

## N-Channel Enhancement Mode Power MOSFET

<p><b>Description</b></p> <p>The GT650N15K uses advanced trench technology to provide excellent <math>R_{DS(ON)}</math>, low gate charge. It can be used in a wide variety of applications.</p> <p><b>General Features</b></p> <ul style="list-style-type: none"> <li>● <math>V_{DS}</math> 150V</li> <li>● <math>I_D</math> (at <math>V_{GS} = 10V</math>) 20A</li> <li>● <math>R_{DS(ON)}</math> (at <math>V_{GS} = 10V</math>) &lt; 65mΩ</li> <li>● 100% Avalanche Tested</li> <li>● RoHS Compliant</li> </ul> <p><b>Application</b></p> <ul style="list-style-type: none"> <li>● Synchronous Rectification in SMPS or LED Driver</li> <li>● UPS</li> <li>● Motor Control</li> <li>● BMS</li> <li>● High Frequency Circuit</li> </ul>	<p>Schematic Diagram</p> <p>TO-252</p>		
<b>Device</b>	<b>Package</b>	<b>Marking</b>	<b>Packaging</b>
GT650N15K	TO-252	GT650N15	2500pcs/Reel

<b>Absolute Maximum Ratings</b> $T_C = 25^\circ\text{C}$ , unless otherwise noted			
<b>Parameter</b>	<b>Symbol</b>	<b>Value</b>	<b>Unit</b>
Drain-Source Voltage	$V_{DS}$	150	V
Continuous Drain Current	$I_D$	20	A
Pulsed Drain Current (note1)	$I_{DM}$	80	A
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Power Dissipation	$P_D$	68	W
Single pulse avalanche energy (note2)	$E_{AS}$	65	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 To 175	$^\circ\text{C}$
<b>Thermal Resistance</b>			
<b>Parameter</b>	<b>Symbol</b>	<b>Value</b>	<b>Unit</b>
Thermal Resistance, Junction-to-Case (note3)	$R_{thJC}$	2.2	$^\circ\text{C}/\text{W}$

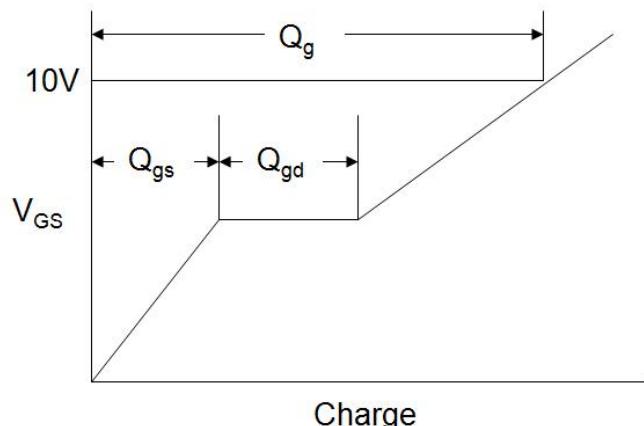
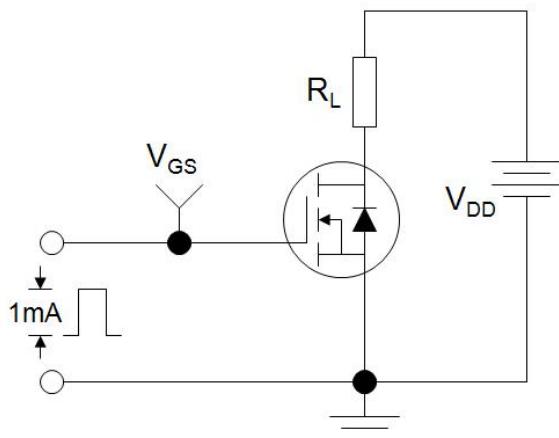
**Specifications**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
<b>Static Parameters</b>						
Drain-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0\text{V}, I_D = 250\mu\text{A}$	150	--	--	V
Zero Gate Voltage Drain Current	$I_{\text{DSS}}$	$V_{\text{DS}} = 100\text{V}, V_{\text{GS}} = 0\text{V}$	--	--	1	$\mu\text{A}$
Gate-Source Leakage	$I_{\text{GSS}}$	$V_{\text{GS}} = \pm 20\text{V}$	--	--	$\pm 100$	nA
Gate-Source Threshold Voltage	$V_{\text{GS}(\text{th})}$	$V_{\text{DS}} = V_{\text{GS}}, I_D = 250\mu\text{A}$	2.5	3.3	4.5	V
Drain-Source On-Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10\text{V}, I_D = 10\text{A}$	--	59	65	$\text{m}\Omega$
Forward Transconductance	$g_{\text{FS}}$	$V_{\text{DS}}=5\text{V}, I_{\text{D}}=10\text{A}$	15	--	--	S
<b>Dynamic Parameters</b>						
Input Capacitance	$C_{\text{iss}}$	$V_{\text{GS}} = 0\text{V}, V_{\text{DS}} = 75\text{V}, f = 1.0\text{MHz}$	--	600	--	pF
Output Capacitance	$C_{\text{oss}}$		--	74.7	--	
Reverse Transfer Capacitance	$C_{\text{rss}}$		--	10.8	--	
Total Gate Charge	$Q_g$	$V_{\text{DS}} = 75\text{V}, I_D = 10\text{A}, V_{\text{GS}} = 10\text{V}$	--	12	--	nC
Gate-Source Charge	$Q_{\text{gs}}$		--	5.7	--	
Gate-Drain Charge	$Q_{\text{gd}}$		--	2.7	--	
Turn-on Delay Time	$t_{\text{d}(\text{on})}$	$V_{\text{DD}}=75\text{V}, RL=7.5\Omega$ $V_{\text{GS}}=10\text{V}, RG=3\Omega$	--	9.5	--	ns
Turn-on Rise Time	$t_r$		--	5.5	--	
Turn-off Delay Time	$t_{\text{d}(\text{off})}$		--	12.5	--	
Turn-off Fall Time	$t_f$		--	3	--	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Body Diode Current	$I_s$	$T_C = 25^\circ\text{C}$	--	--	20	A
Body Diode Voltage	$V_{\text{SD}}$	$T_J = 25^\circ\text{C}, I_{\text{SD}} = 10\text{A}, V_{\text{GS}} = 0\text{V}$	--	--	1.2	V
Reverse Recovery Time	$\text{trr}$	$IF=IS,\text{di}/dt=100\text{A}/\mu\text{s}$	--	29	--	ns
Reverse Recovery Charge	$Q_{\text{rr}}$		--	130	--	nC

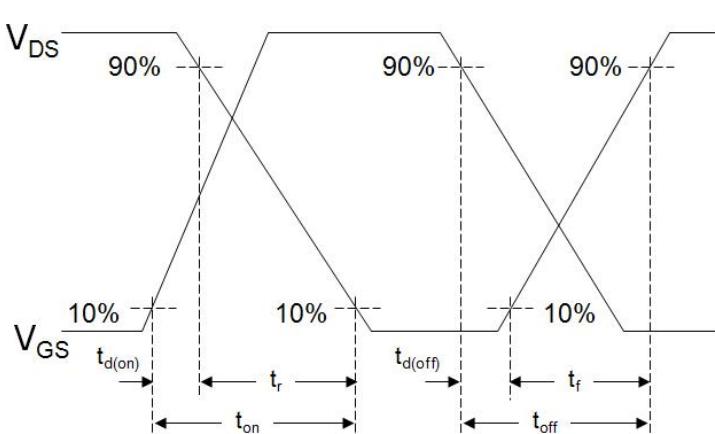
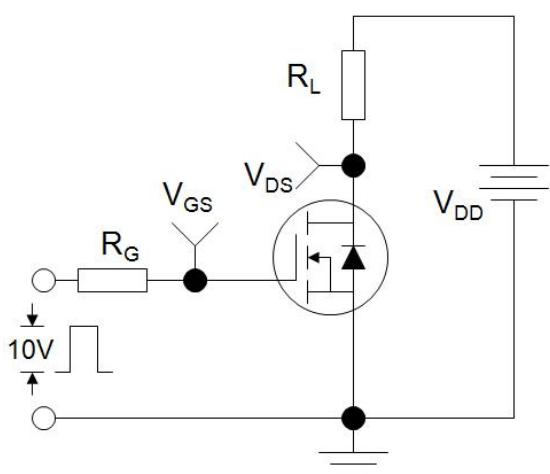
**Notes**

- Repetitive Rating: Pulse width limited by maximum junction temperature
- EAS condition :  $T_j=25^\circ\text{C}$ ,  $V_{\text{DD}}=50\text{V}$ ,  $V_{\text{GS}}=10\text{V}$ ,  $L=0.5\text{mH}$ ,  $R_g=25\Omega$
- Surface Mounted on FR4 Board,  $t \leq 10$  sec

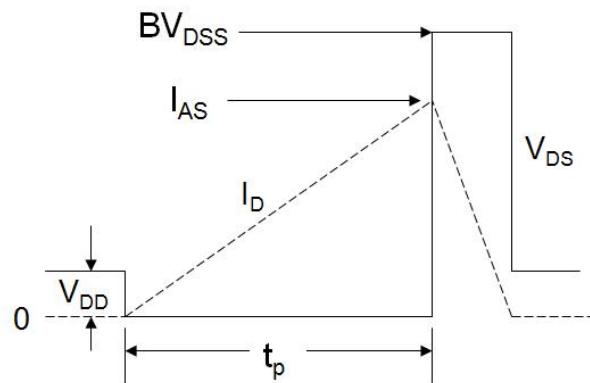
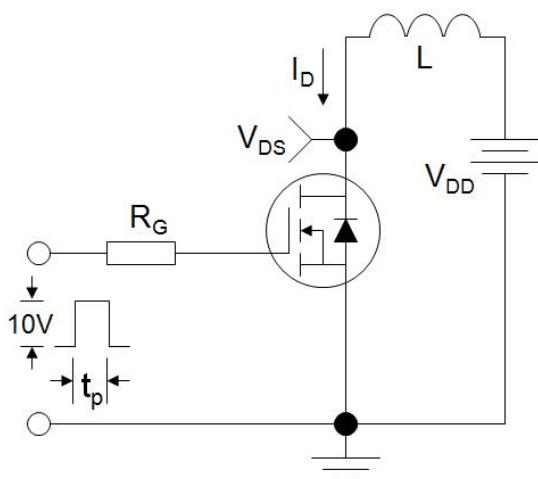
Gate Charge Test Circuit



Switch Time Test Circuit

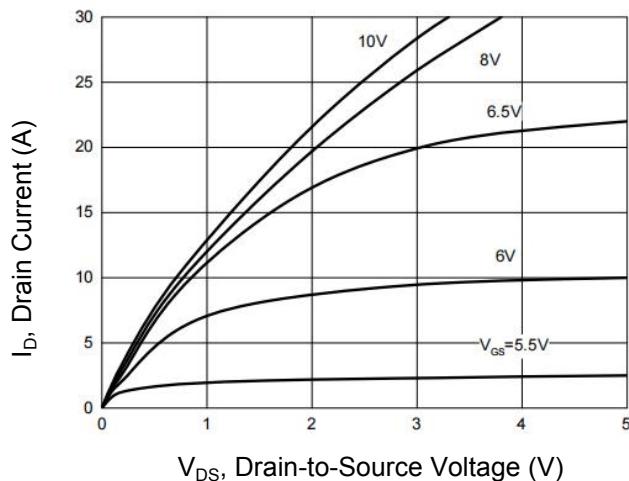


EAS Test Circuit

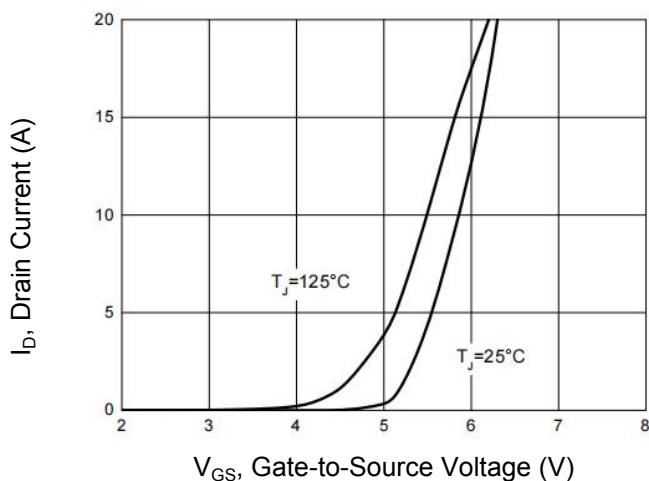


**Typical Characteristics**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

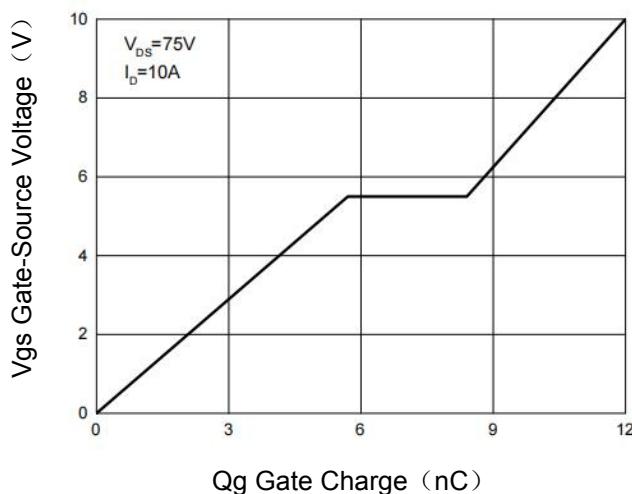
**Figure 1. Output Characteristics**



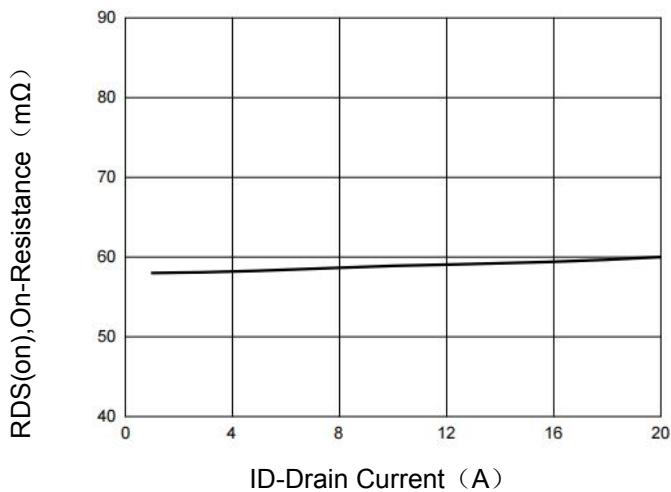
**Figure 2. Transfer Characteristics**



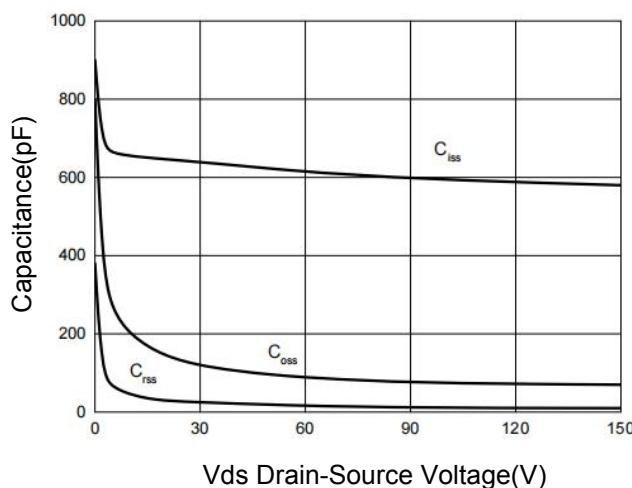
**Figure 3. Gate Charge**



**Figure 4. Drain Source On Resistance**

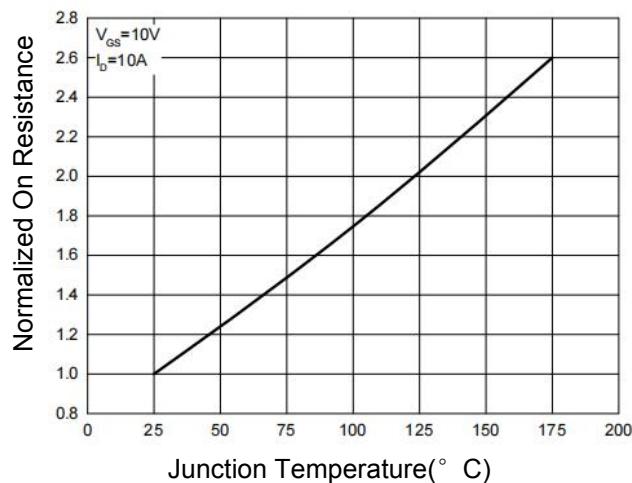


**Figure 5. Capacitance vs Vds**

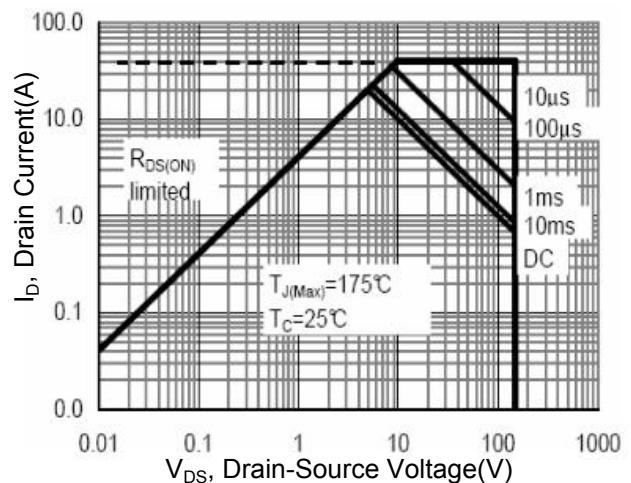


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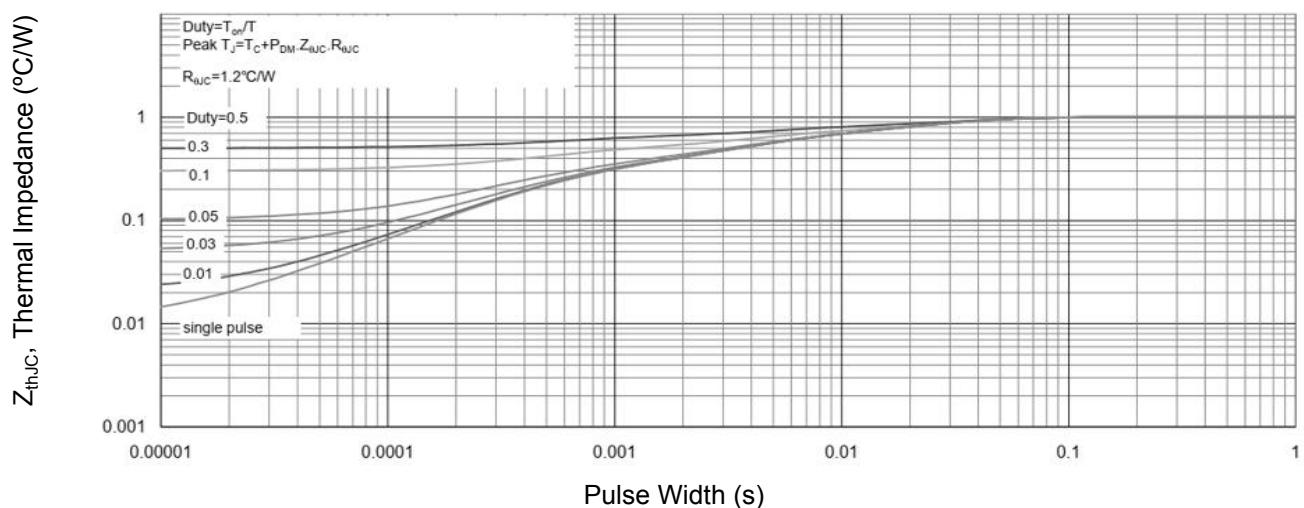
**Figure 6. Normalized On Resistance Characteristics**



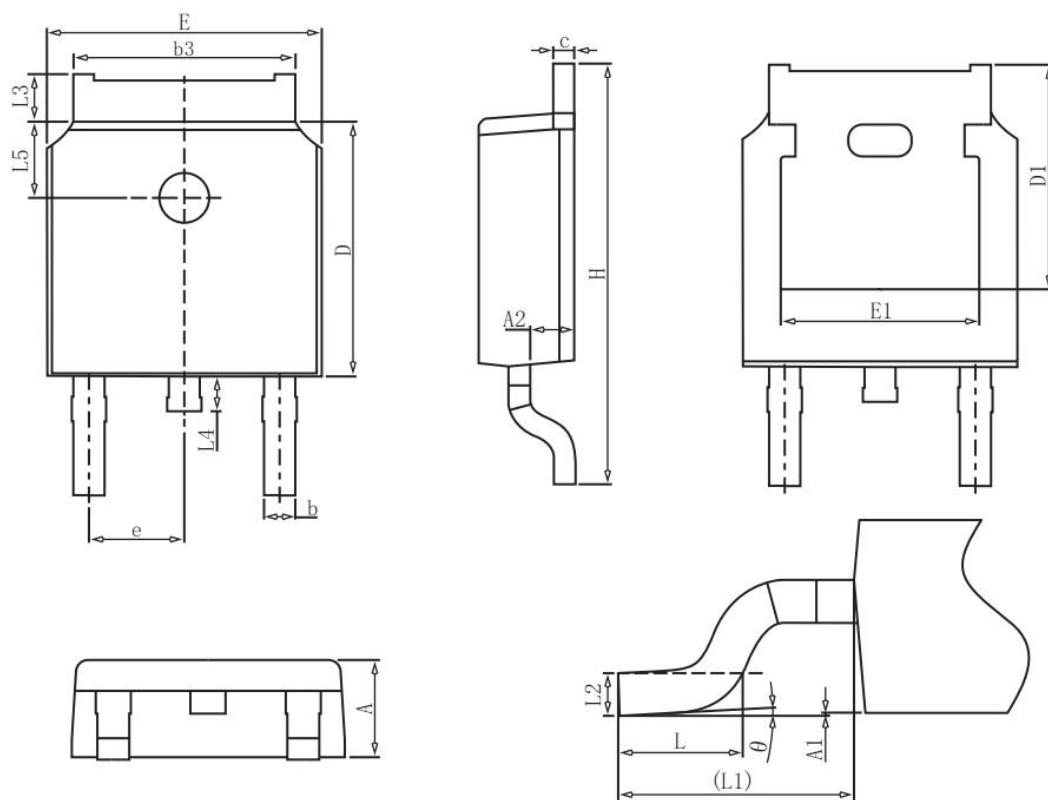
**Figure 7. Safe Operation Area**



**Figure 8. Normalized Maximum Transient Thermal Impedance**



## TO-252 Package Information



Symbol	Dimensions in Millimeters		
	MIN.	NOM.	MAX.
A	2.2	2.3	2.4
A1	0		0.2
A2	0.97	1.07	1.17
b	0.68	0.78	0.9
b3	5.2	5.33	5.5
c	0.43	0.53	0.63
D	5.98	6.1	6.22
D1	5.30REF		
E	6.4	6.6	6.8
E1	4.63		
e	2.286BSC		
H	9.4	10.1	10.5
L	1.38	1.5	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88		1.28
L4	0.5		1
L5	1.65	1.8	1.95
θ	0°		8°