V
Gate-Source Voltage			V_{GSS}	±20	±20	V
Drain Current	Continuous (Note 3)	T_A=25°C	I_D	28	-25	A
		T_A=70		17.6	-15.7	A
	Pulsed (Note 1)		I_{DM}	56	-50	A
Power Dissipation	T_A=25°C	SOP-8	P_D	2		W
		DFN5060-8		3.8		W
Junction Temperature			T_J	-55 ~ +150		°C
Storage Temperature			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 DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient (Note 3)	SOP-8	θ_{JA}	62.5	°C/W
	DFN5060-8		32.5	°C/W

Note: Surface mounted on 1 in^2 copper pad of FR4 board ; 135 °C/W when mounted on Min. copper pad

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

N-channel

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250uA, V_{GS}=0V	30			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=24V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V, V_{DS}=0V			+100	nA
	Reverse		V_{GS}=-20V, V_{DS}=0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250uA	1.0		3.0	V
Static Drain-Source On-State Resistance (Note 2)		$R_{DS(ON)}$	V_{GS}=10V, I_D=10A			10	mΩ
			V_{GS}=4.5V, I_D=7.0A			16	mΩ
Forward Transconductance		g_{FS}	V_{DS}=10V, I_D=10A		20		S
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		715	1140	pF
Output Capacitance		C_{OSS}			220		pF
Reverse Transfer Capacitance		C_{RSS}			160		pF
Gate Resistance		R_G	f=1.0MHz		2.2		Ω
SWITCHING PARAMETERS							
Total Gate Charge (Note 2)		Q_G	V_{GS}=4.5V, V_{DS}=15V, I_D=10A		12	19.2	nC
Gate to Source Charge		Q_{GS}			2.5		nC
Gate to Drain Charge		Q_{GD}			7.5		nC
Turn-ON Delay Time (Note 2)		$t_{D(ON)}$	V_{DS}=15V, V_{GS}=10V, I_D=1A, R_G=3.3Ω, R_D=15Ω		9		ns
Rise Time		t_R			6.5		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			23		ns
Fall-Time		t_F			9.5		ns
SOURCE TO DRAIN DIODE SPECIFICATIONS							
Drain-Source Diode Forward Voltage (Note 2)		V_{SD}	I_S=1.7A, V_{GS}=0V			1.2	V
Body Diode Reverse Recovery Time (Note 2)		t_{rr}	I_S=10A, V_{GS}=0V, dI/dt=100A/μs		27		ns
Body Diode Reverse Recovery Charge		Q_{rr}			18		nC

■ ELECTRICAL CHARACTERISTICS (CONT.)

P-channel

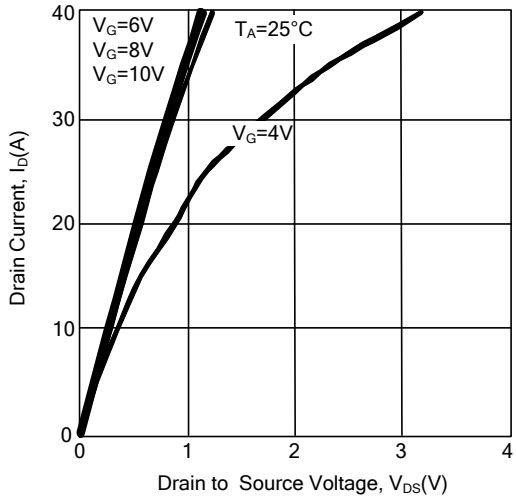
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=-250uA, V_{GS}=0V	-30			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=-24V, V_{GS}=0V			-10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V, V_{DS}=0V			+100	nA
	Reverse		V_{GS}=-20V, V_{DS}=0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=-250uA	-1.0		-3.0	V
Static Drain-Source On-State Resistance (Note 2)		$R_{DS(ON)}$	V_{GS}=-10V, I_D=-7.0A			21	mΩ
			V_{GS}=-4.5V, I_D=-5.0A			32	mΩ
Forward Transconductance		g_{FS}	V_{DS}=-10V, I_D=-7.0A		15		S
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=-25V, f=1.0MHz		1260	2000	pF
Output Capacitance		C_{OSS}			210		pF
Reverse Transfer Capacitance		C_{RSS}			185		pF
Gate Resistance		R_G	f=1.0MHz		5.6		Ω
SWITCHING PARAMETERS							
Total Gate Charge (Note 2)		Q_G	V_{GS}=-4.5V, V_{DS}=-15V, I_D=-7A		15	24	nC
Gate to Source Charge		Q_{GS}			3		nC
Gate to Drain Charge		Q_{GD}			8		nC
Turn-ON Delay Time (Note 2)		$t_{D(ON)}$	V_{DS}=-15V, V_{GS}=-10V, I_D=-1A, R_G=3.3Ω, R_D=15Ω		10.5		ns
Rise Time		t_R			6.5		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			40		ns
Fall-Time		t_F			29		ns
SOURCE TO DRAIN DIODE SPECIFICATIONS							
Drain-Source Diode Forward Voltage (Note 2)		V_{SD}	I_S=-1.7A, V_{GS}=0V			-1.2	V
Body Diode Reverse Recovery Time (Note 2)		t_{rr}	I_S=-7A, V_{GS}=0V, dI/dt=100A/μs		22		ns
Body Diode Reverse Recovery Charge		Q_{rr}			12		nC

Notes: 1. Pulse width limited by Max. junction temperature.
2. Pulse test.

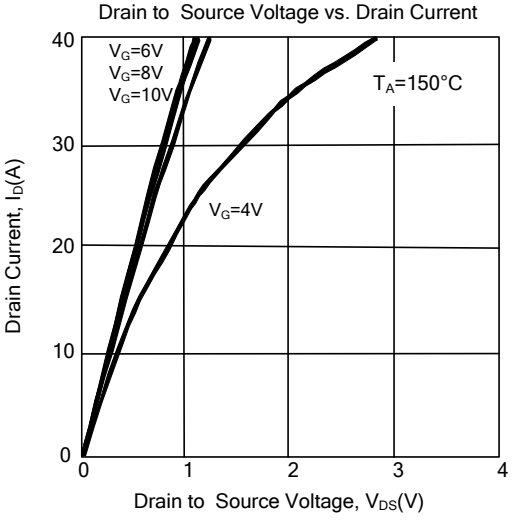
■ TYPICAL CHARACTERISTICS

N-CHANNEL

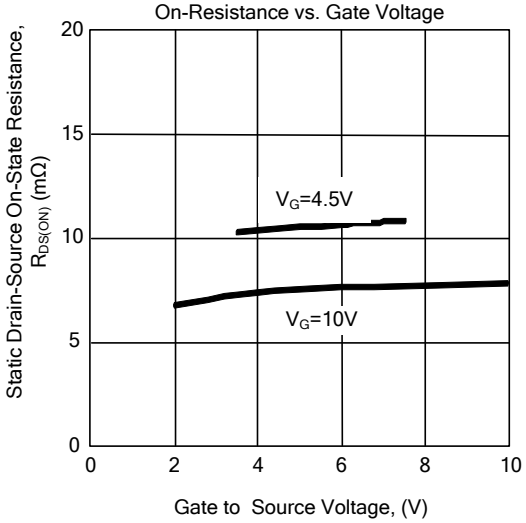
Drain to Source Voltage vs. Drain Current



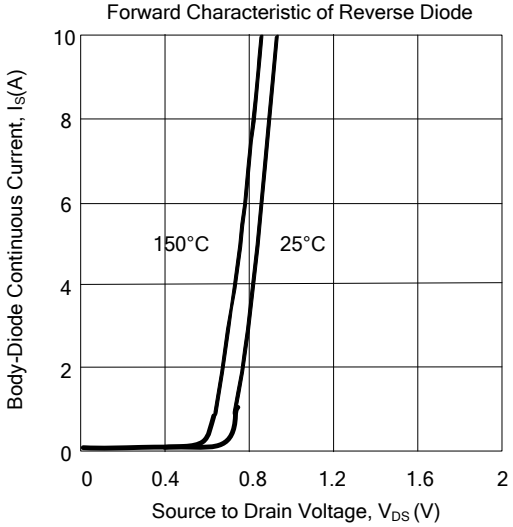
Drain to Source Voltage vs. Drain Current



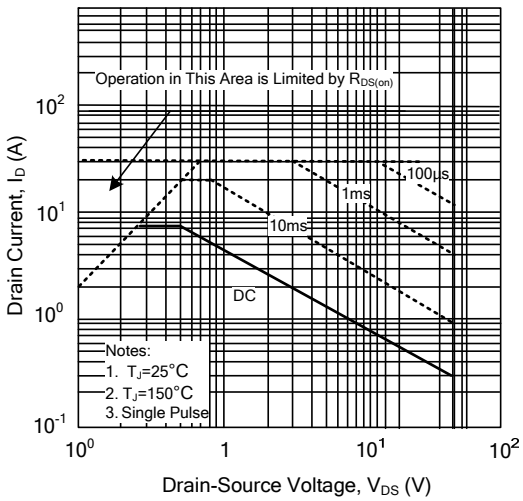
On-Resistance vs. Gate Voltage



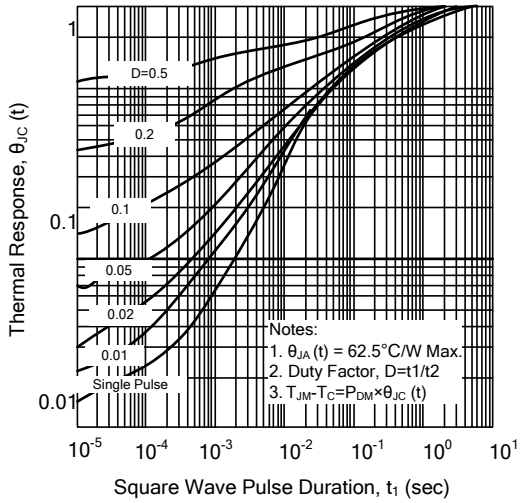
Forward Characteristic of Reverse Diode



Safe Operating Area

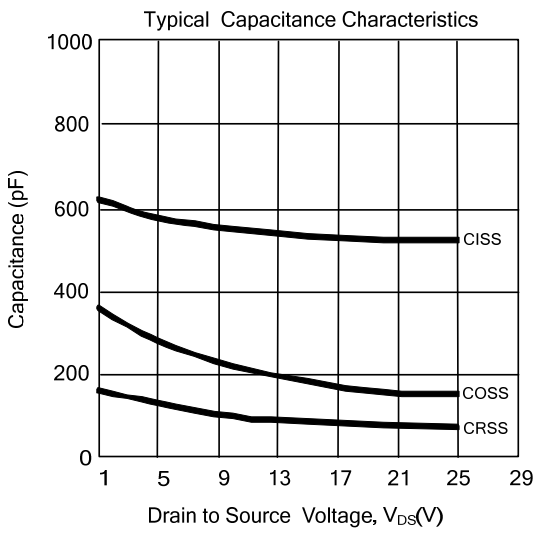


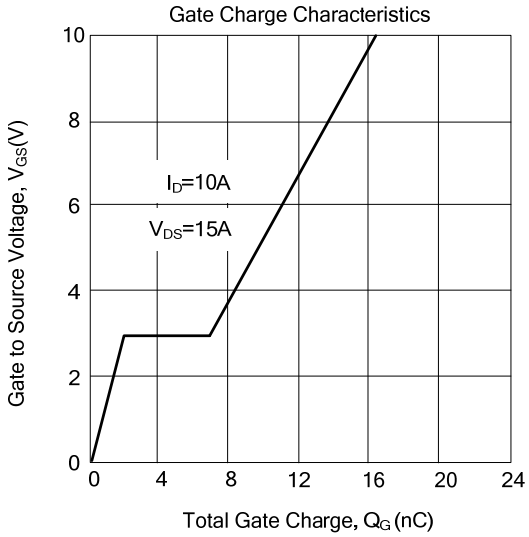
Transient Thermal Response Curve

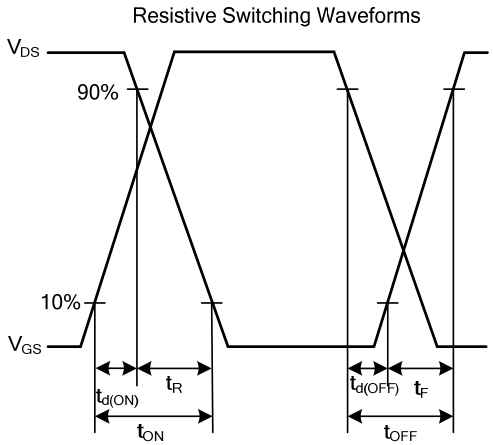


■ TYPICAL CHARACTERISTICS (Cont.)

N-CHANNEL



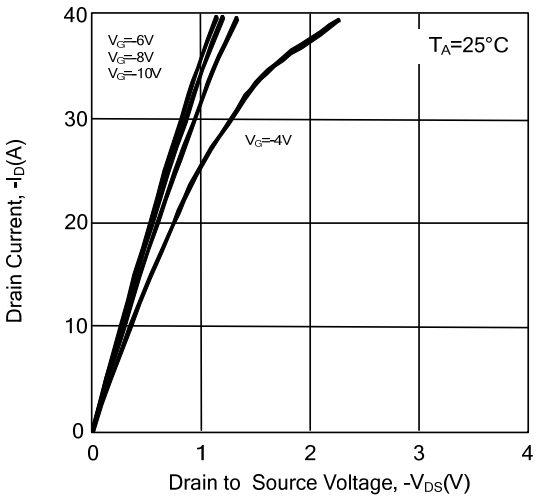




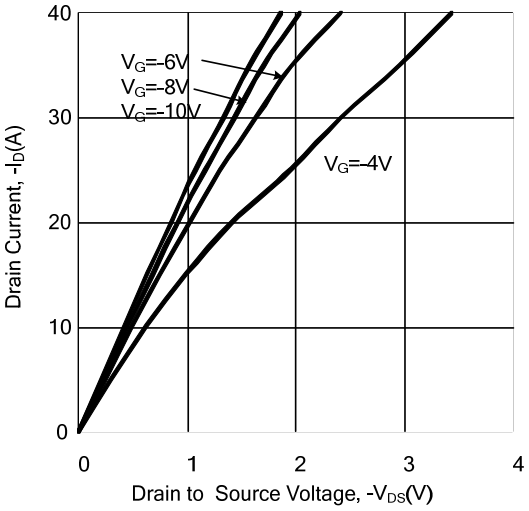
■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL

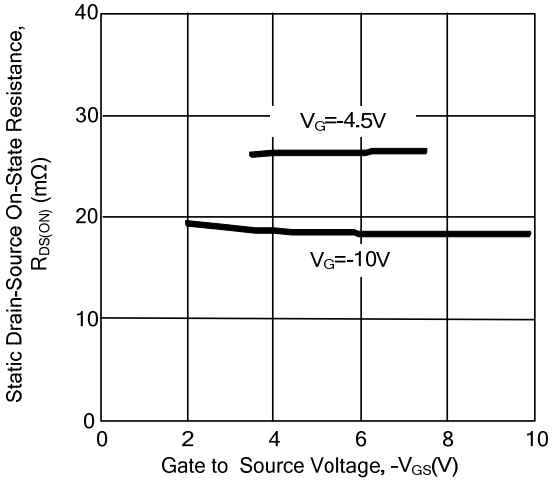
Drain to Source Voltage vs. Drain Current



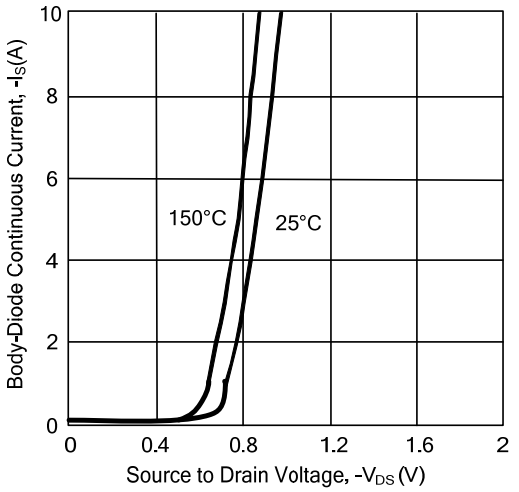
Drain to Source Voltage vs. Drain Current



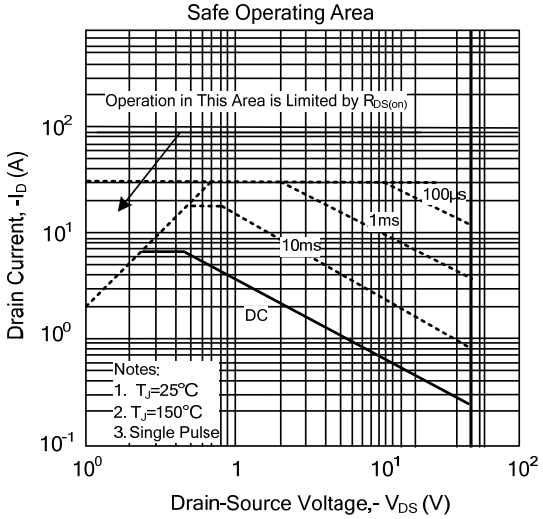
On-Resistance vs. Gate Voltage



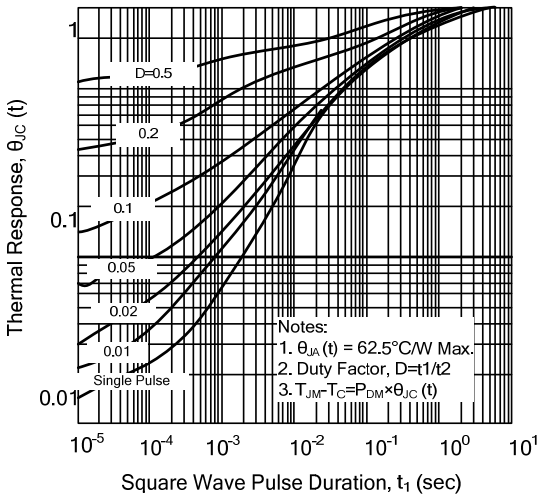
Forward Characteristic of Reverse Diode



Safe Operating Area



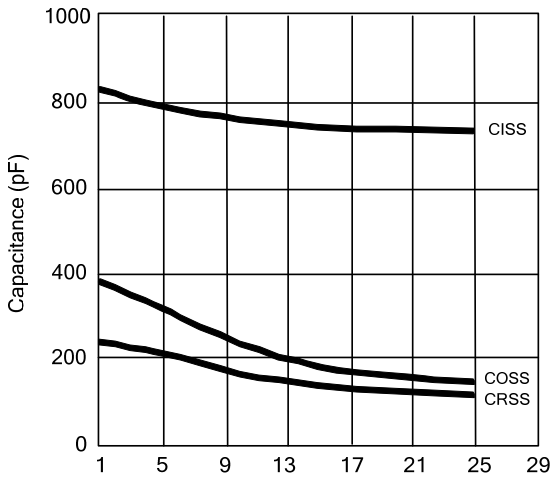
Transient Thermal Response Curve



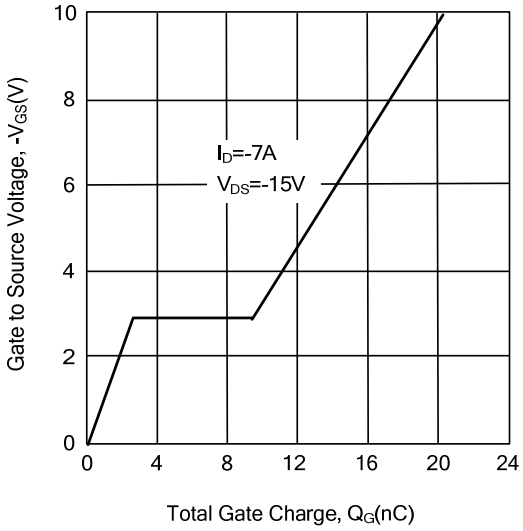
■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL

Typical Capacitance Characteristics



Gate Charge Characteristics



Resistive Switching Waveforms