

N-Channel Enhancement Mode MOSFET

1. Product Information

1.1 Features

- ☑ Surface-mounted package
- ☑ Advanced trench cell design

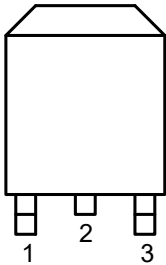
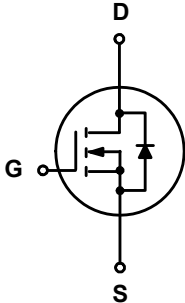
1.2 Applications

- ☑ MB and NB
- ☑ TV and Monitor
- ☑ DC to DC Converter
- ☑ LCD Inverter

1.3 Quick reference

- ☑ $BV \geq 200\text{ V}$
- ☑ $P_{tot} \leq 73\text{ W}$
- ☑ $I_D \leq 20\text{ A}$
- ☑ $R_{DS(ON)} \leq 68\text{ m}\Omega @ V_{GS} = 10\text{ V}$
- ☑ $R_{DS(ON)} \leq 78\text{ m}\Omega @ V_{GS} = 6\text{ V}$

2. Pin Description

Pin	Description	Simplified Outline	Symbol
1	Gate (G)	 Top View TO-252-3L	
2	Drain (D)		
3	Source (S)		

3. Limiting Values

Symbol	Parameter	Conditions	Min	Max	Unit
V _{DS}	Drain-Source Voltage	T _C = 25 °C	-	200	V
V _{GS}	Gate-Source Voltage	T _C = 25 °C	-	±20	V
I _D	Drain Current (DC)	T _C = 25 °C, V _{GS} = 10 V	-	20	A
		T _C = 100 °C, V _{GS} = 10 V	-	13	A
I _{DM} *	Drain Current (Pulsed)	T _C = 25 °C, V _{GS} = 10 V	-	46	A
P _{tot}	Drain power dissipation	T _C = 25 °C	-	73	W
T _{stg}	Storage Temperature		-55	150	°C
T _J	Junction Temperature		-	150	°C
I _S	Continuous-Source Current	T _C = 25 °C	-	20	A
E _{AS}	Single Pulsed Avalanche Energy	V _{DD} =50V , L=1.0mH	-	162	mJ
R _{θJA} **	Thermal Resistance- Junction to Ambient		-	48	°C/W
R _{θJC}	Thermal Resistance- Junction to Case		-	1.7	

Notes :

- * Pulse width ≤ 300 μs, duty cycle ≤ 2 %
- ** Surface Mounted on 1 in² pad area, t ≤ 10 sec
- *** Limited by bonding wire

4. Marking Information

Product Name	Marking
UP650N20K	650N20 YWWXXX YWW: Date Code

5. Ordering Code

Product Name	Package	Reel Size	Tape width	Quantity	Note
UP650N20K	TO252			2500	

6. Electrical Characteristics (T_A = 25 °C 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	200	-	-	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} = 160 V, V _{GS} = 0 V	-	-	1	μA
I _{GSS}	Gate Leakage Current	V _{GS} = 0 V, V _{GS} = ± 20 V	-	-	±100	nA
R _{DS(ON)} ^a	On-State Resistance	V _{GS} = 10 V, I _{DS} = 10 A	-	60	68	mΩ
		V _{GS} = 6 V, I _{DS} = 5 A	-	64	78	
Diode Characteristics						
V _{SD} ^a	Diode Forward Voltage	I _{SD} = 10 A, V _{GS} = 0 V	-	-	1.3	V
t _{rr}	Reverse Recovery Time	I _{DS} = 10 A, V _{GS} = 0 V dI _{SD} /dt = 100 A/μs	-	86	-	nS
Q _{rr}	Reverse Recovery Charge		-	204	-	nC
Dynamic Characteristics ^b						
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 100 V Frequency = 1 MHz	-	1102	-	pF
C _{oss}	Output Capacitance		-	60	-	
C _{rss}	Reverse Transfer Capacitance		-	28	-	
t _{d(on)}	Turn-on Delay Time	V _{DS} = 100 V, V _{GEN} = 10 V, R _G = 3.9 Ω, R _L = 10 Ω, I _{DS} = 10 A	-	9	-	nS
t _r	Turn-on Rise Time		-	12	-	
t _{d(off)}	Turn-off Delay Time		-	17	-	
t _f	Turn-off Fall Time		-	6	-	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{DS} = 100 V, V _{GS} = 10 V, I _{DS} = 10 A	-	21	-	nC
Q _{gs}	Gate-Source Charge		-	6	-	
Q _{gd}	Gate-Drain Charge		-	5	-	

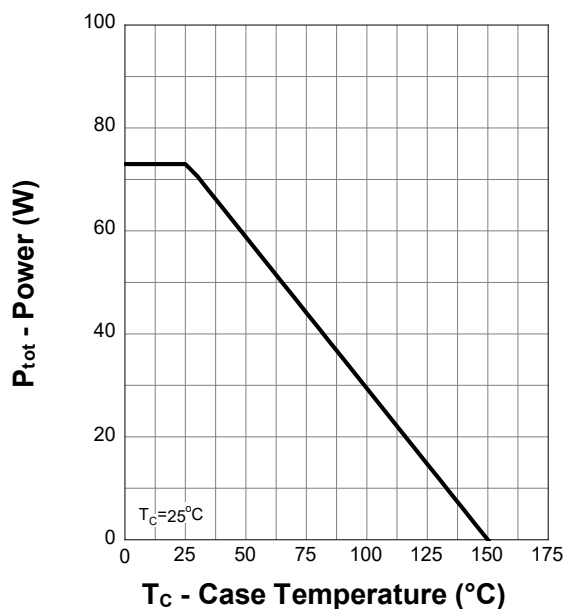
Notes :

a : Pulse test ; pulse width ≤ 300 μs, duty cycle ≤ 2%

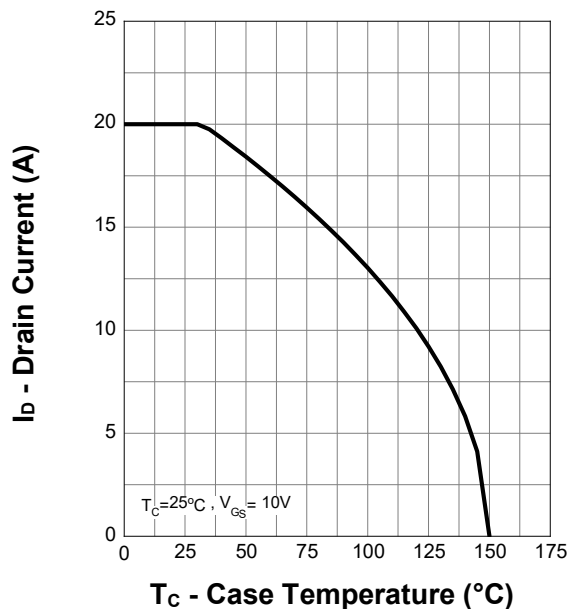
b : Guaranteed by design, not subject to production testing

7. Typical Characteristics

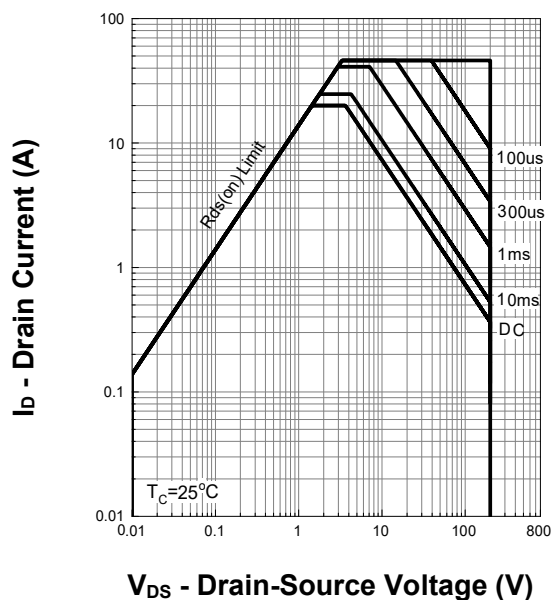
Power Capability



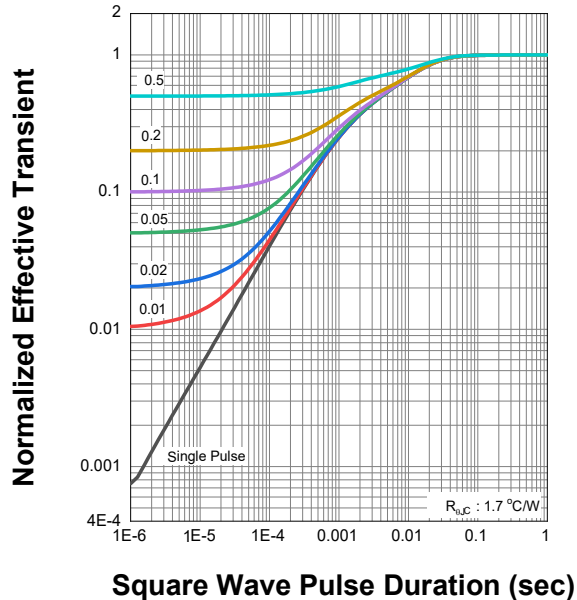
Current Capability



Safe Operating Area

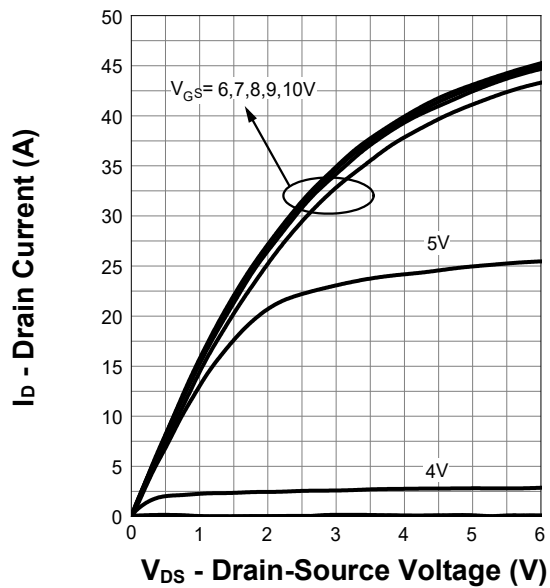


Transient Thermal Impedance

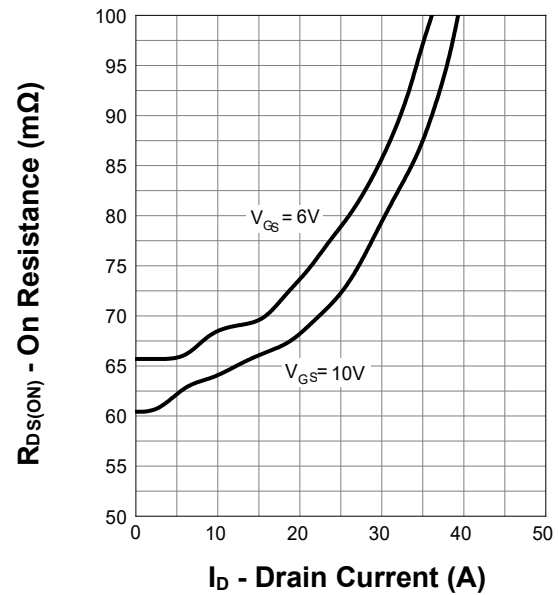


7. Typical Characteristics (cont.)

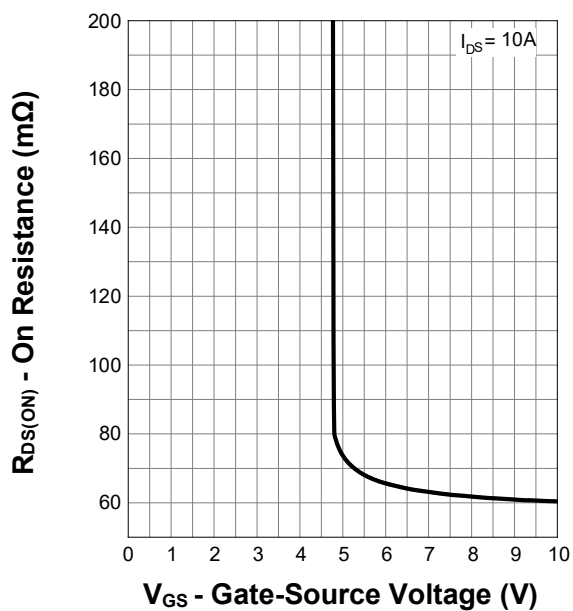
Output Characteristics



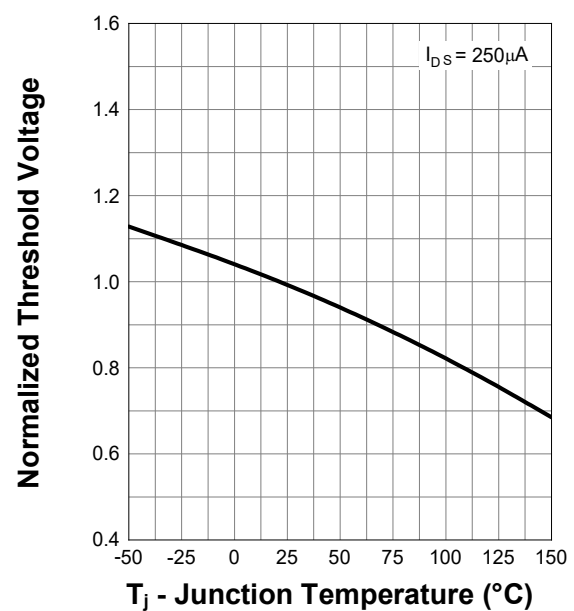
On Resistance



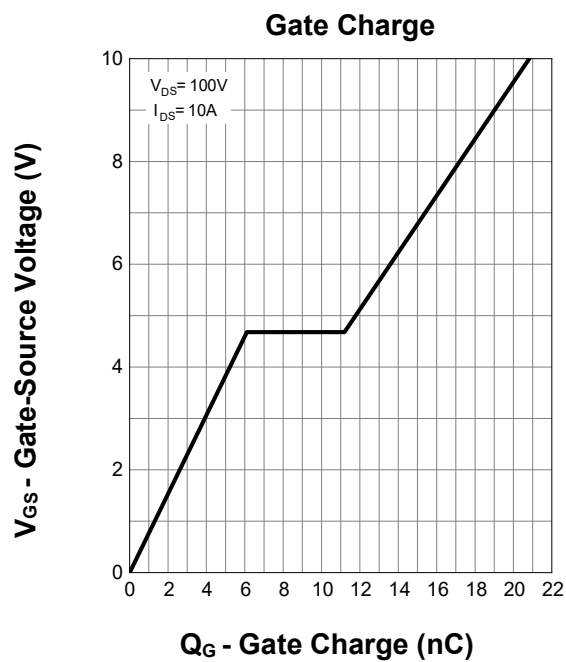
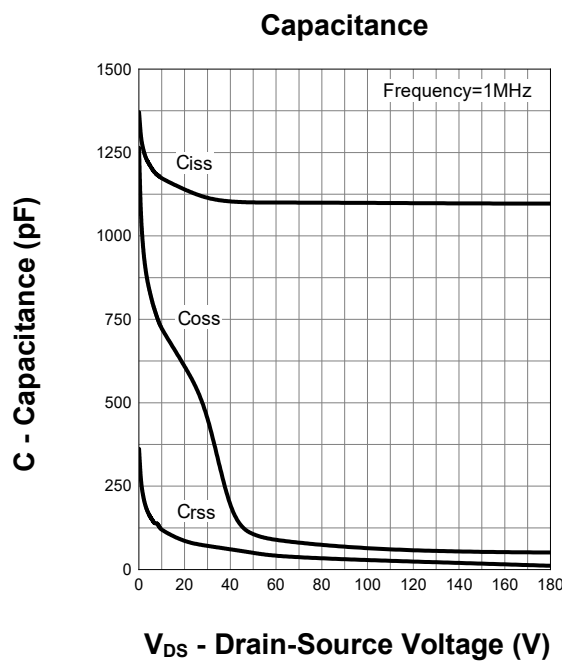
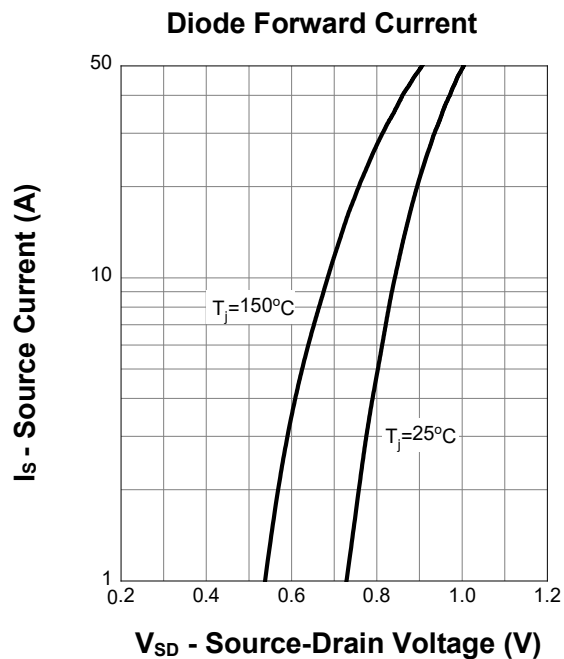
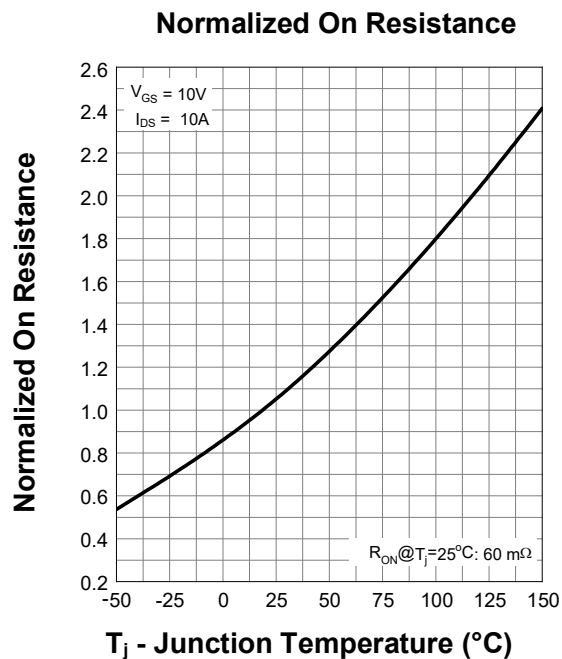
Transfer Characteristics



Normalized Threshold Voltage

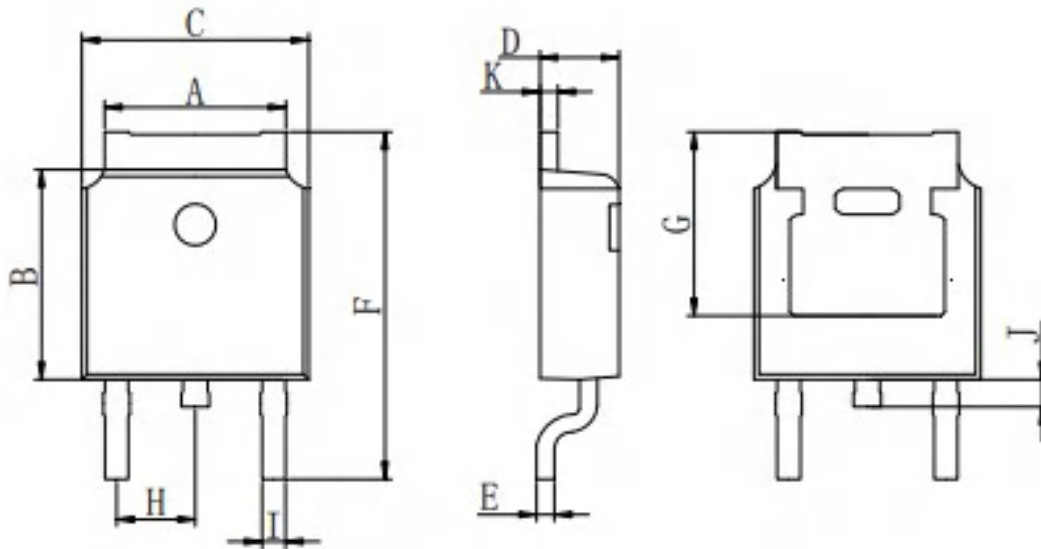


7. Typical Characteristics (cont.)



8.Package Dimensions

TO-252-3L



SYMBOL	Dimension in mm	
	MIN.	MAX.
A	5.05	5.65
B	5.80	6.40
C	6.25	6.85
D	2.08	2.48
E	0.40	0.61
F	9.56	10.46
G	5.05	5.65
H	2.09	2.50
I	0.66	0.90
J	0.50	1.20
K	0.40	0.61