

N-Channel Enhancement Mode MOSFET

1. Product Information

1.1 Features

- ✓ Surface-mounted package
- ✓ Super Trench
- ✓ Advanced trench cell design
- ✓ MSL1

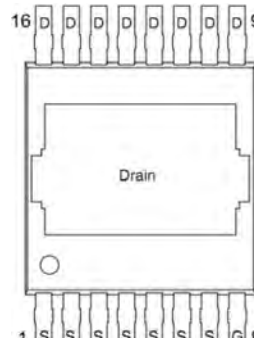
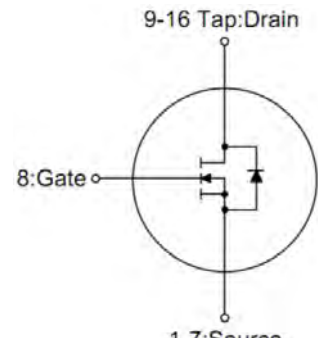
1.2 Applications

- ✓ BMS
- ✓ Drones
- ✓ High power inverter system
- ✓ Light electric vehicles

1.3 Quick reference

- ✓ $BV \geq 120\text{ V}$
- ✓ $P_{tot} \leq 333\text{ W}$
- ✓ $I_D \leq 230\text{ A}$
- ✓ $R_{DS(ON)} \leq 2.3\text{ m}\Omega @ V_{GS} = 10\text{ V}$
- ✓ $R_{DS(ON)} \leq 3.2\text{ m}\Omega @ V_{GS} = 6\text{ V}$

2. Pin Description

Pin	Description	Simplified Outline	Symbol
8	Gate(G)		
1,2,3,4,5,6,7	Source(S)		
9,10,11,12,13,14,15,16	Drain(D)		
Tap	Drain(D)		

Top View
TOLT

3. Limiting Values

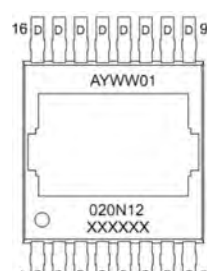
Symbol	Parameter		Rating	Unit
V _{DS}	Drain-Source Voltage		120	V
V _{GS}	Gate-Source Voltage		± 20	V
I _D	Drain Current	T _C = 25 °C	230	A
		T _C = 100 °C	165	A
I _{DM}	Pulsed Source Current	T _C = 25 °C	920	A
I _S	Diode Forward Current	T _C = 25 °C	230	A
E _{AS}	Single Pulsed Avalanche Energy	L = 1.0mH	2450	mJ
P _{tot}	Total Power Dissipation	T _C = 25 °C	333	W
R _{θJA} ^{Note1}	Thermal Resistance- Junction to Ambient		50	°C / W
R _{θJC}	Thermal Resistance- Junction to Case		0.45	°C / W
T _{stg}	Storage Temperature		-55~175	°C
T _J	Junction Temperature		175	°C

Note 1 : Surface Mounted on 1 in² pad area, $t \leq 10$ sec.

Note 2 : Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

Note 3 : Limited by bonding wire.

4. Marking Information

Product Name	Marking
UP020N12LT	

5. Ordering Code

Product Name	Package	Reel Size	Tape width	Quantity	Note
UP020N12LT	TOLT			1800	

6. Electrical Characteristics ($T_A=25^\circ$ Unless Otherwise Noted)

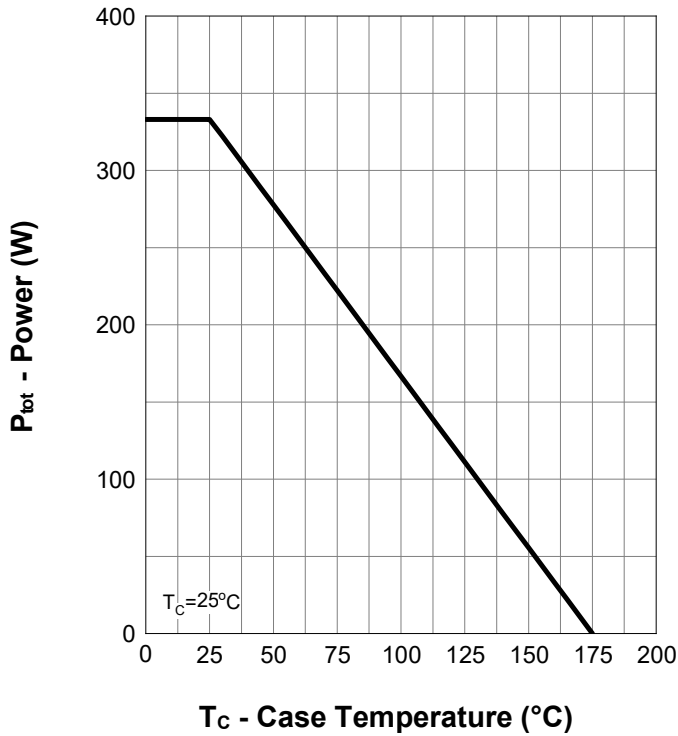
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _{DS} = 250 μA	120	-	-	V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _{DS} = 250 μA	2	-	4	V
I _{DSS}	Drain Leakage Current	V _{DS} = 96 V, V _{GS} = 0 V	-	-	1	μA
I _{GSS}	Gate Leakage Current	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	±100	nA
R _{DS(ON)} ^{Note1}	On-State Resistance	V _{GS} = 10 V, I _{DS} = 50 A	-	2.0	2.3	mΩ
		V _{GS} = 6 V, I _{DS} = 30 A	-	2.5	3.2	
Diode Characteristics						
V _{SD} ^{Note1}	Diode Forward Voltage	I _{SD} = 50 A, V _{GS} = 0 V	-	-	1.3	V
t _{rr}	Reverse Recovery Time	I _{DS} = 50 A, V _{GS} = 0 V dI _{SD} /dt = 100 A/μs	-	151	-	nS
Q _{rr}	Reverse Recovery Charge		-	533	-	nC
Dynamic Characteristics ^{Note2}						
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 60 V Frequency = 1 MHz	-	12133	-	pF
C _{oss}	Output Capacitance		-	1312	-	
C _{rss}	Reverse Transfer Capacitance		-	49	-	
t _{d(on)}	Turn-on Delay Time	V _{DS} = 60 V, V _{GEN} = 10 V, R _G = 3.9 Ω, R _L = 1.2 Ω, I _{DS} = 50 A	-	31	-	nS
t _r	Turn-on Rise Time		-	88	-	
t _{d(off)}	Turn-off Delay Time		-	137	-	
t _f	Turn-off Fall Time		-	70	-	
Gate Charge Characteristics ^{Note2}						
Q _g	Total Gate Charge	V _{DS} = 60 V, V _{GS} = 10 V, I _{DS} = 50 A	-	210	-	nC
Q _{gs}	Gate-Source Charge		-	69	-	
Q _{gd}	Gate-Drain Charge		-	51	-	

Note 1: Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

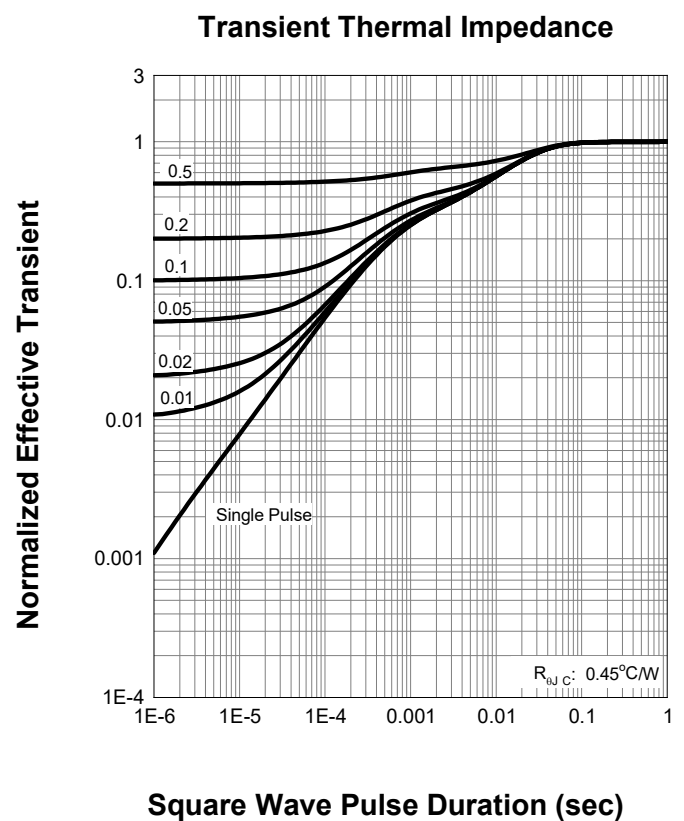
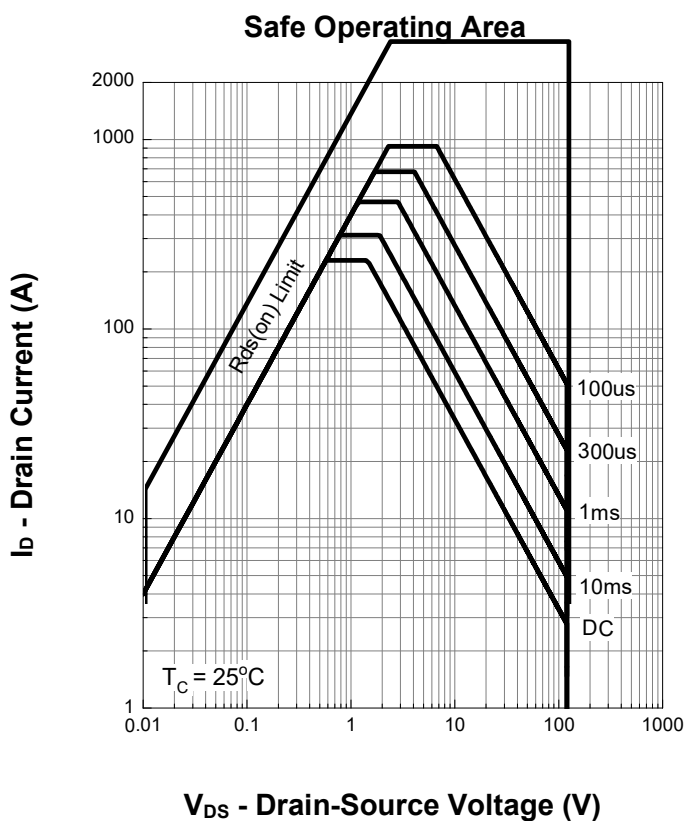
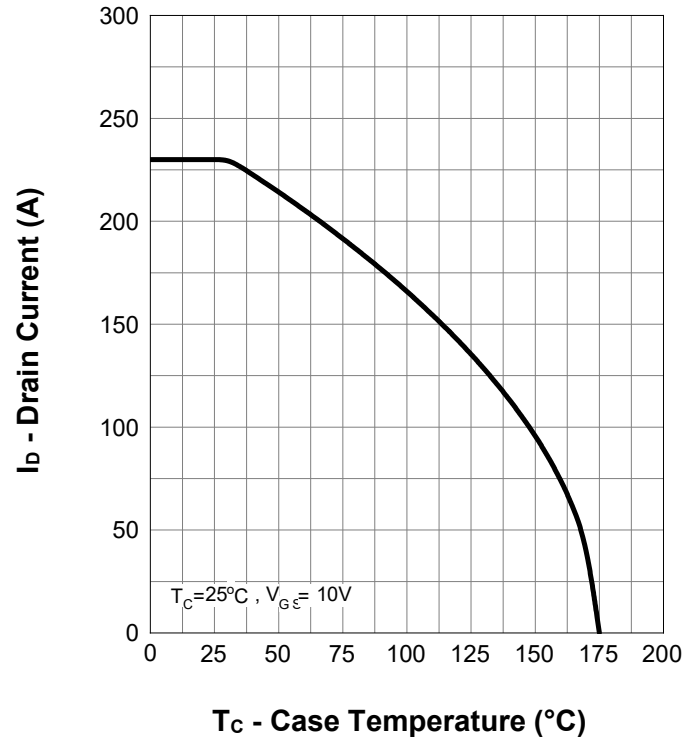
Note 2: Guaranteed by design, not subject to production testing.

7. Typical Characteristics

Power Capability

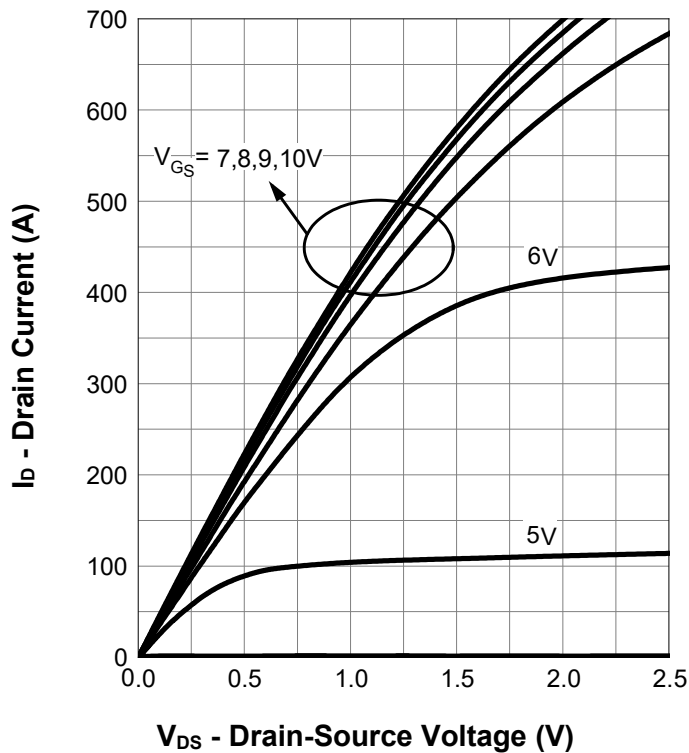


Current Capability

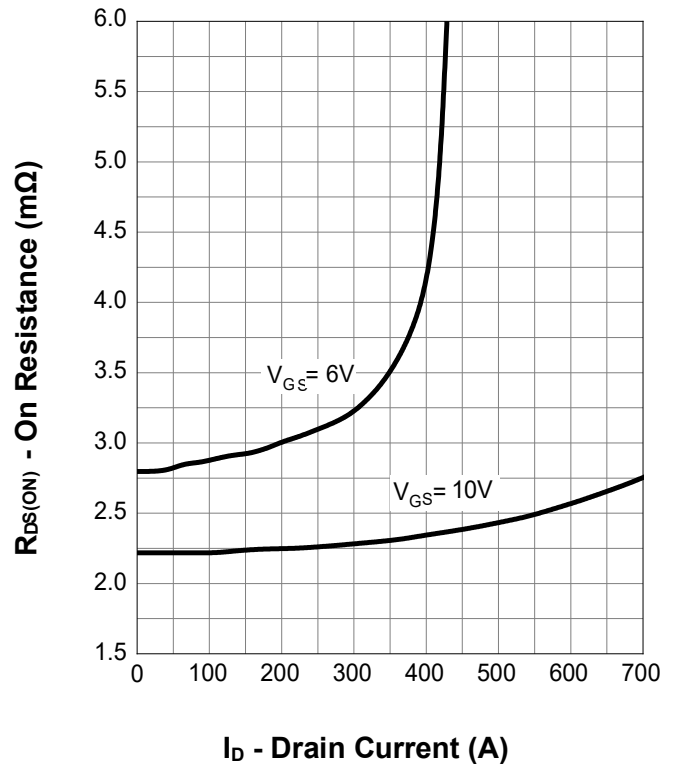


7. Typical Characteristics (cont.)

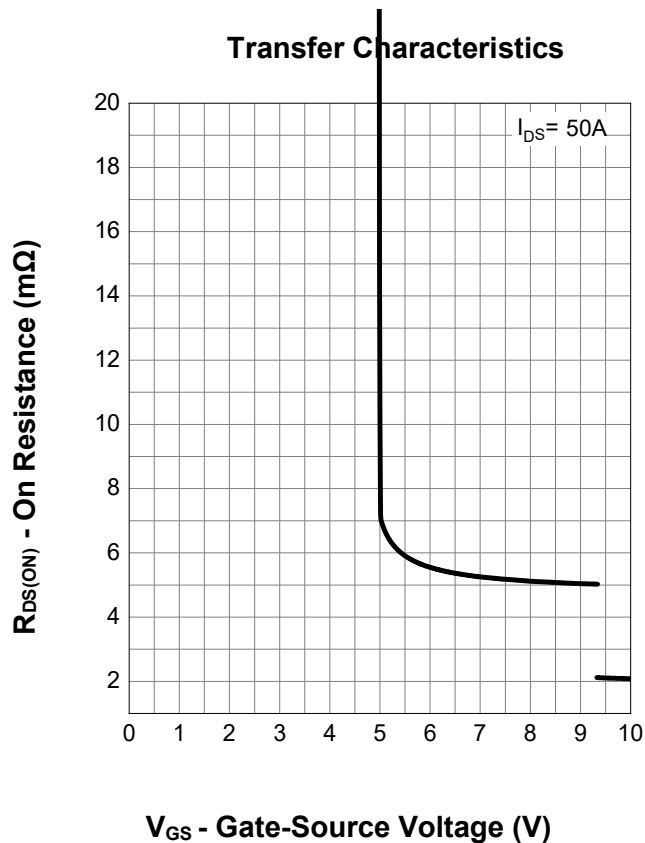
Output Characteristics



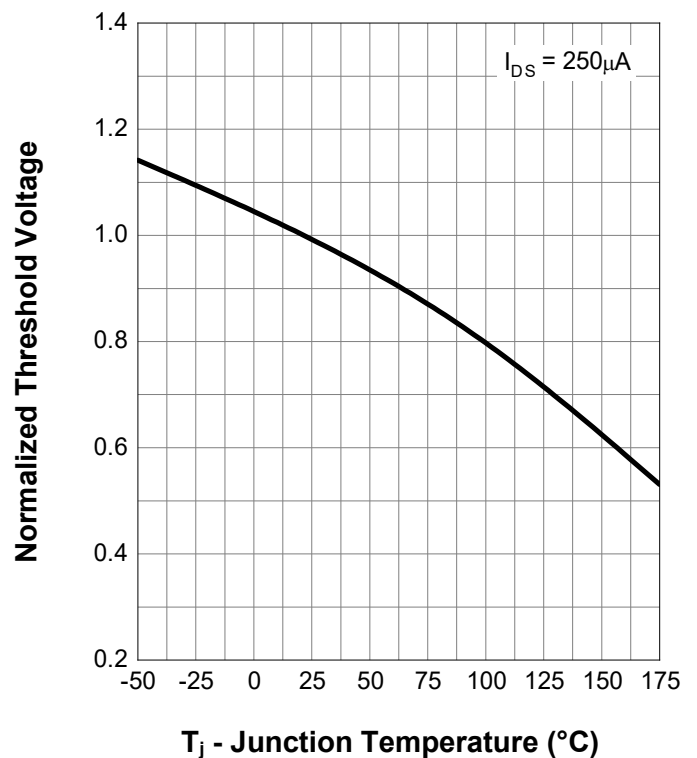
On Resistance



Transfer Characteristics

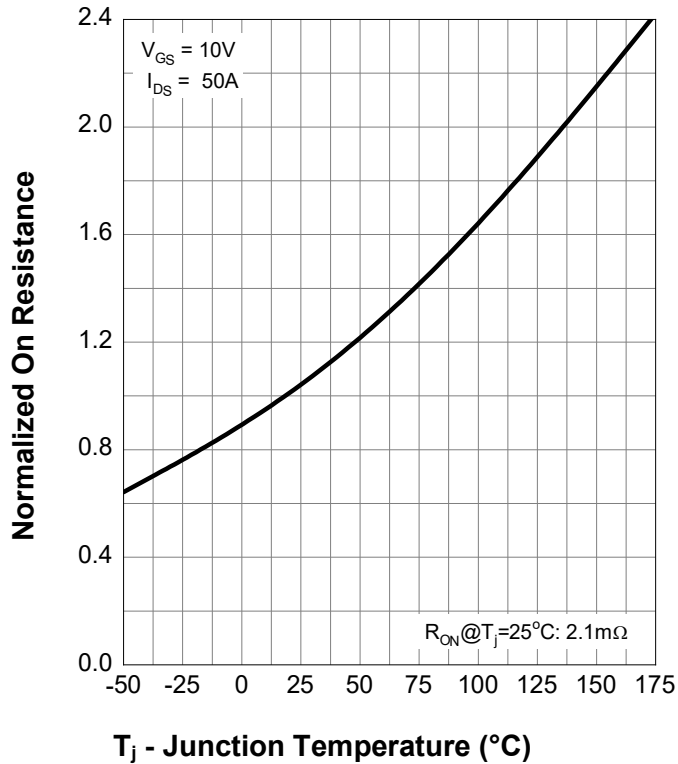


Normalized Threshold Voltage

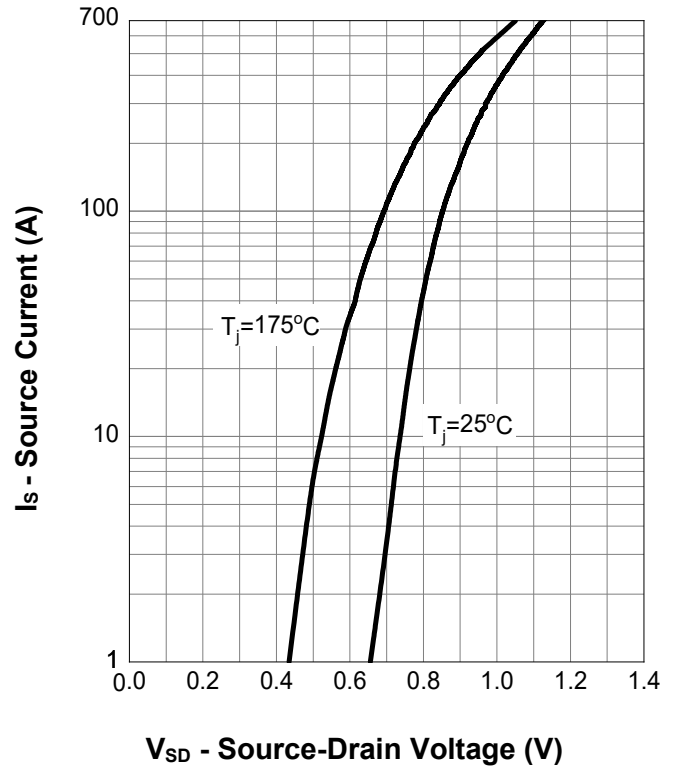


7. Typical Characteristics (cont.)

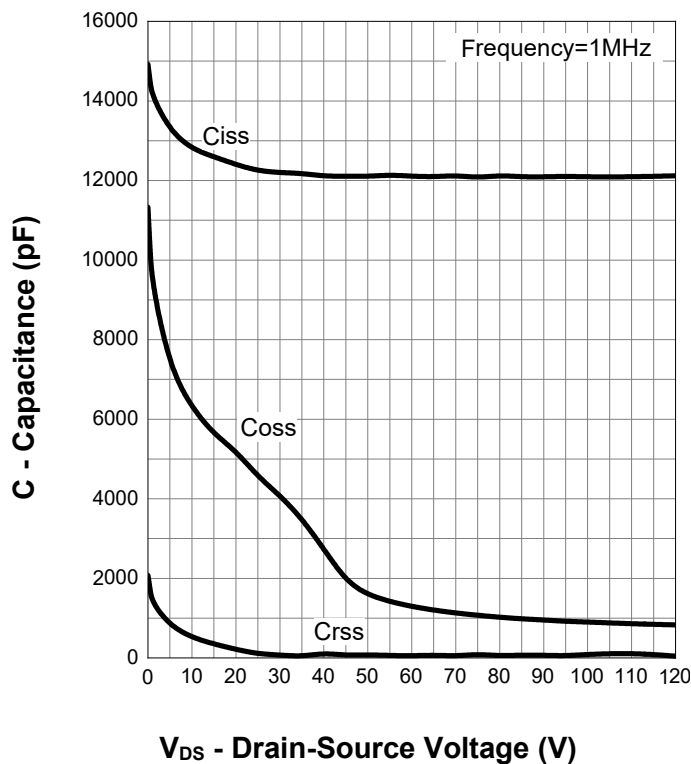
Normalized On Resistance



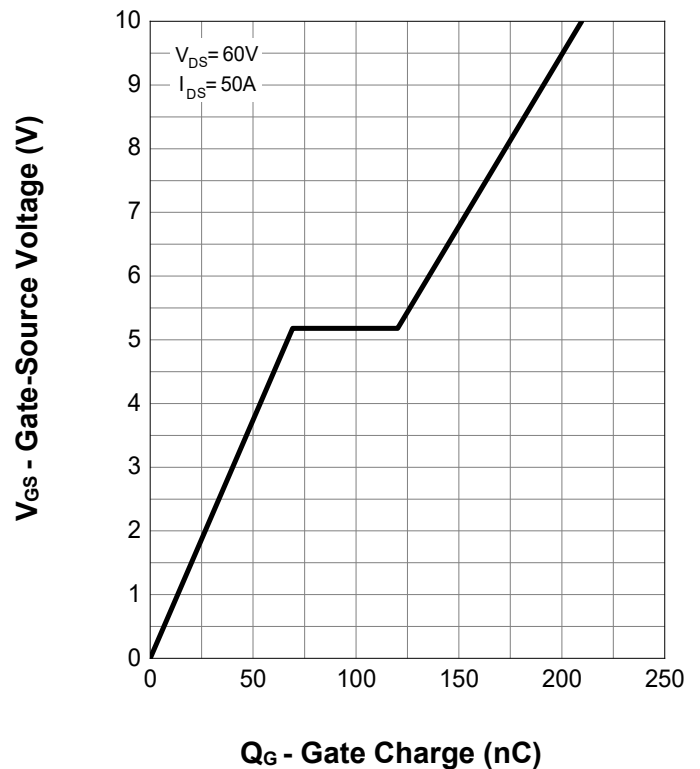
Diode Forward Current



Capacitance

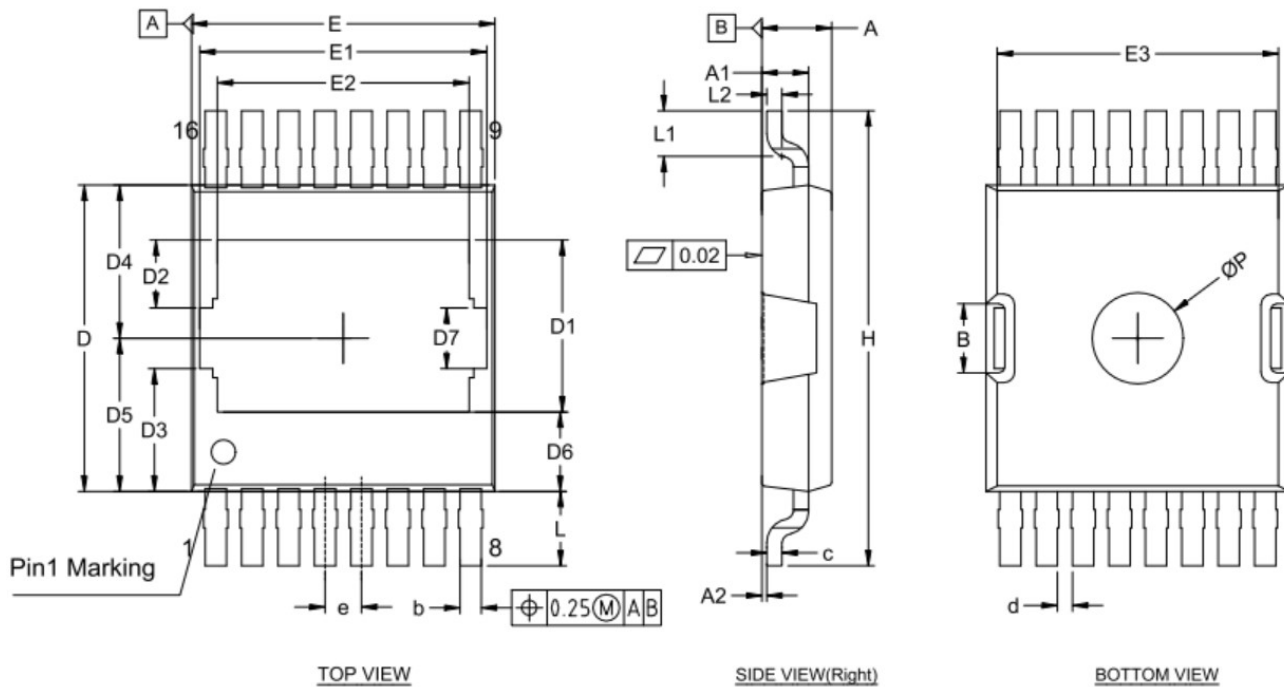


Gate Charge



8. Package Dimensions

TOLT Package



Symbol	Dimensions In Millimeters		
	MIN.	NOM.	MAX.
A	2.250	2.300	2.350
A1	1.440	1.540	1.640
A2	0.010	-	0.160
b	0.600	0.700	0.800
c	0.400	0.500	0.600
d	0.400	0.500	0.600
e	1.200 BSC		
D	10.000	10.100	10.300
D1	5.470	5.670	5.870
D2	2.040	2.240	2.440
D3	4.050 REF.		
D4	5.050 REF.		
D5	5.050 REF.		
D6	2.620 REF.		
D7	2.000 REF.		

Symbol	Dimensions In Millimeters		
	MIN.	NOM.	MAX.
E	9.700	10.000	10.100
E1	9.460 REF.		
E2	8.100	8.300	8.500
E3	9.070	9.270	9.470
H	14.800	15.000	15.200
L	2.250	2.450	2.650
L1	1.350	1.500	1.650
L2	0.500 BSC		
Øp	2.900	3.000	3.100
B	0.812	2.280	1.212
θ	1°	3°	5°
θ 1	6°	7°	8°