



UD4509-H

Power MOSFET

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

■ 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

$$R_{DS(on)} \leq 10 \text{ m}\Omega @ V_{GS}=10V, I_D=10A$$

$$R_{DS(on)} \leq 16 \text{ m}\Omega @ V_{GS}=4.5V, I_D=7.0A$$

* P-channel: -30V/-25A

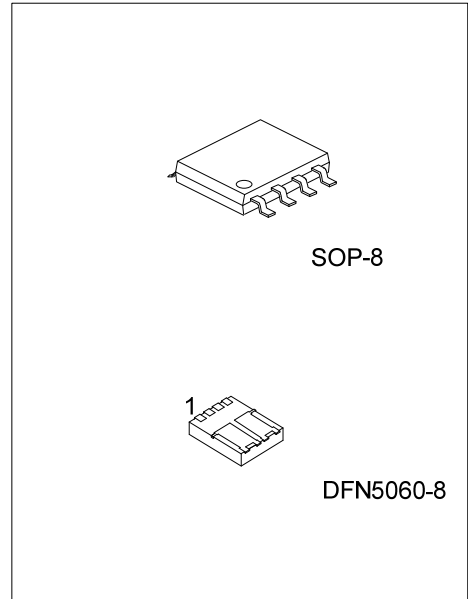
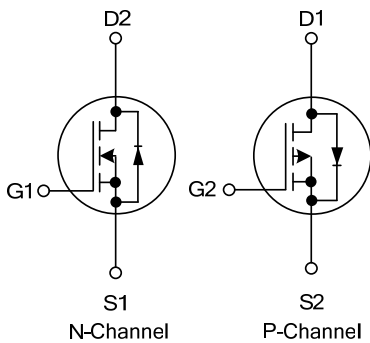
$$R_{DS(on)} \leq 21 \text{ m}\Omega @ V_{GS}=-10V, I_D=-7.0A$$

$$R_{DS(on)} \leq 32 \text{ m}\Omega @ V_{GS}=-4.5V, I_D=-5.0A$$

* High switching speed

* Low gate charge

■ SYMBOL



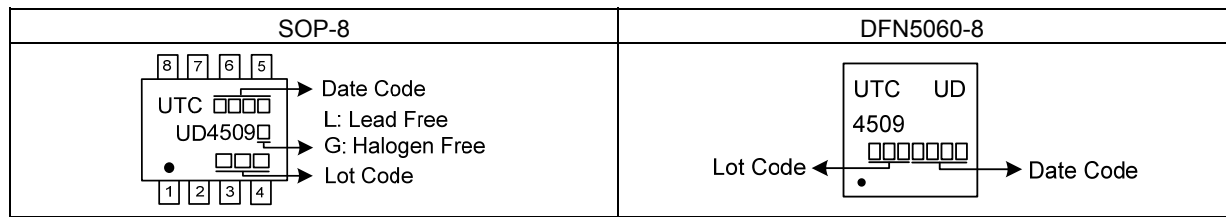
■ ORDERING INFORMATION

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

<p>UD4509G-S08-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) S08: SOP-8, K08-5060: DFN5060-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING



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

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

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			
	DFN5060-8	32.5	$^\circ\text{C/W}$	

Note: Surface mounted on 1 in² copper pad of FR4 board ; 135 $^\circ\text{C/W}$ when mounted on Min. copper pad

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

N-channel

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	30			V
Drain-Source Leakage Current		I_{DSS}	$V_{DS}=24\text{V}, V_{GS}=0\text{V}$			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	$V_{GS}=+20\text{V}, V_{DS}=0\text{V}$			+100	nA
	Reverse		$V_{GS}=-20\text{V}, V_{DS}=0\text{V}$			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.0		3.0	V
Static Drain-Source On-State Resistance (Note 2)		$R_{DS(ON)}$	$V_{GS}=10\text{V}, I_D=10\text{A}$			10	m Ω
			$V_{GS}=4.5\text{V}, I_D=7.0\text{A}$			16	m Ω
Forward Transconductance		g_{FS}	$V_{DS}=10\text{V}, I_D=10\text{A}$		20		S
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	$V_{GS}=0\text{V}, V_{DS}=25\text{V}, f=1.0\text{MHz}$		715	1140	pF
Output Capacitance		C_{OSS}			220		pF
Reverse Transfer Capacitance		C_{RSS}			160		pF
Gate Resistance		R_G	$f=1.0\text{MHz}$		2.2		Ω
SWITCHING PARAMETERS							
Total Gate Charge (Note 2)		Q_G	$V_{GS}=4.5\text{V}, V_{DS}=15\text{V}, I_D=10\text{A}$		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)		$t_{D(ON)}$	$V_{DS}=15\text{V}, V_{GS}=10\text{V}, I_D=1\text{A}, R_G=3.3\Omega, R_D=15\Omega$		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}	$I_S=1.7\text{A}, V_{GS}=0\text{V}$			1.2	V
Body Diode Reverse Recovery Time (Note 2)		t_{rr}	$I_S=10\text{A}, V_{GS}=0\text{V},$		27		ns
Body Diode Reverse Recovery Charge		Q_{rr}	$dI/dt=100\text{A}/\mu\text{s}$		18		nC

■ ELECTRICAL CHARACTERISTICS (CONT.)

P-channel

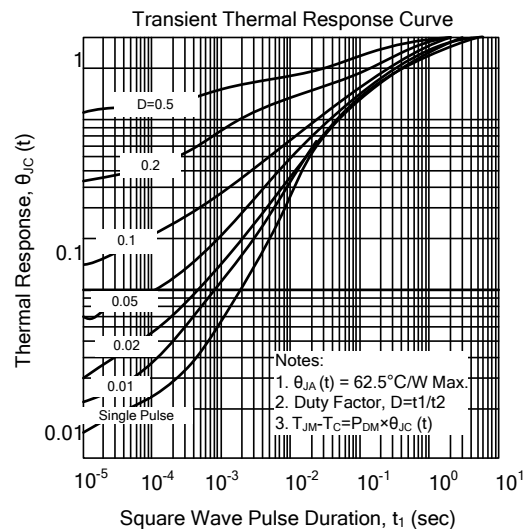
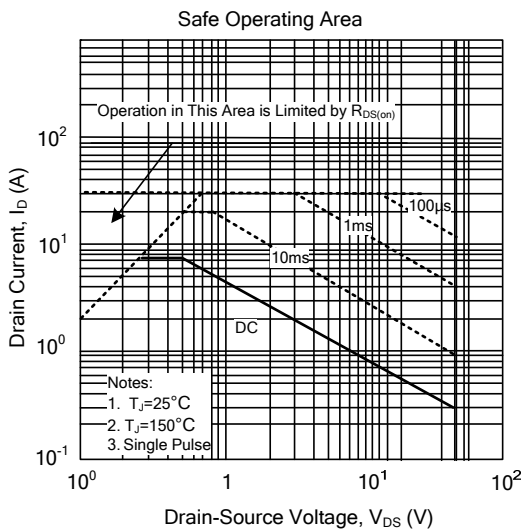
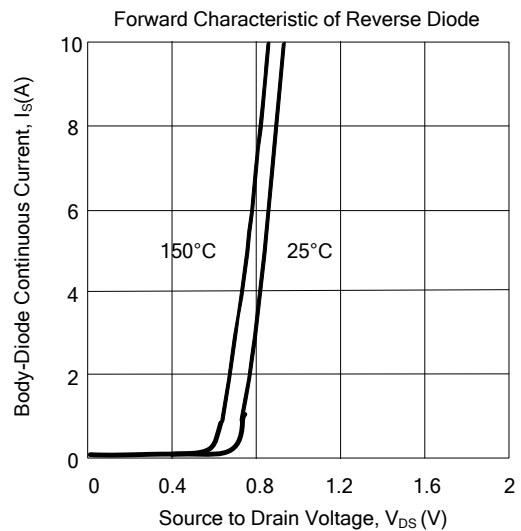
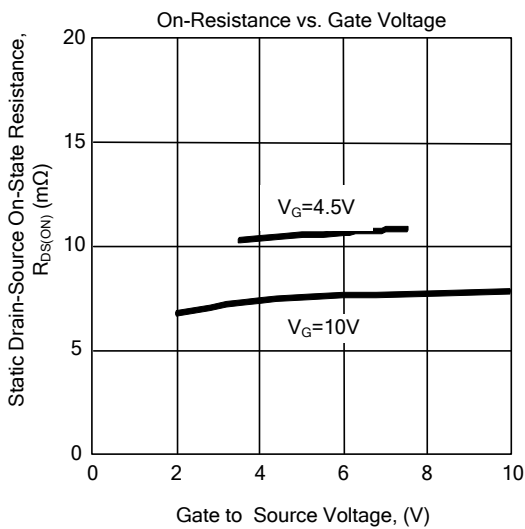
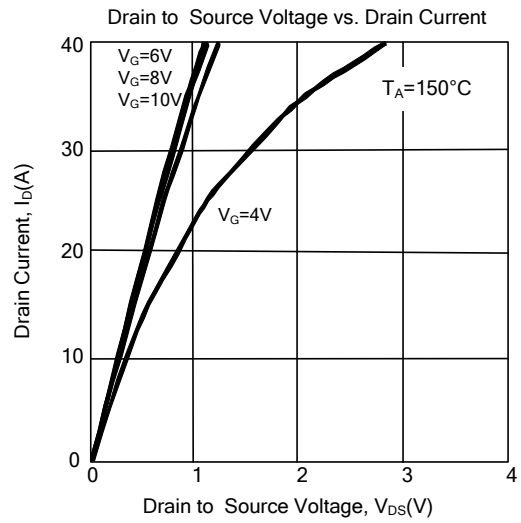
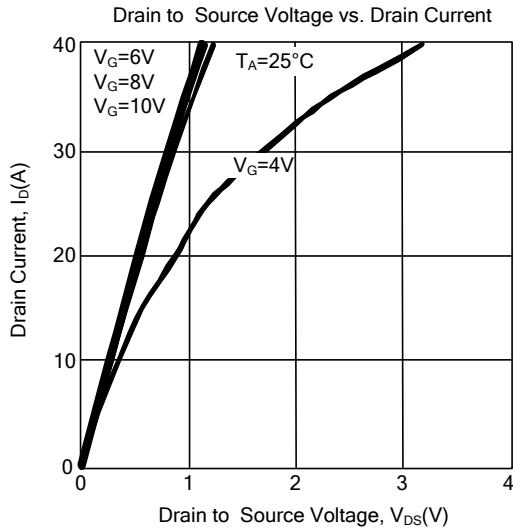
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=-250\mu A, V_{GS}=0V$	-30			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-24V, V_{GS}=0V$			-10	μA
Gate-Source Leakage Current	Forward	$V_{GS}=+20V, V_{DS}=0V$			+100	nA
	Reverse	$V_{GS}=-20V, V_{DS}=0V$			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0		-3.0	V
Static Drain-Source On-State Resistance (Note 2)	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-7.0A$			21	m Ω
		$V_{GS}=-4.5V, I_D=-5.0A$			32	m Ω
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	
SWITCHING PARAMETERS						
Total Gate Charge (Note 2)	Q_G	$V_{GS}=-4.5V, V_{DS}=-15V, I_D=-7A,$ $V_{DS}=-15V, V_{GS}=-10V, I_D=-1A,$ $R_G=3.3\Omega, R_D=15\Omega$		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)	$t_{D(ON)}$			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}	$I_S=-7A, V_{GS}=0V,$ $dI/dt=100A/\mu s$		22		ns
Body Diode Reverse Recovery Charge	Q_{rr}			12		nC

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

2. Pulse test.

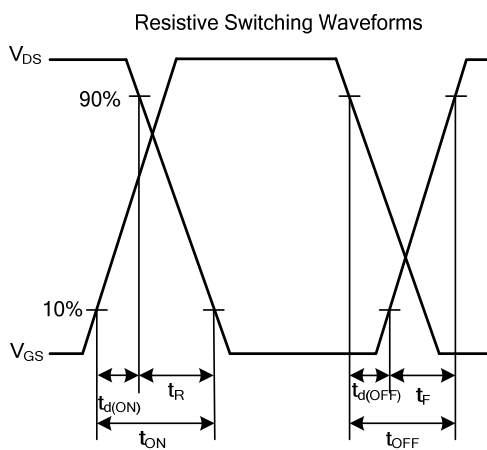
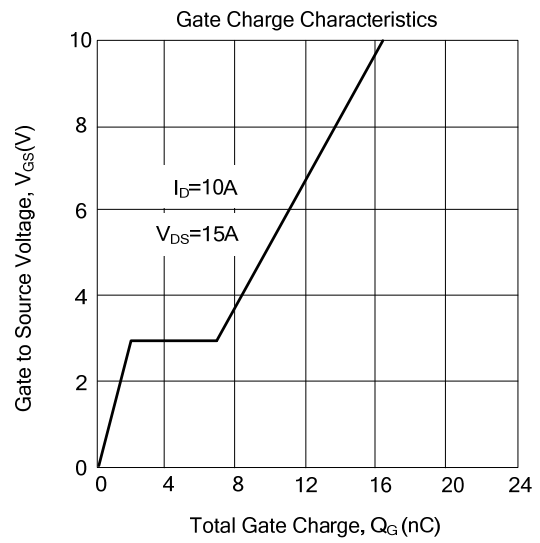
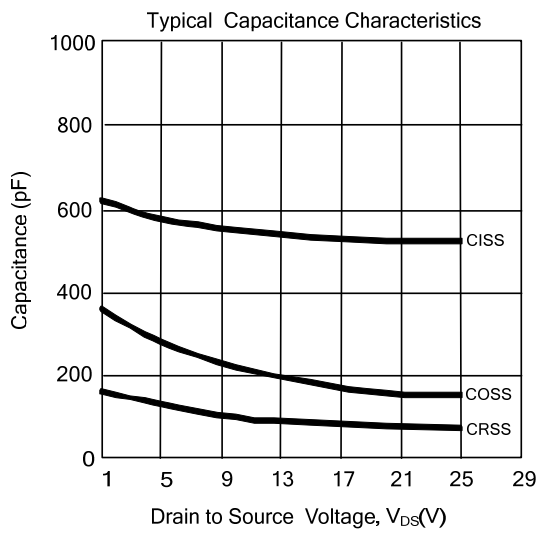
TYPICAL CHARACTERISTICS

N-CHANNEL



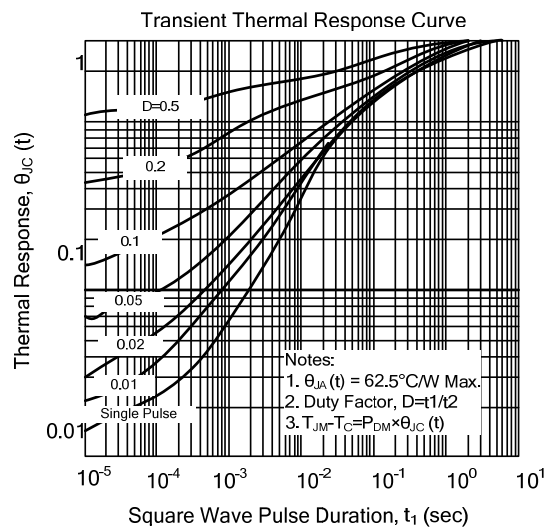
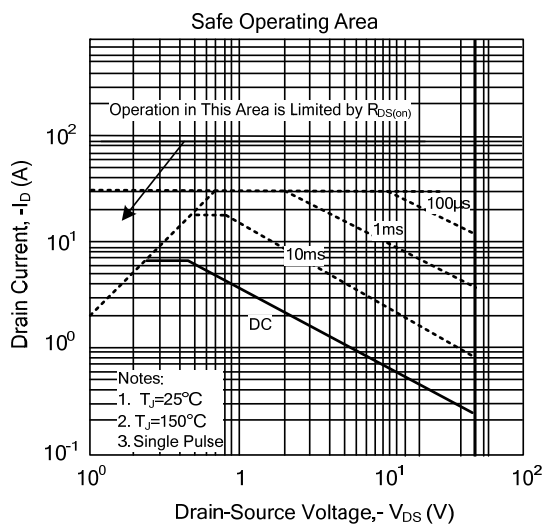
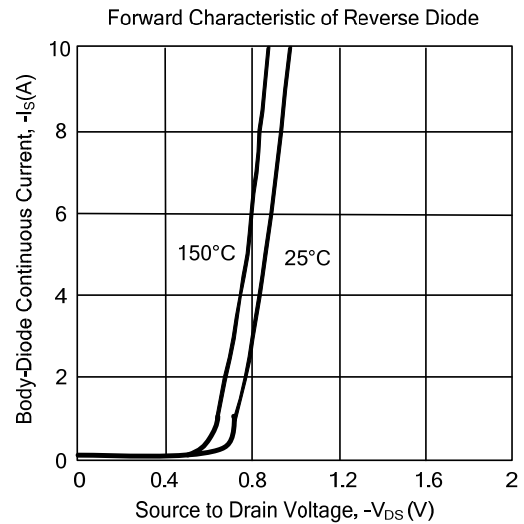
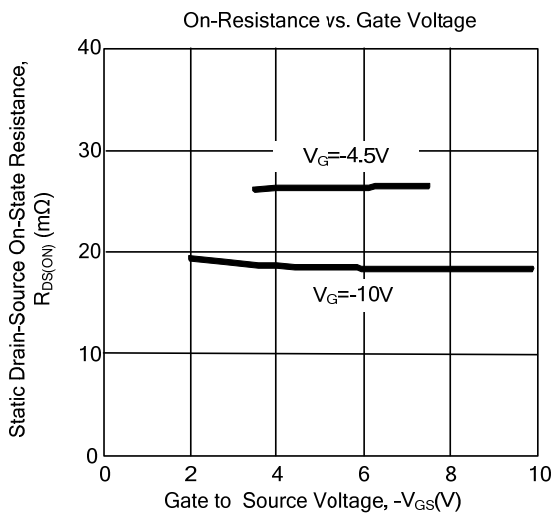
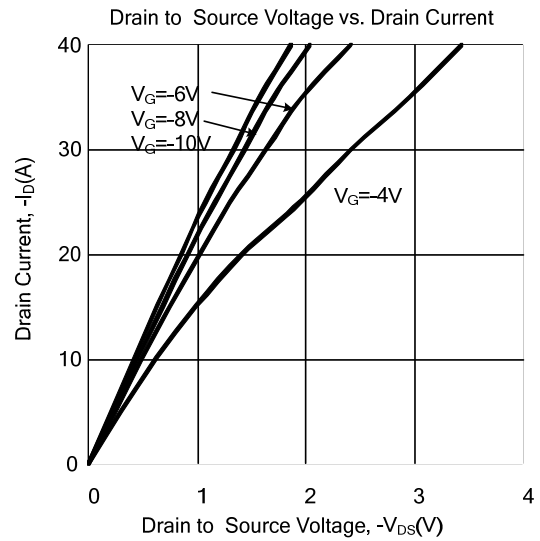
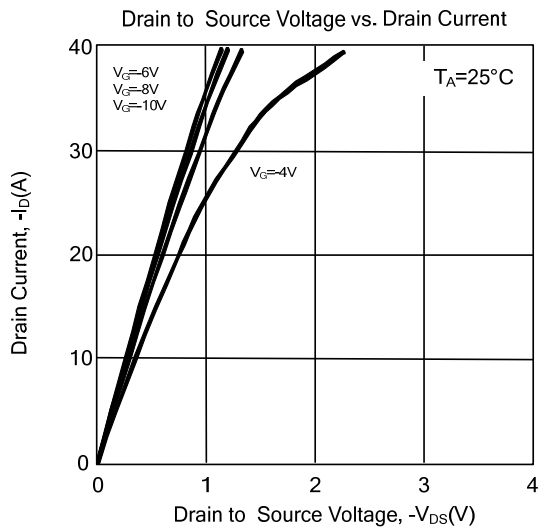
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N-CHANNEL



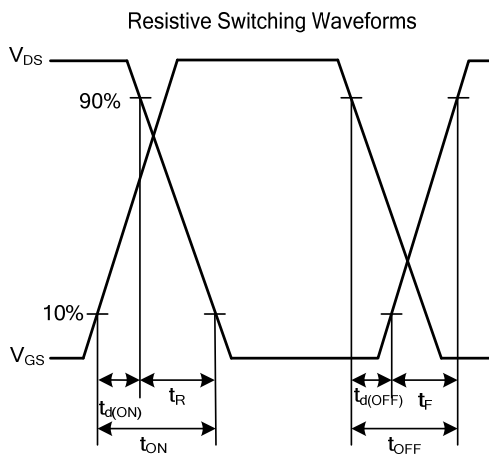
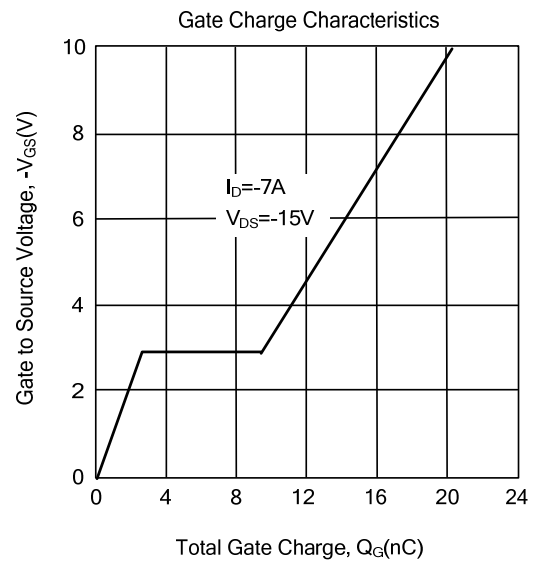
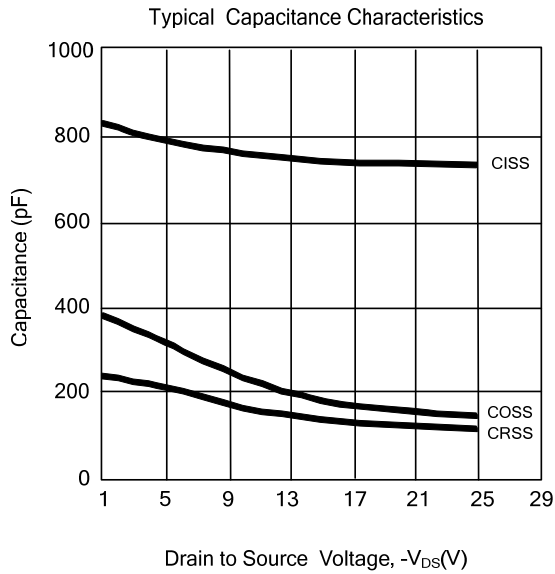
■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL



■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL



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