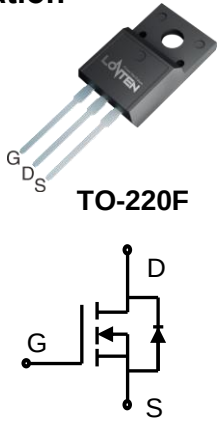


Lonten N-channel 650V, 7.5A, 0.65Ω LonFET™ Power MOSFET

Description LonFET™ Power MOSFET is fabricated using advanced super junction technology. The resulting device has extremely low on resistance, making it especially suitable for applications which require superior power density and outstanding efficiency. Features ● Ultra low $R_{DS(on)}$ ● Ultra low gate charge (typ. $Q_g=14nC$) ● 100% UIS tested ● RoHS compliant Applications ● Power factor correction (PFC). ● Switched mode power supplies (SMPS). ● Uninterruptible power supply (UPS).	Product Summary <table> <tr> <td>V_{DS}</td><td>650V</td></tr> <tr> <td>$R_{DS(on), max}$</td><td>0.65Ω</td></tr> <tr> <td>I_{DM}</td><td>22.5A</td></tr> <tr> <td>$Q_{g,typ}$</td><td>14nC</td></tr> </table> Pin Configuration  TO-220F N-Channel MOSFET	V_{DS}	650V	$R_{DS(on), max}$	0.65Ω	I_{DM}	22.5A	$Q_{g,typ}$	14nC
V_{DS}	650V								
$R_{DS(on), max}$	0.65Ω								
I_{DM}	22.5A								
$Q_{g,typ}$	14nC								

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	650	V
Continuous drain current ¹⁾ ($T_c = 25^{\circ}C$)	I_D	7.5	A
($T_c = 100^{\circ}C$)		4.7	A
Pulsed drain current ²⁾	I_{DM}	22.5	A
Gate-Source voltage	V_{GSS}	± 30	V
Avalanche energy, single pulse ³⁾	E_{AS}	120	mJ
Power Dissipation	P_D	27	W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^{\circ}C$
Continuous diode forward current	I_S	7.5	A
Diode pulse current	$I_{S,pulse}$	22.5	A

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	4.6	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient, minimal Footprint ⁴⁾	$R_{\theta JA}$	62	$^{\circ}C/W$
Soldering temperature, wave soldering only allowed at leads. (1.6mm from case for 10s)	T_{solder}	260	$^{\circ}C$

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube
LSD65R650GM	TO-220F	LSD65R650GM	50

Electrical Characteristics

 $T_c = 25^{\circ}\text{C}$ unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0V, I _D =250uA	650	-	-	V
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250uA	2.5	3.13	4.5	V
Drain cut-off current	I _{DSS}	V _{DS} =650V, V _{GS} =0 V, T _J =25°C	-	-	1	μA
Gate leakage current, Forward	I _{GSSF}	V _{GS} =30V, V _{DS} =0 V	-	-	100	nA
Gate leakage current, Reverse	I _{GSSR}	V _{GS} =-30V, V _{DS} =0 V	-	-	-100	nA
Drain-source on-state resistance	R _{DS(on)}	V _{GS} =10V, I _D =3.5A T _J = 25°C T _J = 150°C	- - -	 0.57 1.378	 0.65 -	 Ω
Gate resistance	R _G	f=1 MHz, open drain	-	6.03	-	Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} =100V, V _{GS} =0V, f=250kHz	-	565	-	pF
Output capacitance	C _{oss}		-	21.55	-	
Reverse transfer capacitance	C _{rss}		-	0.77	-	
Turn-on delay time	t _{d(on)}	V _{DD} =400V, I _D =3.5A R _G = 10Ω, V _{GS} =10V	-	36.8	-	ns
Rise time	t _r		-	9.8	-	
Turn-off delay time	t _{d(off)}		-	27.9	-	
Fall time	t _f		-	15.6	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =520V, I _D =3.5A, V _{GS} =0 to 10 V	-	2.9	-	nC
Gate to drain charge	Q _{gd}		-	6.3	-	
Gate charge total	Q _g		-	14	-	
Gate plateau voltage	V _{plateau}		-	5	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =3.5A	-	-	1.1	V
Reverse recovery time	t _{rr}	V _R =400V, I _F =3.5A, dI _F /dt=100 A/μs	-	198.1	-	ns
Reverse recovery charge	Q _{rr}		-	1123.7	-	nC
Peak reverse recovery current	I _{rrm}		-	12.74	-	A

Notes:

- Limited by maximum junction temperature and duty cycle, TO-220 equivalent.
- Limited by maximum junction temperature, maximum duty cycle is 0.75.
- $I_{AS}=2A, L=60mH, V_{DD}=60V$, Starting $T_j=25^{\circ}\text{C}$.
- The value of R_{thJA} is measured by placing the device in a still air box which is one cubic foot.

Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

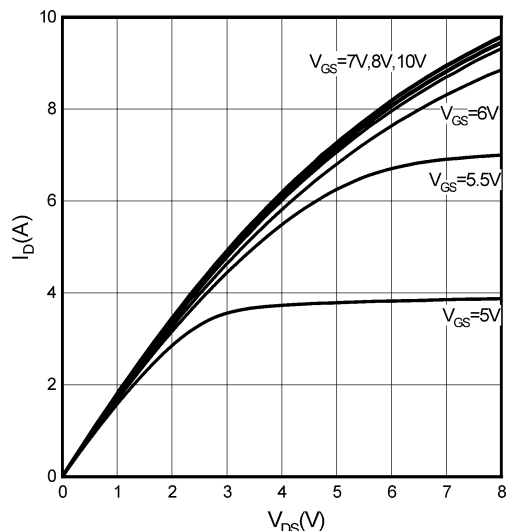


Figure 2. Transfer Characteristics

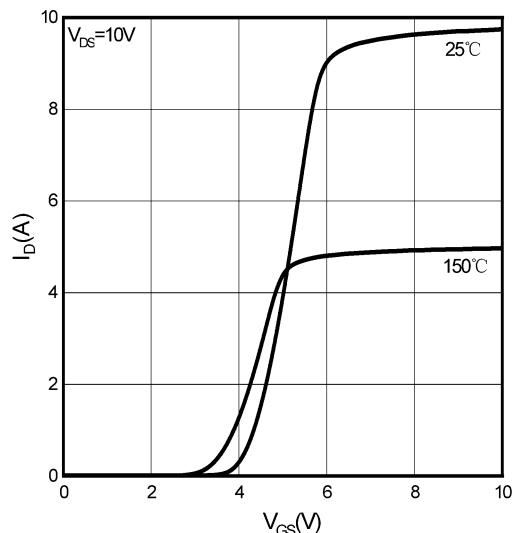


Figure 3. On-Resistance vs. Drain Current

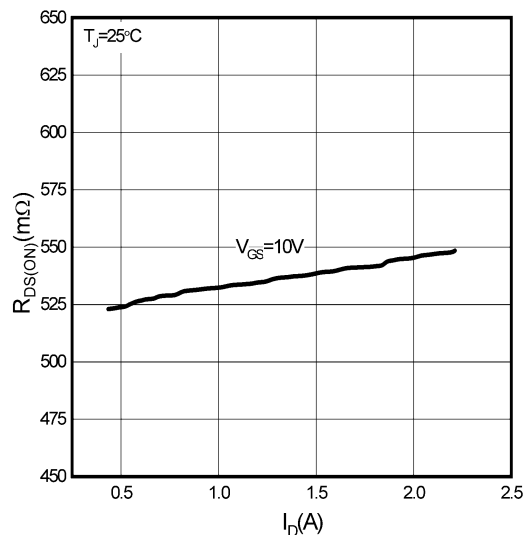


Figure 4. On-Resistance vs. Temperature

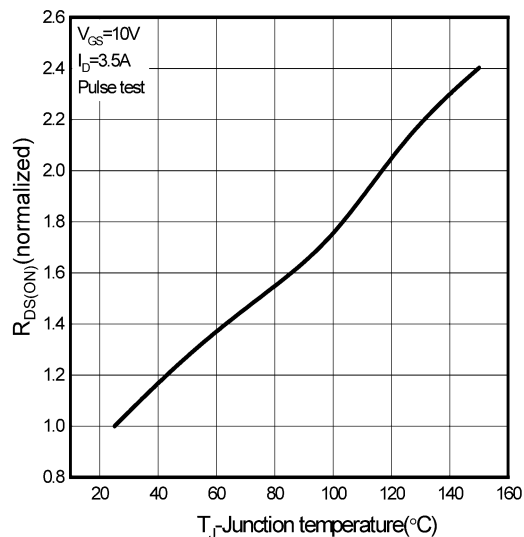


Figure 5. Breakdown Voltage vs. Temperature

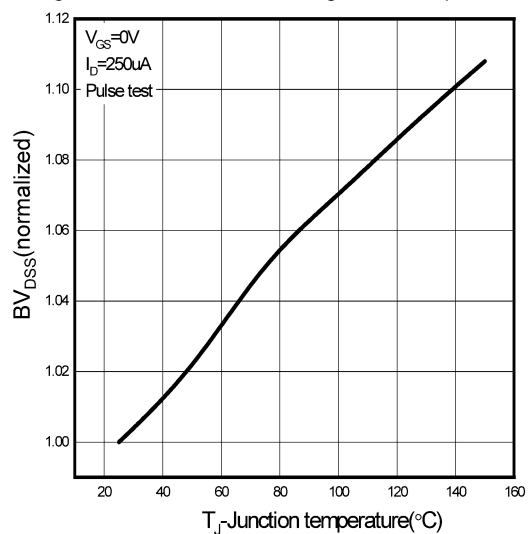


Figure 6. Threshold Voltage vs. Temperature

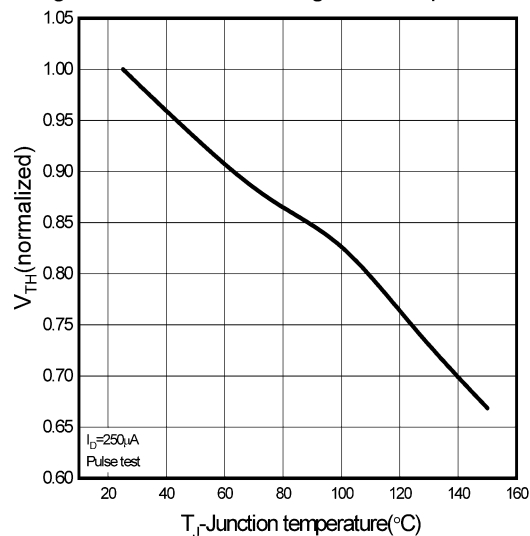


Figure 7.Body-Diode Characteristics

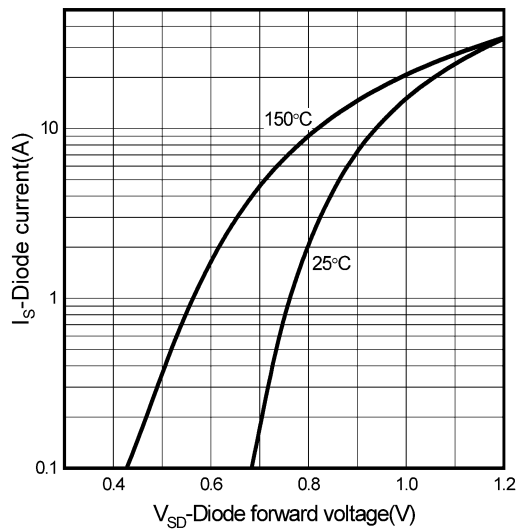


Figure 8.Capacitance Characteristics

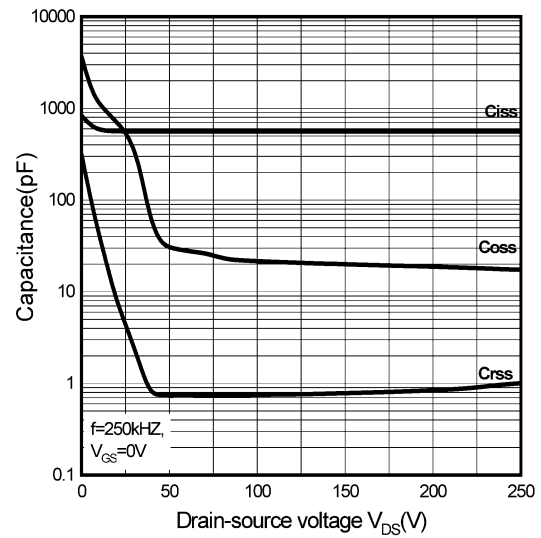


Figure 9.Gate Charge Characteristics

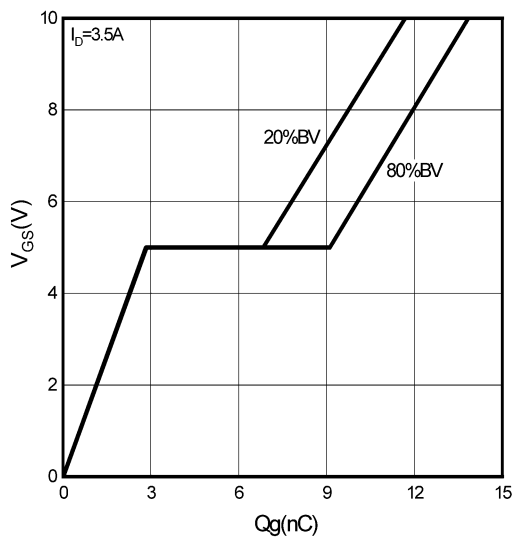


Figure 10.Drain Current Derating

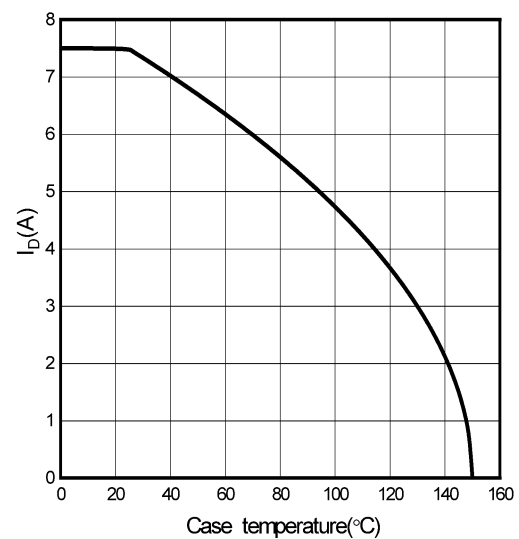


Figure 11.Power Dissipation vs.Temperature

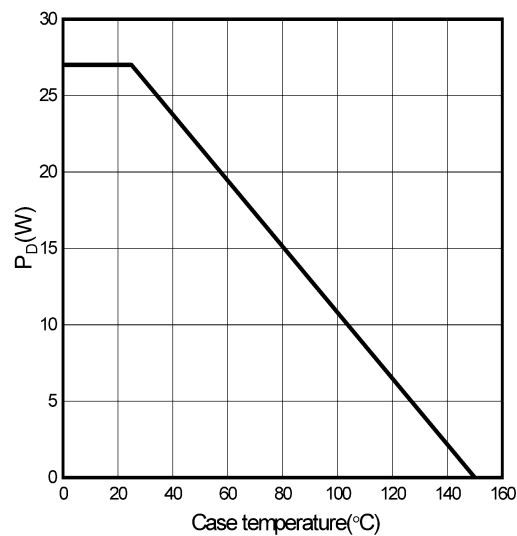


Figure 12. Safe Operating Area

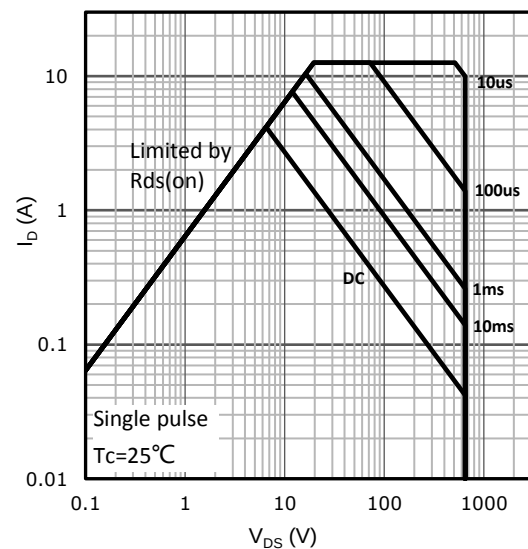
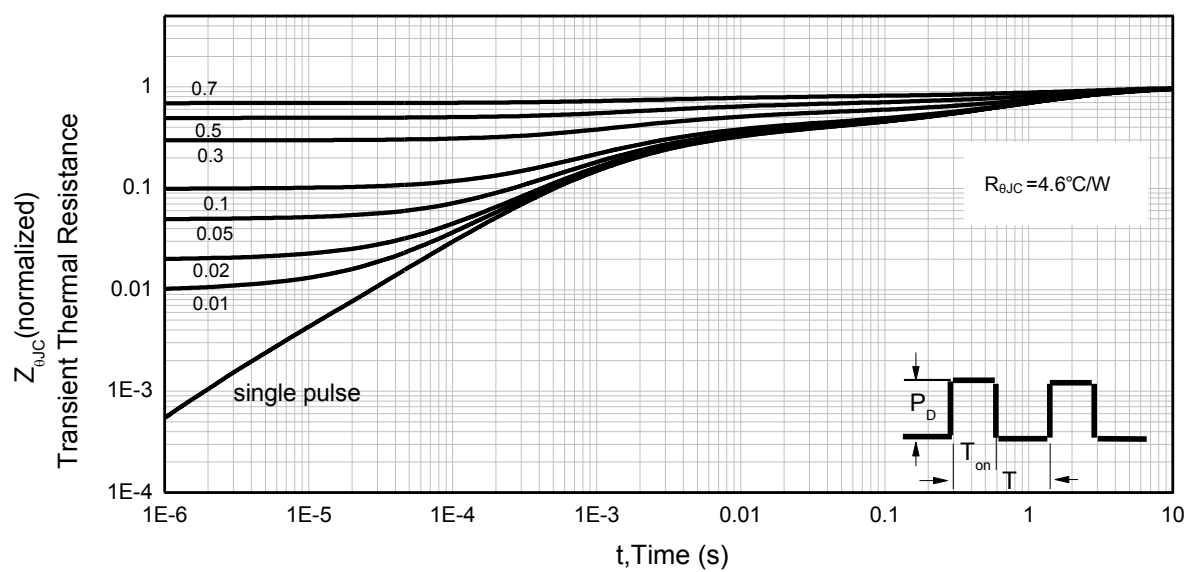
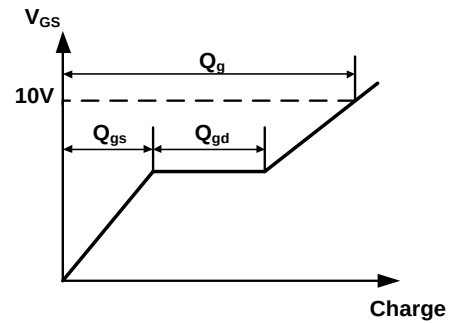
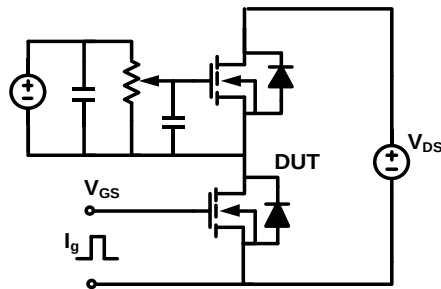


Figure 13. Normalized Maximum Transient Thermal Impedance (R_{thJC})

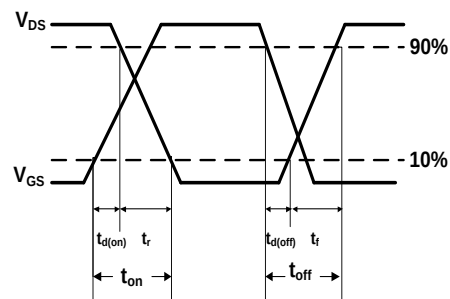
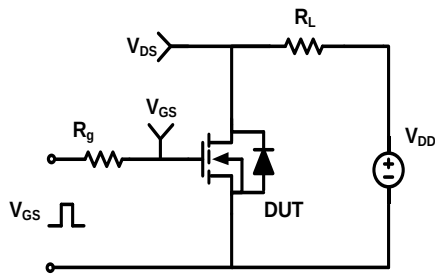


Test Circuit & Waveforms

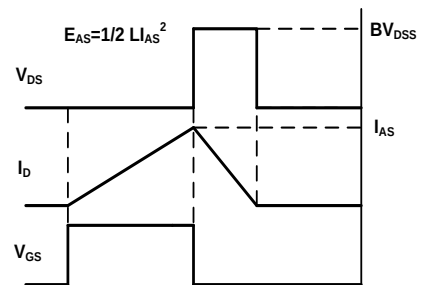
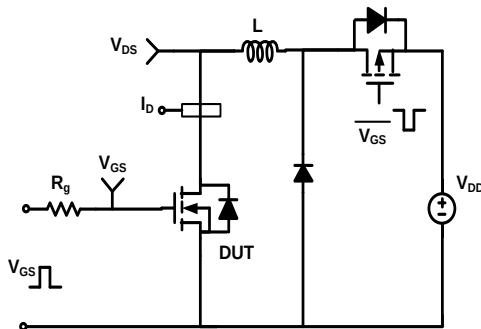
Gate Charge Test Circuit & Waveform



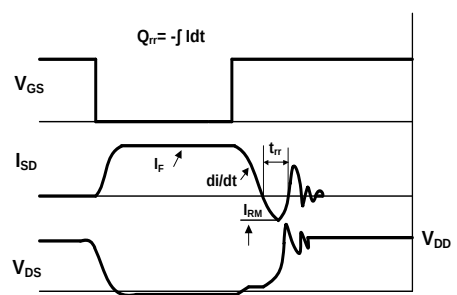
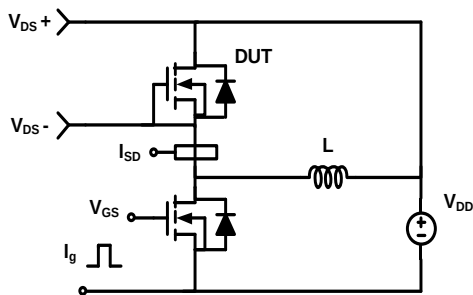
Resistive Switching Test Circuit & Waveform



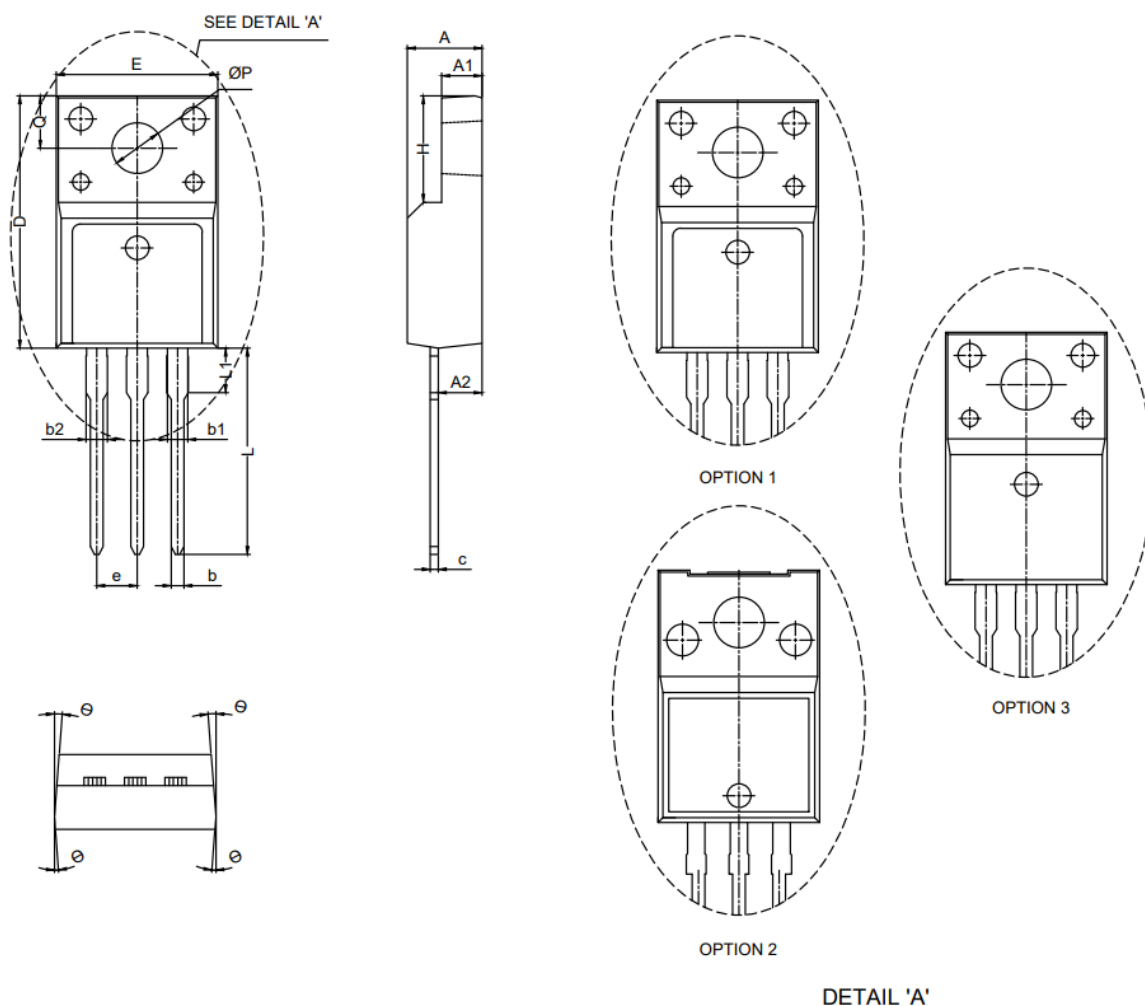
Unclamped Inductive Switching (UIS) Test Circuit & Waveform



Diode Recovery Test Circuit & Waveform



Mechanical Dimensions for TO-220F



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.40	4.90	0.173	0.193
A1	2.34	2.74	0.092	0.108
A2	2.50	2.96	0.098	0.117
b	0.70	1.00	0.028	0.039
b1	1.18	1.43	0.046	0.056
b2	1.15	1.58	0.045	0.062
c	0.40	0.70	0.016	0.028
D	15.57	16.40	0.613	0.646
E	9.96	10.40	0.392	0.409
e	2.54 BSC		0.100 BSC	
H	6.48	7.25	0.255	0.285
L	12.64	14.20	0.498	0.559
L1	2.90	3.60	0.114	0.142
ØP	3.00	3.38	0.118	0.133
Q	3.10	3.50	0.122	0.138
θ	1°	5°	1°	5°

Version Information

LSD65R650GM

Revision 1.0

Disclaimer

The content specified herein is for the purpose of introducing LONTEN's products (hereinafter "Products"). The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. Examples of application circuits, circuit constants and any other information contained herein illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

LONTEN does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of the Products or technical information described in this document.

The Products are not designed or manufactured to be used with any equipment, device or system which requires an extremely high level of reliability the failure or malfunction of which may result in a direct threat to human life or create a risk of human injury (such as a medical instrument, transportation equipment, aerospace machinery, nuclear-reactor controller, fuel-controller or other safety device). LONTEN shall bear no responsibility in any way for use of any of the Products for the above special purposes.

Although LONTEN endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a LONTEN product.

The content specified herein is subject to change for improvement without notice. When using a LONTEN product, be sure to obtain the latest specifications.