

General Description

The WSD27N10DN56 is the highest performance trench N-Ch and P-Channel MOSFET with extreme high cell density, which provide excellent $R_{DS(ON)}$ and gate charge for most of the synchronous buck converter applications.

The WSD27N10DN56 meet the RoHS and Green Product requirement 100% E_{AS} guaranteed with full function reliability approved.

Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% E_{AS} Guaranteed
- Green Device Available

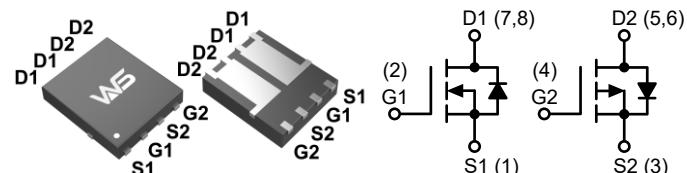
Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D
100V	50mΩ	18A
-100V	80mΩ	-12A

Applications

- Synchronous Buck Converter
- DC-DC Power System
- Inverter

DFN5X6-8L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
V_{DS}	Drain-Source Voltage	100	-100	V
V_{GS}	Gate-Source Voltage	± 20	± 20	
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ ¹	18	-12	A
$I_D @ T_A = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ ¹	7.5	-5.0	
I_{DM}	Pulsed Drain Current ²	54	-36	A
E_{AS}	Single Pulse Avalanche Energy ³	36	49	
I_{AS}	Avalanche Current	12	-14	A
$P_D @ T_A = 25^\circ C$	Power Dissipation ⁴	37.5		W
T_{STG}	Storage Temperature Range	-55 to 150		$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150		

Thermal Data

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient ¹	---	75	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case ¹	---	4.0	

N-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$, Unless Otherwise Noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$, $I_D=250\mu\text{A}$	30	---	---	V
$\Delta \text{BV}_{\text{DSS}}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	---	-0.034	---	$\text{V}/^\circ\text{C}$
$R_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance ²	$V_{\text{GS}}=10\text{V}$, $I_D=10\text{A}$	---	50	58	$\text{m}\Omega$
		$V_{\text{GS}}=4.5\text{V}$, $I_D=6\text{A}$	---	60	67	
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$V_{\text{GS}}=V_{\text{DS}}$, $I_D=250\mu\text{A}$	1.3	1.8	2.5	V
$\Delta V_{\text{GS}(\text{th})}$	$V_{\text{GS}(\text{th})}$ Temperature Coefficient		---	-4.56	---	$\text{mV}/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{\text{DS}}=80\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=25^\circ\text{C}$	---	---	1.0	μA
		$V_{\text{DS}}=80\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=55^\circ\text{C}$	---	---	30	
I_{GSS}	Gate-Source Leakage Current	$V_{\text{GS}}=\pm 20\text{V}$, $V_{\text{DS}}=0\text{V}$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{\text{DS}}=5\text{V}$, $I_D=12\text{A}$	---	10	---	S
R_g	Gate Resistance	$V_{\text{DS}}=0\text{V}$, $V_{\text{GS}}=0\text{V}$, $f = 1.0\text{MHz}$	---	1.5	2.5	Ω
Q_g	Total Gate Charge (4.5V)	$V_{\text{DS}}=50\text{V}$, $V_{\text{GS}}=10\text{V}$, $I_D=10\text{A}$	---	14	---	nC
Q_{gs}	Gate-Source Charge		---	2.5	---	
Q_{gd}	Gate-Drain Charge		---	3.0	---	
$T_{\text{d}(\text{on})}$	Turn-On Delay Time	$V_{\text{DD}}=30\text{V}$, $V_{\text{GS}}=10\text{V}$, $R_G=6\Omega$, $I_D=1\text{A}$	---	11	---	ns
T_r	Rise Time		---	6	---	
$T_{\text{d}(\text{off})}$	Turn-Off Delay Time		---	23	---	
T_f	Fall Time		---	21	---	
C_{iss}	Input Capacitance	$V_{\text{DS}}=50\text{V}$, $V_{\text{GS}}=0\text{V}$, $f = 1.0\text{MHz}$	---	800	---	pF
C_{oss}	Output Capacitance		---	120	---	
C_{rss}	Reverse Transfer Capacitance		---	24	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_s	Continuous Source Current ^{1,6}	$V_G=V_D=0\text{V}$, Force Current	---	---	18	A
I_{SM}	Pulsed Source Current ^{2,6}		---	---	54	
V_{SD}	Diode Forward Voltage ²	$V_{\text{GS}}=0\text{V}$, $I_s=1\text{A}$, $T_J=25^\circ\text{C}$	---	0.75	1.3	V

Note:

1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
2. The data tested by pulsed , pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$
3. The E_{AS} data shows Max. rating . The test condition is $V_{\text{DD}}=50\text{V}$, $V_{\text{GS}}=10\text{V}$, $L=0.5\text{mH}$, $I_{\text{AS}}=12\text{A}$
4. The power dissipation is limited by 150°C junction temperature.
5. The Min. value is 100% E_{AS} tested guarantee.
6. The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

P-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$, Unless Otherwise Noted)

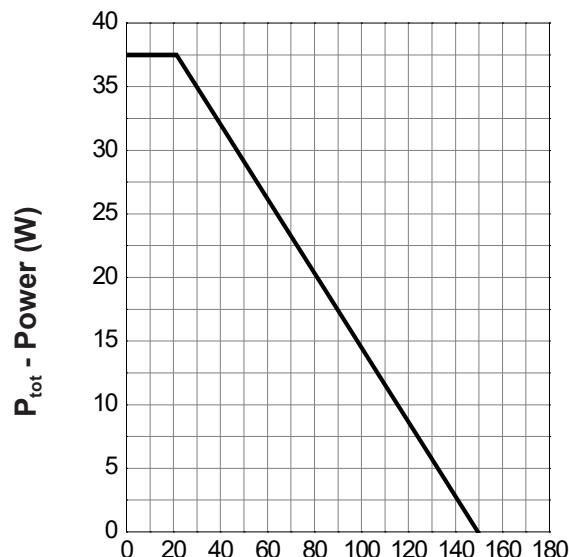
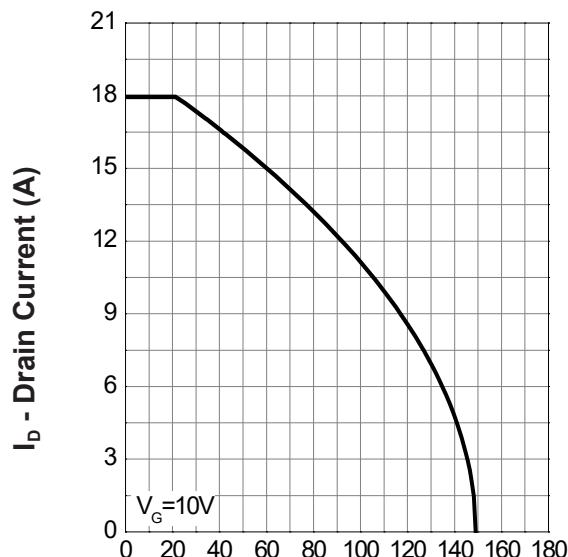
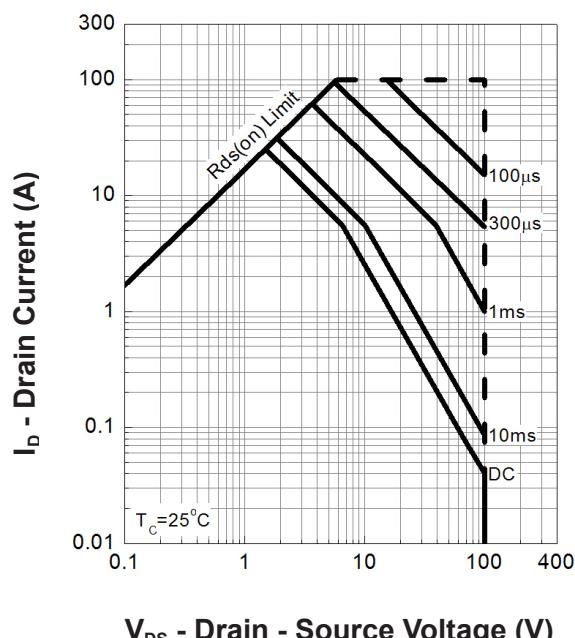
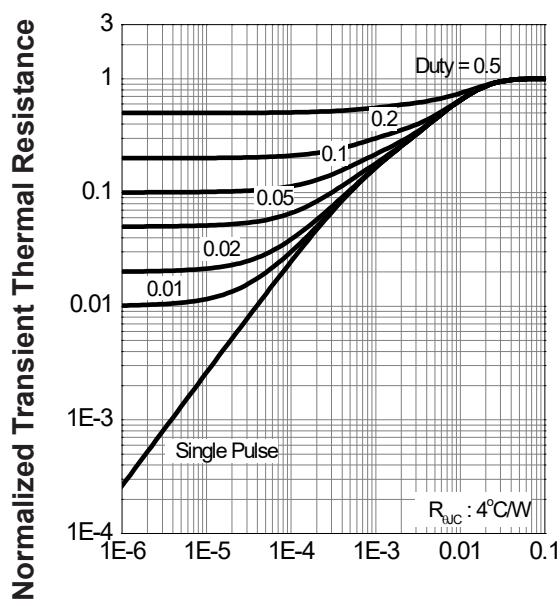
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$, $I_D=-250\mu\text{A}$	-100	---	---	V
$\Delta \text{BV}_{\text{DSS}}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	-0.012	---	$\text{V}/^\circ\text{C}$
$R_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance ²	$V_{\text{GS}}=-10\text{V}$, $I_D=-5\text{A}$	---	80	100	$\text{m}\Omega$
		$V_{\text{GS}}=-4.5\text{V}$, $I_D=-3\text{A}$	---	95	125	
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$V_{\text{GS}}=V_{\text{DS}}$, $I_D=-250\mu\text{A}$	-1.4	-1.8	-2.5	V
$\Delta V_{\text{GS}(\text{th})}$	$V_{\text{GS}(\text{th})}$ Temperature Coefficient		---	4.32	---	$\text{mV}/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{\text{DS}}=-80\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=25^\circ\text{C}$	---	---	1.0	μA
		$V_{\text{DS}}=-80\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=55^\circ\text{C}$	---	---	30	
I_{GSS}	Gate-Source Leakage Current	$V_{\text{GS}}=\pm20\text{V}$, $V_{\text{DS}}=0\text{V}$	---	---	±100	nA
g_{fs}	Forward Transconductance	$V_{\text{DS}}=-5\text{V}$, $I_D=-8\text{A}$	---	12	---	S
R_g	Gate Resistance	$V_{\text{DS}}=0\text{V}$, $V_{\text{GS}}=0\text{V}$, $f = 1.0\text{MHz}$	---	9.0	12	Ω
Q_g	Total Gate Charge (-4.5V)	$V_{\text{DS}}=-50\text{V}$, $V_{\text{GS}}=-10\text{V}$, $I_D=-3\text{A}$	---	30	---	nC
Q_{gs}	Gate-Source Charge		---	4.2	---	
Q_{gd}	Gate-Drain Charge		---	6.5	---	
$T_{\text{d}(\text{on})}$	Turn-On Delay Time	$V_{\text{DD}}=-30\text{V}$, $V_{\text{GS}}=-10\text{V}$, $R_G=6\Omega$, $I_D=-1\text{A}$	---	12	---	ns
T_r	Rise Time		---	10	---	
$T_{\text{d}(\text{off})}$	Turn-Off Delay Time		---	86	---	
T_f	Fall Time		---	40	---	
C_{iss}	Input Capacitance	$V_{\text{DS}}=-15\text{V}$, $V_{\text{GS}}=0\text{V}$, $f = 1.0\text{MHz}$	---	1410	---	pF
C_{oss}	Output Capacitance		---	85	---	
C_{rss}	Reverse Transfer Capacitance		---	60	---	

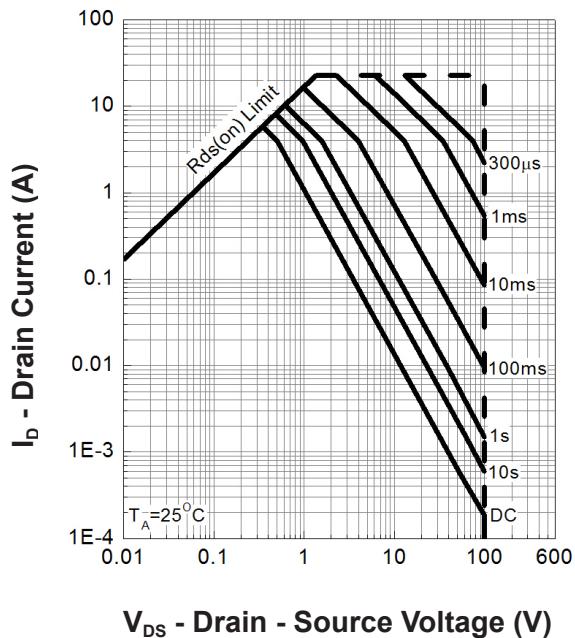
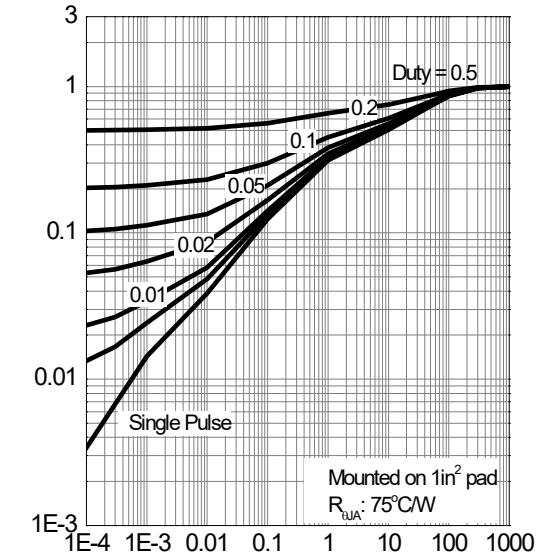
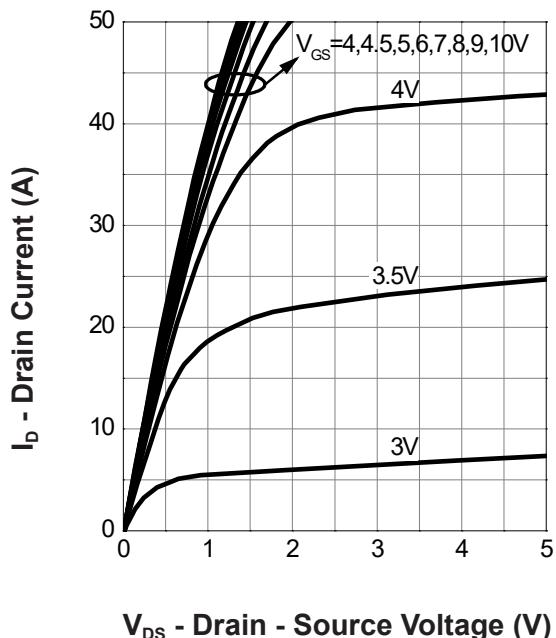
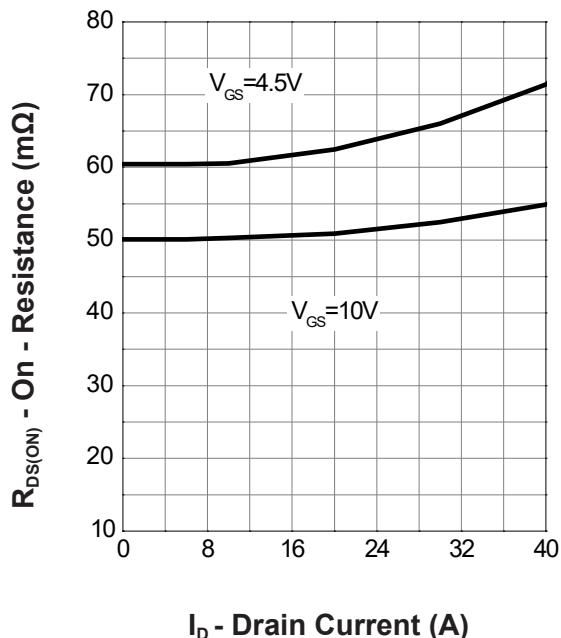
Diode Characteristics

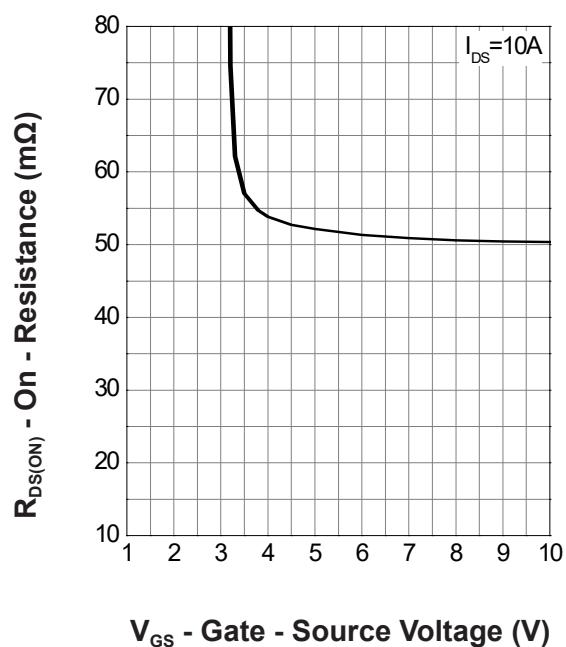
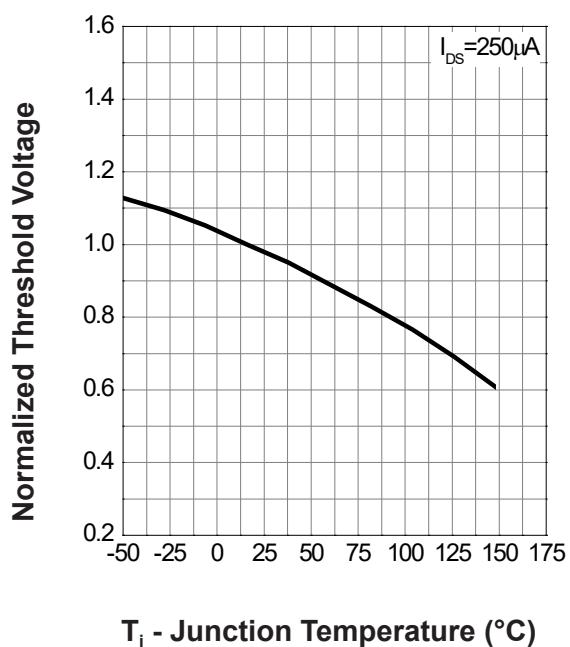
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_s	Continuous Source Current ^{1,6}	$V_G=V_D=0\text{V}$, Force Current	---	---	-12	A
I_{SM}	Pulsed Source Current ^{2,6}		---	---	-36	
V_{SD}	Diode Forward Voltage ²	$V_{\text{GS}}=0\text{V}$, $I_s=-1\text{A}$, $T_J=25^\circ\text{C}$	---	-0.7	-1.2	V

Note:

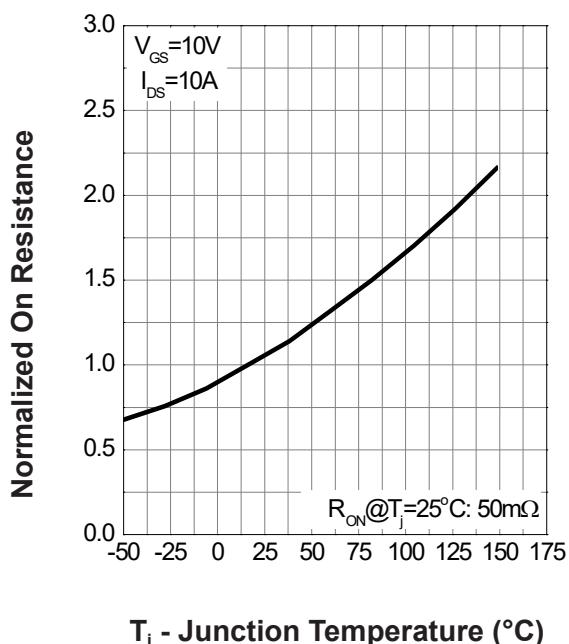
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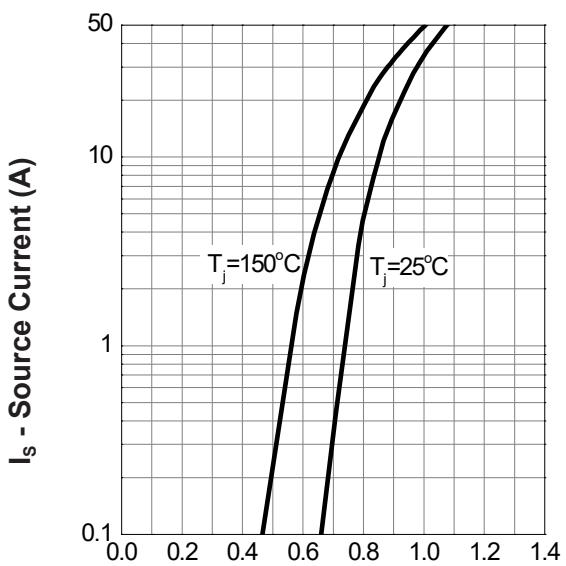
N-Channel Typical Characteristics
Power Dissipation

Drain Current

 T_c - Case Temperature (°C)
 T_c - Case Temperature (°C)
Safe Operation Area

Thermal Transient Impedance

 V_{DS} - Drain - Source Voltage (V)
Square Wave Pulse Duration (sec)

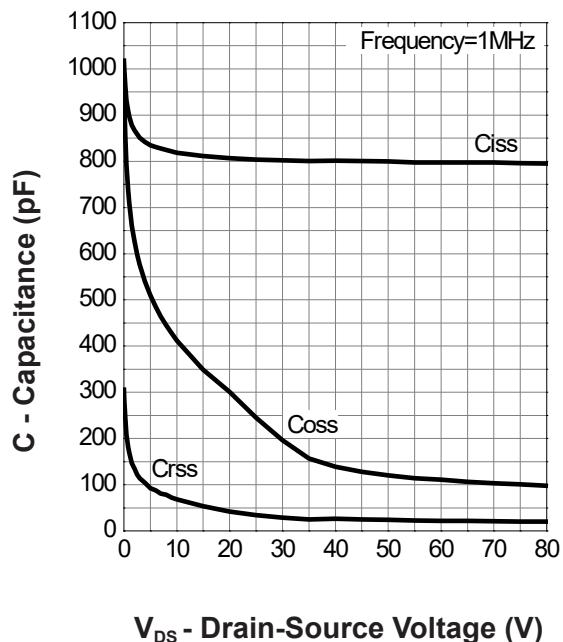
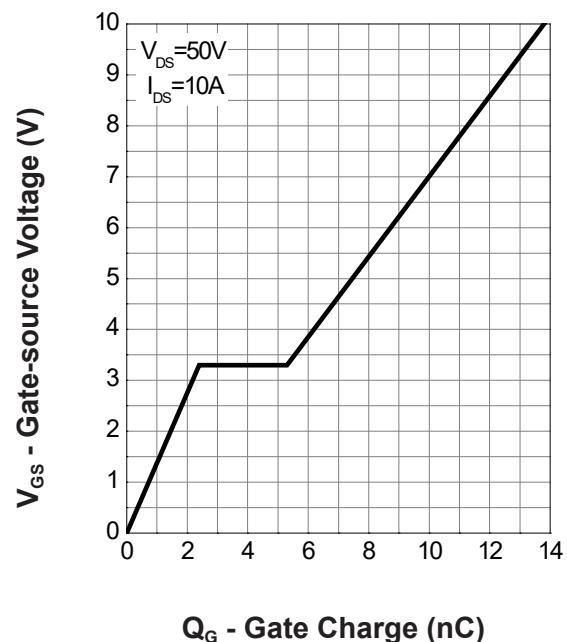
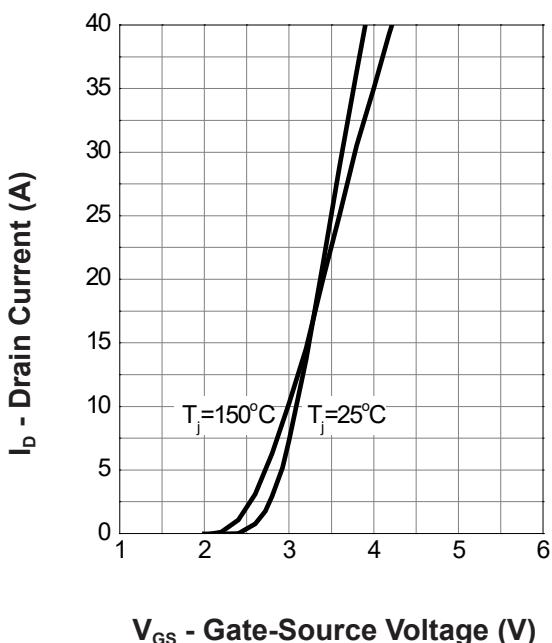
N-Channel Typical Characteristics (Cont.)
Safe Operation Area

Thermal Transient Impedance

Square Wave Pulse Duration (sec)
Output Characteristics

Drain-Source On Resistance


N-Channel Typical Characteristics (Cont.)
Gate-Source On Resistance

Gate Threshold Voltage

 V_{GS} - Gate - Source Voltage (V)

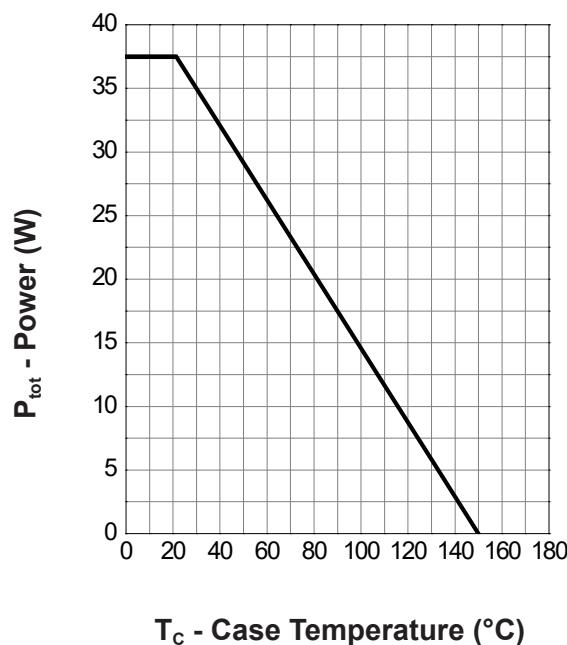
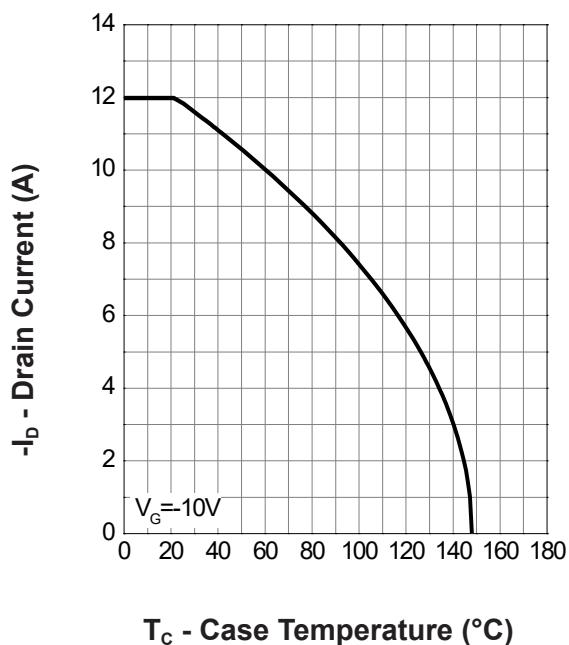
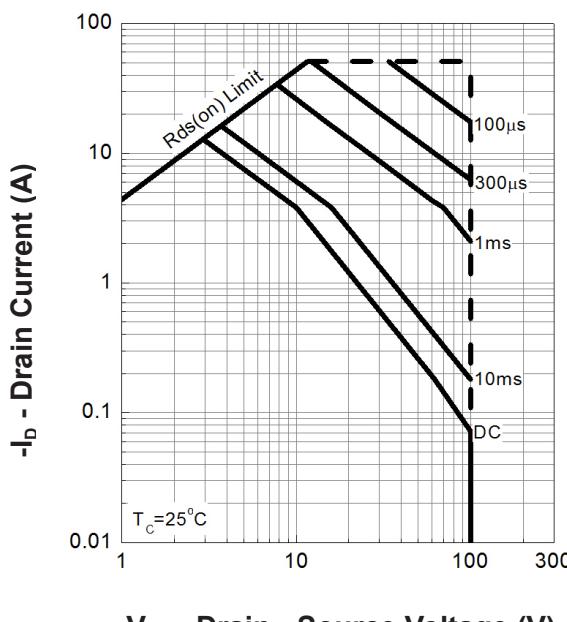
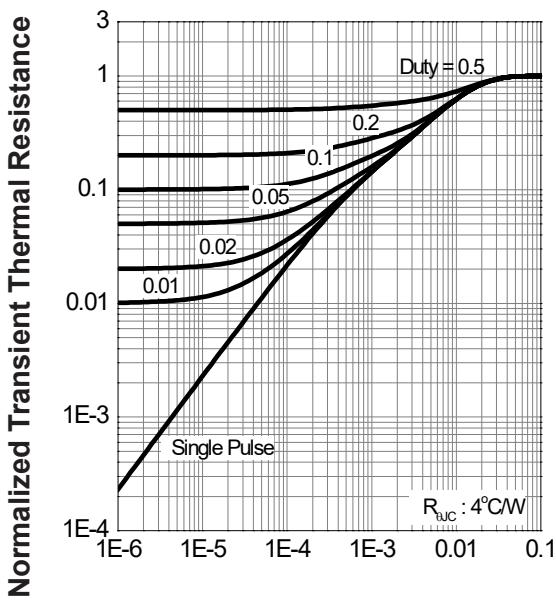
 T_j - Junction Temperature (°C)

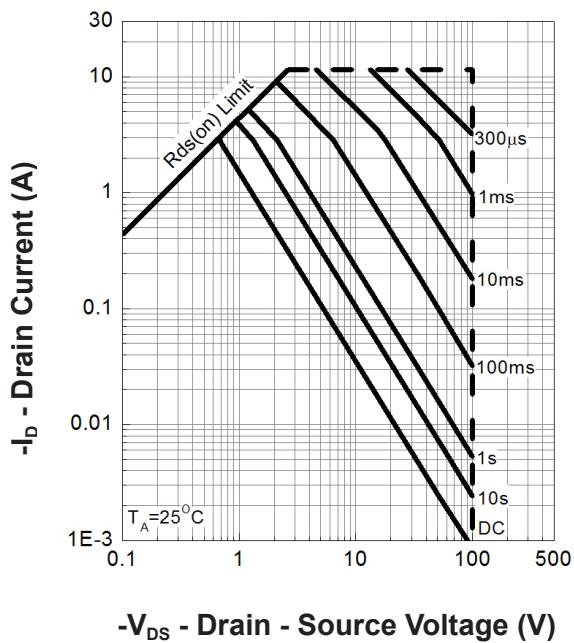
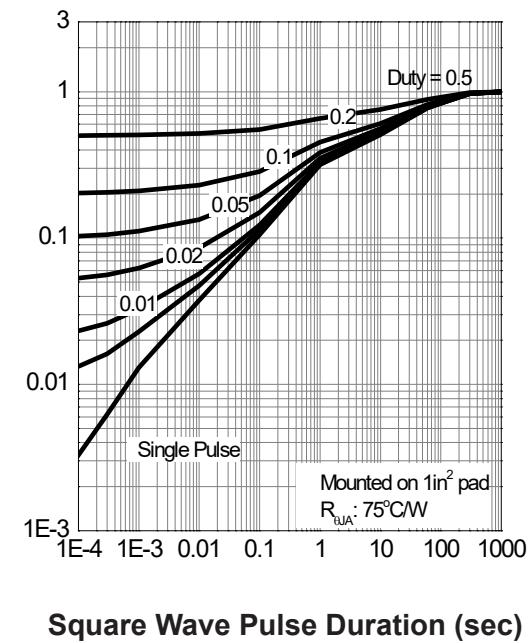
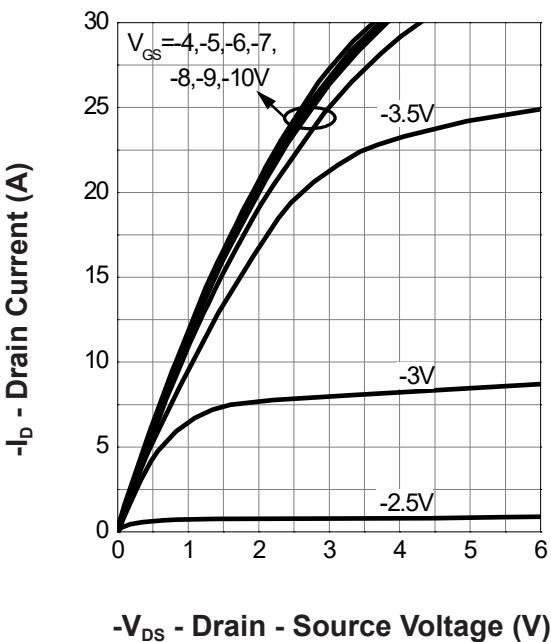
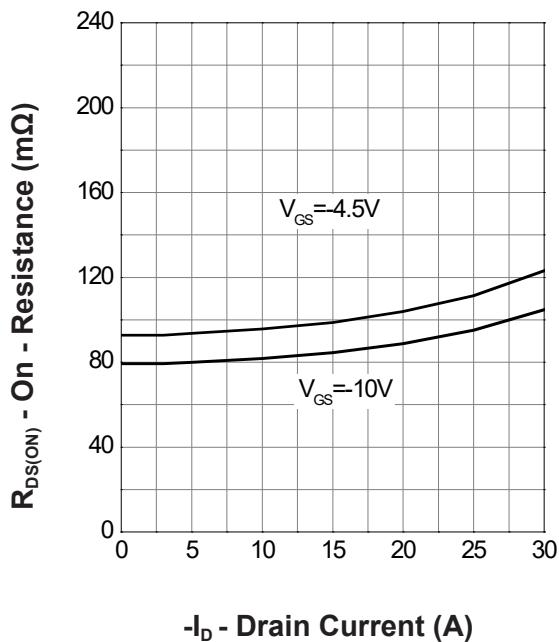
Drain-Source On Resistance

 T_j - Junction Temperature (°C)

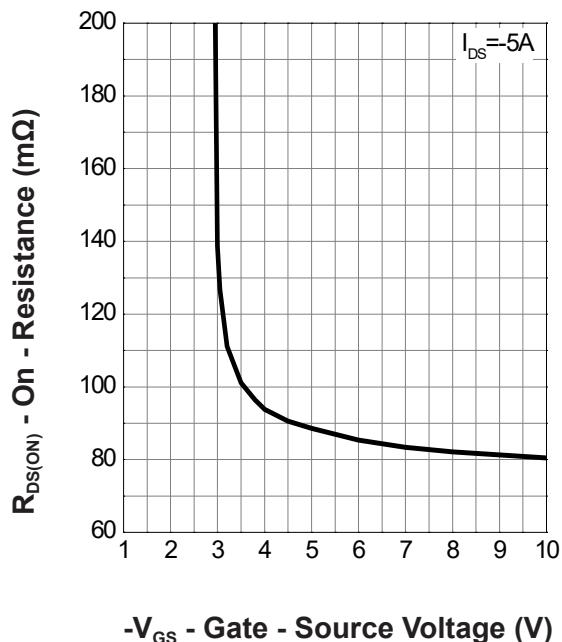
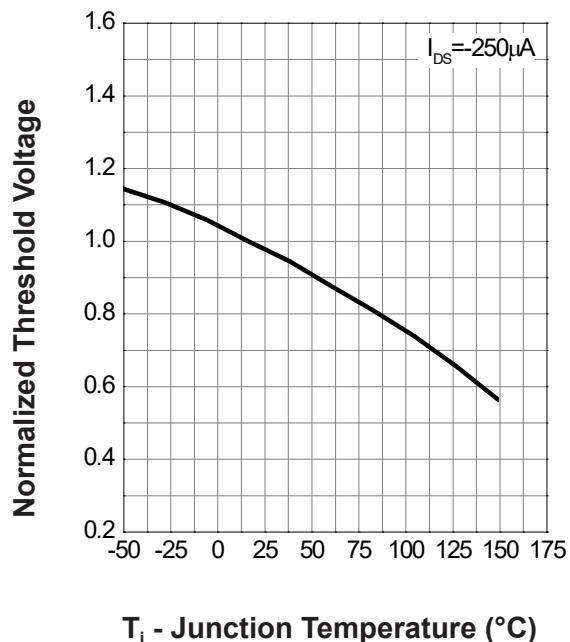
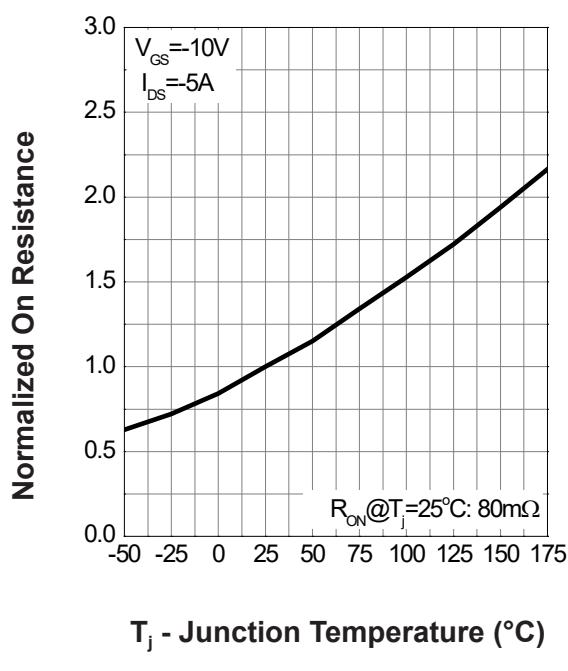
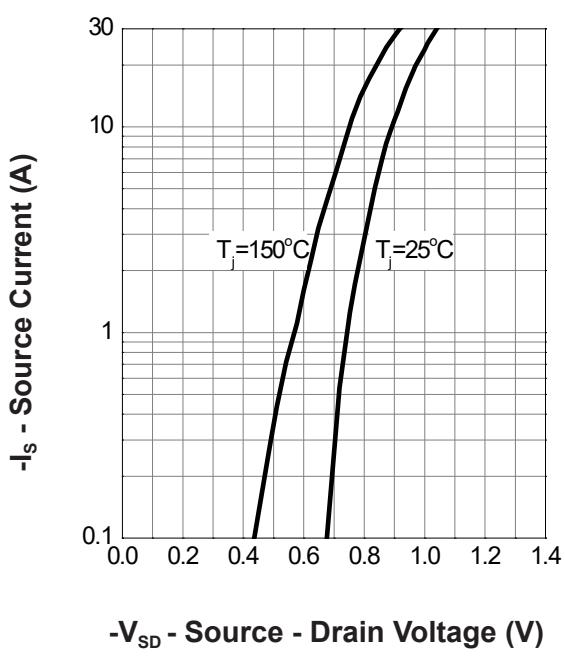
Source-Drain Diode Forward

 V_{SD} - Source - Drain Voltage (V)

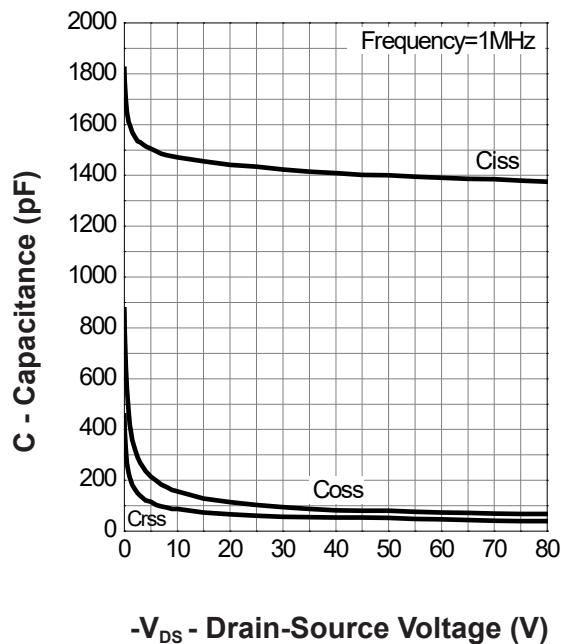
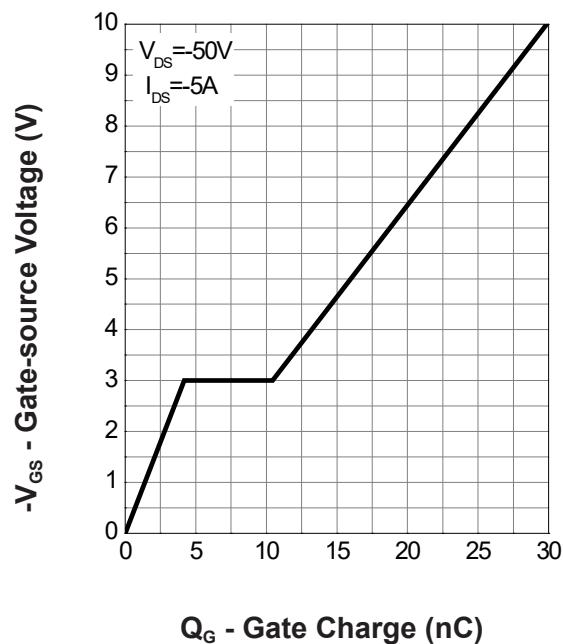
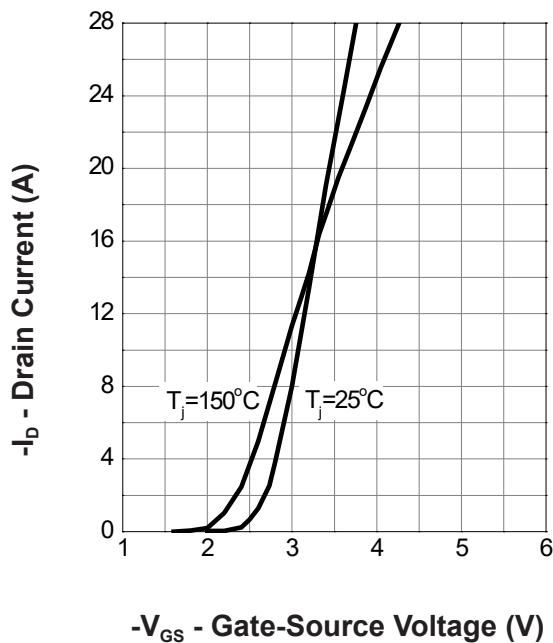
N-Channel Typical Characteristics (Cont.)
Capacitance

Gate Charge

Transfer Characteristics


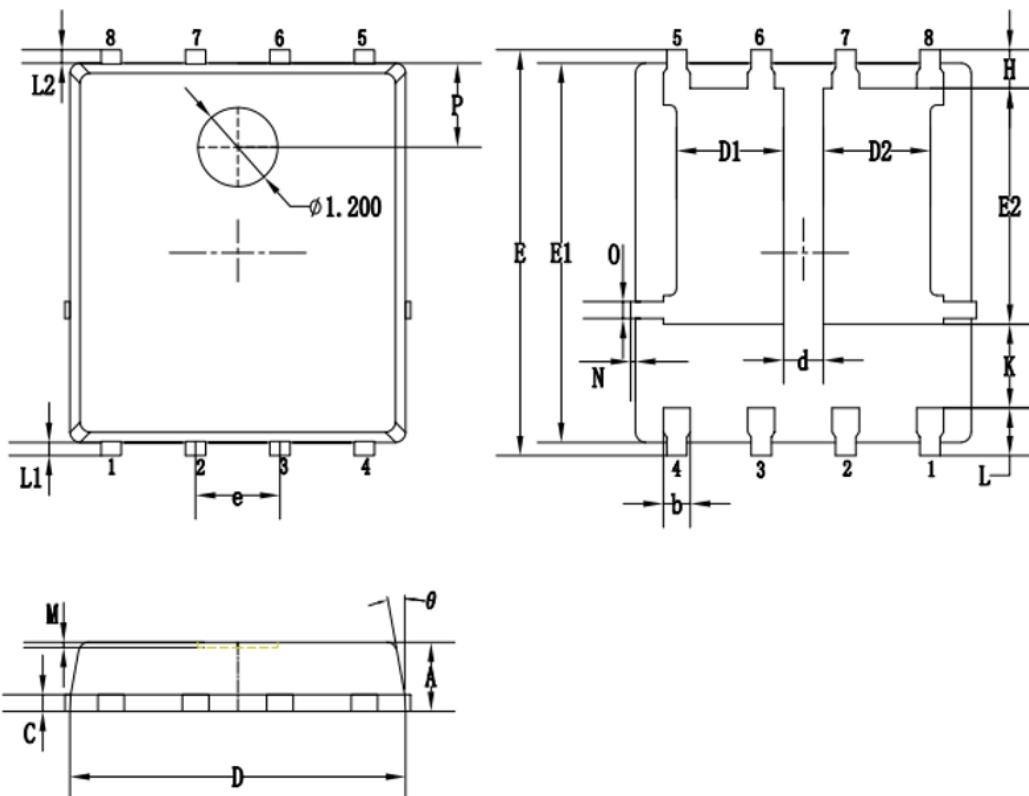
P-Channel Typical Characteristics

Power Dissipation

Drain Current

T_c - Case Temperature (°C)
T_c - Case Temperature (°C)
Safe Operation Area

Thermal Transient Impedance

-V_{DS} - Drain - Source Voltage (V)
Square Wave Pulse Duration (sec)

P-Channel Typical Characteristics (Cont.)
Safe Operation Area

Thermal Transient Impedance

Output Characteristics

Drain-Source On Resistance


P-Channel Typical Characteristics (Cont.)
Gate-Source On Resistance

Gate Threshold Voltage

Drain-Source On Resistance

Source-Drain Diode Forward


P-Channel Typical Characteristics (Cont.)
Capacitance

Gate Charge

Transfer Characteristics


Packaging information


SYMBOLS	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.05	1.20
b	0.35	0.40	0.50
C	0.20	0.25	0.35
D	4.90	5.05	5.20
D1/D2	1.51	1.61	1.71
d	0.50	0.60	0.70
E	6.00	6.15	6.30
E1	5.60	5.75	5.90
E2	3.47	3.57	3.67
e	1.27 BSC.		
H	0.48	0.58	0.68
K	1.17	1.27	1.37
L	0.64	0.74	0.84
L1/L2	0.20 REF.		
θ	8°	10°	12°
M	0.08 REF.		
N	0	-	0.15
O	0.25 REF.		
P	1.28 REF.		



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