

### General Description

The WSD4098DN56 is the highest performance trench Dual N-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 WSD4098DN56 meet the RoHS and Green Product requirement, 100%  $E_{AS}$  guaranteed with full function reliability approved.

### Features

- 100% UIS +  $R_g$  Tested.
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

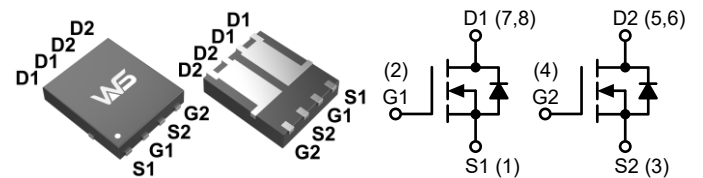
### Product Summary

$BV_{DSS}$	$R_{DS(ON)}$	$I_D$
40V	7.8m $\Omega$	22A

### Applications

- Motor Control
- Transmission Control
- High Current, High Speed Switching

### DFN5X6-8L Pin Configuration



### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ , Unless Otherwise Noted)

Symbol	Parameter	Rating	Units	
$V_{DS}$	Drain-Source Voltage	40	V	
$V_{GS}$	Gate-Source Voltage	$\pm 20$		
$I_D$	Continuous Drain Current	$T_C=25^\circ\text{C}$	22 <sup>1</sup>	A
		$T_C=100^\circ\text{C}$	22 <sup>1</sup>	
$I_{DM}^2$	Pulse Drain Current	$T_C=25^\circ\text{C}$	88	
$P_D$	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	25	W
		$T_C=100^\circ\text{C}$	10	
$E_{AS}^4$	Avalanche Energy, Single pulse	$L=0.1\text{mH}$	39.2	mJ
$I_{AS}^4$	Avalanche Current, Single pulse	$L=0.1\text{mH}$	28	A
$T_{STG}$	Storage Temperature Range		-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range		150	
$R_{\theta JA}^3$	Thermal Resistance-Junction to Ambient	$t \leq 10\text{s}$	45	$^\circ\text{C/W}$
		Steady State	90	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		5.0	

**Electrical Characteristics (T<sub>J</sub>=25°C, Unless Otherwise Noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	40	---	---	V
R <sub>DS(ON)</sub> <sup>5</sup>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	---	6.8	7.8	mΩ
		T <sub>J</sub> =125°C	---	8.9	---	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA	1.2	1.8	2.5	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =32V, V <sub>GS</sub> =0V	---	---	1.0	μA
		T <sub>J</sub> =85°C	---	---	30	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =15A	---	26	---	S
R <sub>G</sub> <sup>6</sup>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1.0MHz	---	1.0	2.0	Ω
Q <sub>g</sub> <sup>6</sup>	Total Gate Charge	V <sub>DS</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A	---	22	---	nC
Q <sub>gth</sub> <sup>6</sup>	Threshold Gate Charge		---	2.6	---	
Q <sub>gs</sub> <sup>6</sup>	Gate-Source Charge		---	4.7	---	
Q <sub>gd</sub> <sup>6</sup>	Gate-Drain Charge		---	3.0	---	
T <sub>d(on)</sub> <sup>6</sup>	Turn-On Delay Time	V <sub>DD</sub> =20V, R <sub>L</sub> =20Ω, I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V, R <sub>G</sub> =6Ω	---	13.8	25	ns
T <sub>r</sub> <sup>6</sup>	Rise Time		---	8	15	
T <sub>d(off)</sub> <sup>6</sup>	Turn-Off Delay Time		---	30	54	
T <sub>f</sub> <sup>6</sup>	Fall Time		---	21	38	
C <sub>iss</sub> <sup>6</sup>	Input Capacitance	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1.0MHz	---	1370	1781	pF
C <sub>oss</sub> <sup>6</sup>	Output Capacitance		---	317	---	
C <sub>rss</sub> <sup>6</sup>	Reverse Transfer Capacitance		---	96	---	

**Diode Characteristics**

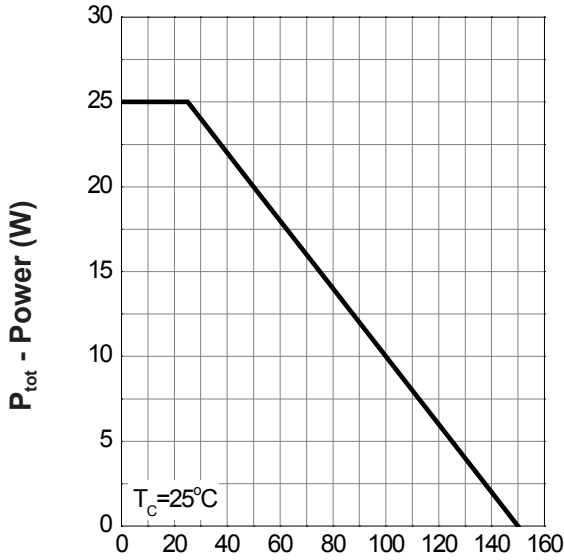
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I <sub>S</sub>	Continuous Source Current	T <sub>C</sub> =25°C	---	---	11.4	A
V <sub>SD</sub> <sup>5</sup>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>SD</sub> =1A	---	0.75	1.1	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> =20A, di <sub>SD</sub> /dt=100A/μs	---	23	---	ns
Q <sub>rr</sub>	Reverse Recovery Charge		---	13	---	nC

**Note:**

- Maximum continuous current is limited by bonding wire.
- Pulse width limited by maximum junction temperature.
- Surface mounted on 1in<sup>2</sup> pad area, steady state t=999s.
- UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature T<sub>J</sub>=25°C).
- Pulse test; pulse width≤300μs, duty cycles≤2%.
- Guaranteed by design, not subject to production testing.

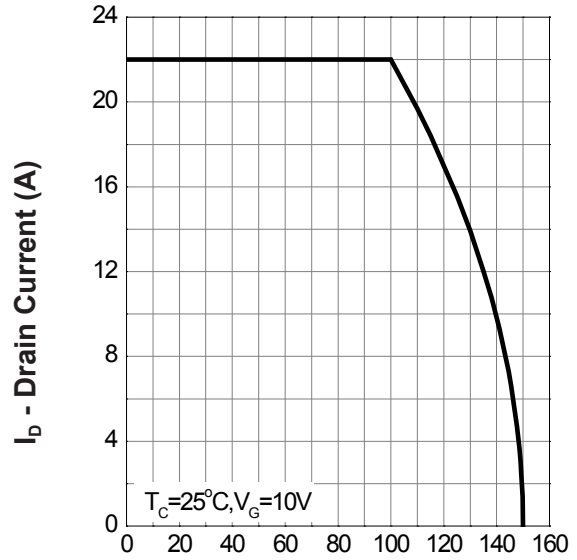
Typical Characteristics

Power Dissipation



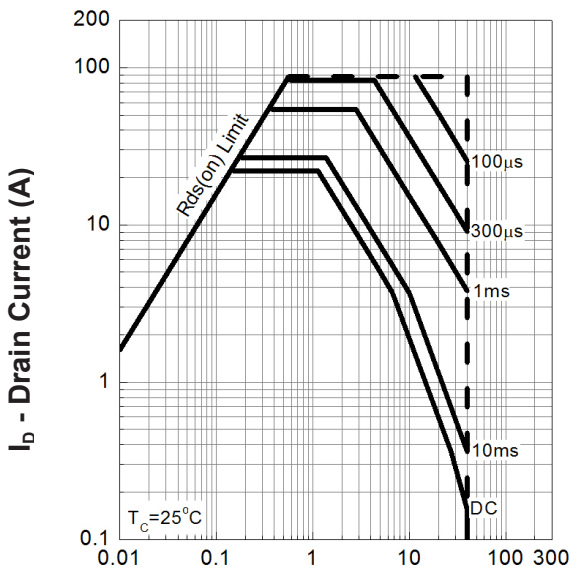
T<sub>j</sub> - Junction Temperature (°C)

Drain Current



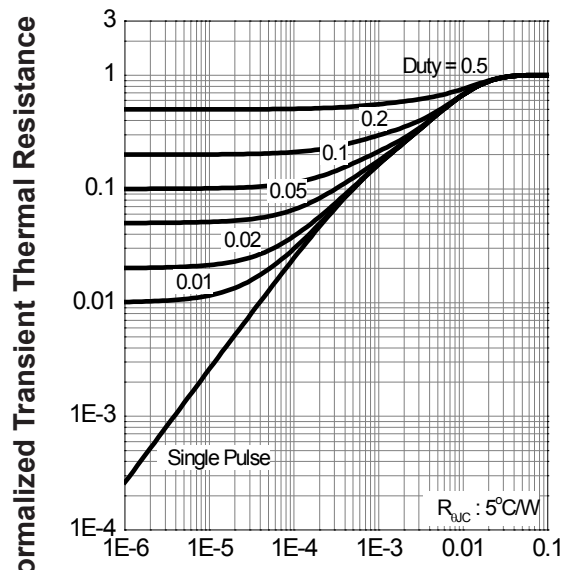
T<sub>j</sub> - Junction Temperature (°C)

Safe Operation Area



V<sub>DS</sub> - Drain - Source Voltage (V)

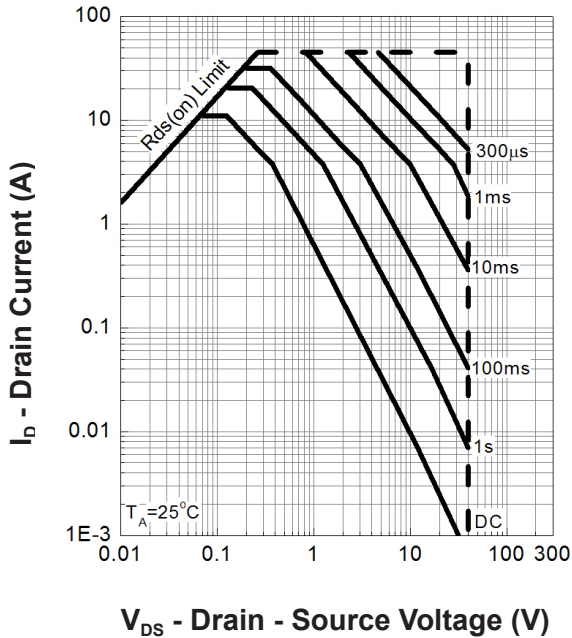
Thermal Transient Impedance



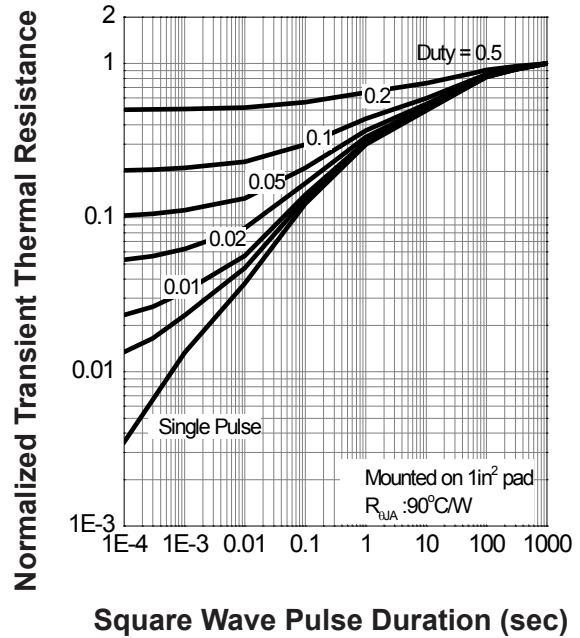
Square Wave Pulse Duration (sec)

Typical Characteristics (Cont.)

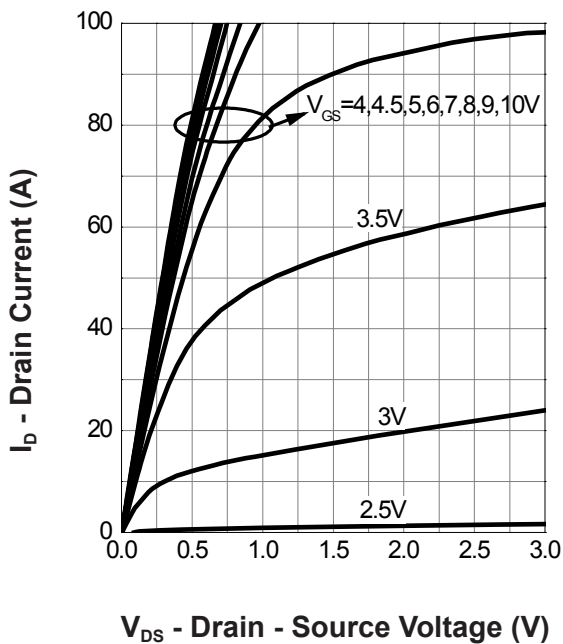
Safe Operation Area



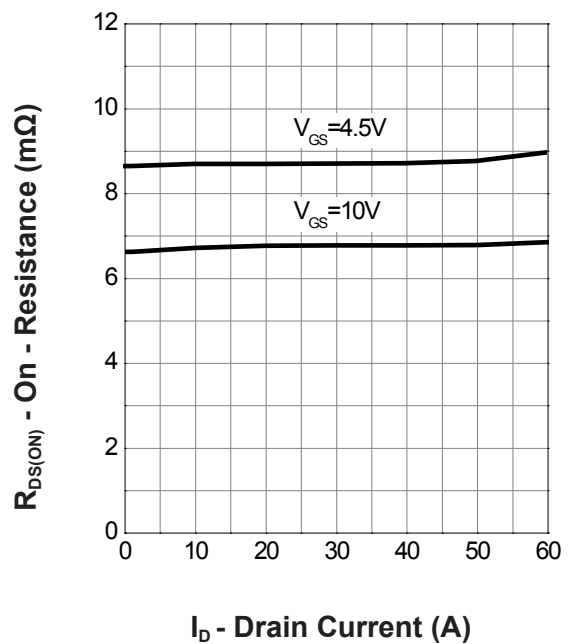
Thermal Transient Impedance



Output Characteristics

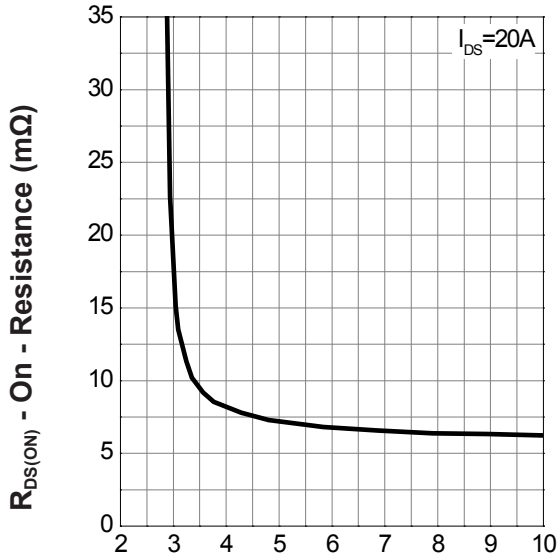


Drain-Source On Resistance



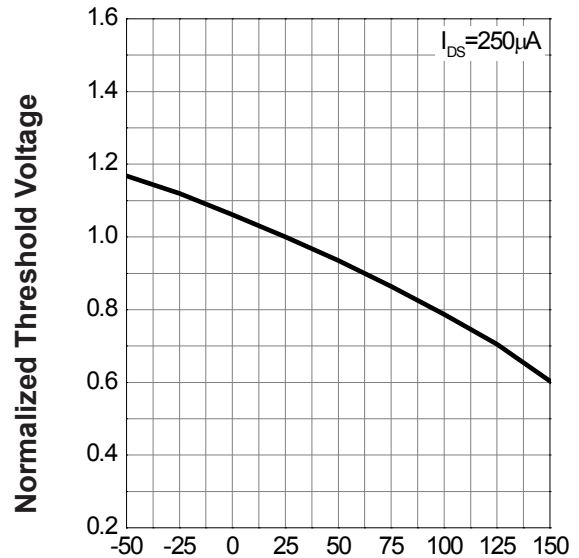
Typical Characteristics (Cont.)

Gate-Source On Resistance



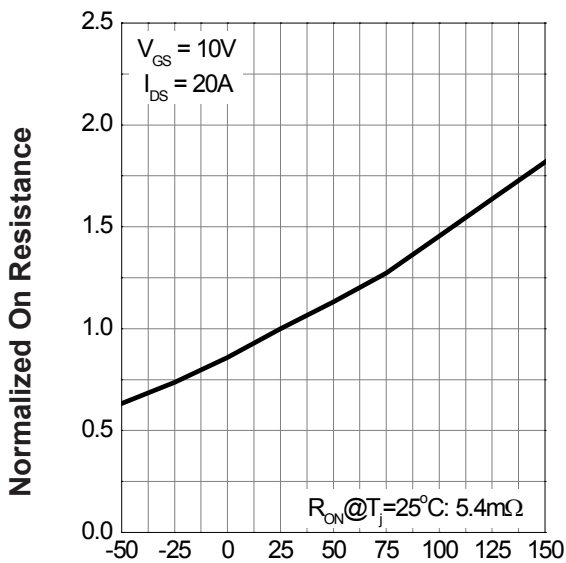
V<sub>GS</sub> - Gate - Source Voltage (V)

Gate Threshold Voltage



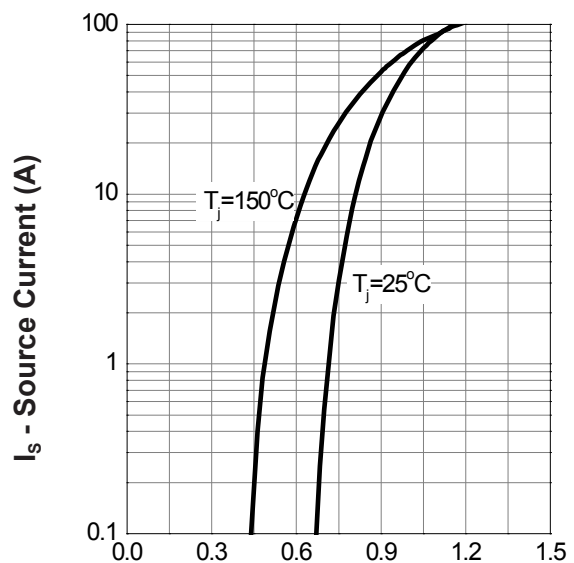
T<sub>j</sub> - Junction Temperature (°C)

Drain-Source On Resistance



T<sub>j</sub> - Junction Temperature (°C)

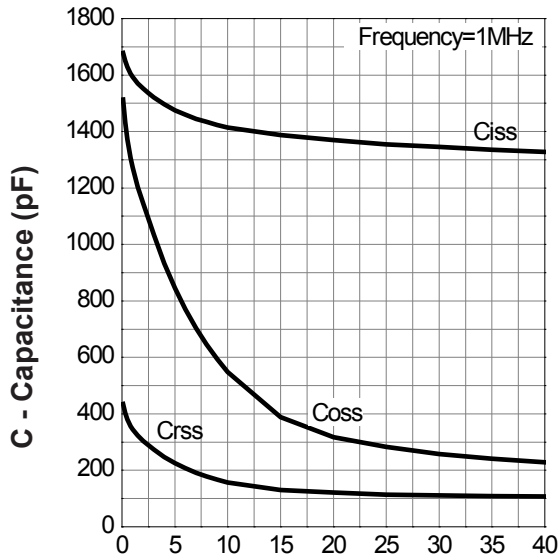
Source-Drain Diode Forward



V<sub>SD</sub> - Source - Drain Voltage (V)

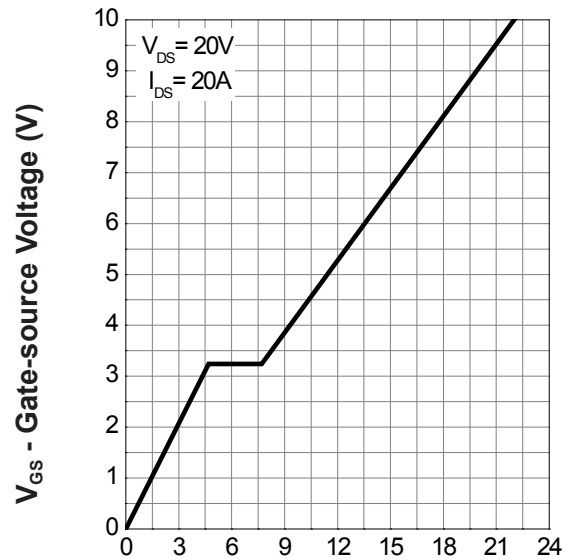
Typical Characteristics (Cont.)

Capacitance



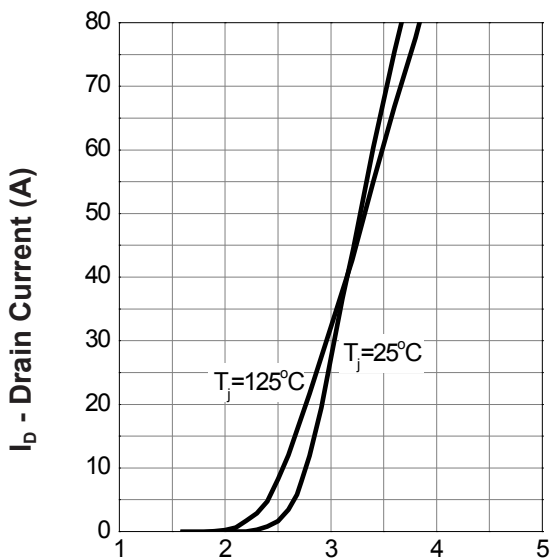
$V_{DS}$  - Drain-Source Voltage (V)

Gate Charge

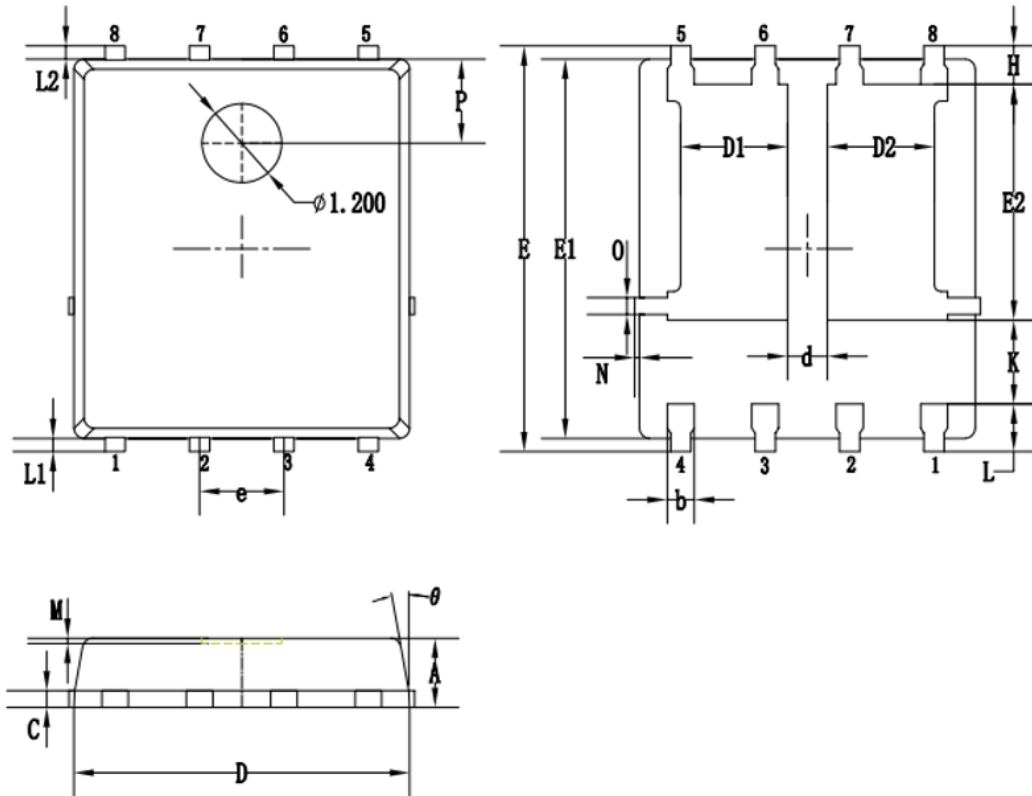


$Q_G$  - Gate Charge (nC)

Transfer Characteristics



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

**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.		
$\theta$	8°	10°	12°
M	0.08 REF.		
N	0	-	0.15
O	0.25 REF.		
P	1.28 REF.		

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