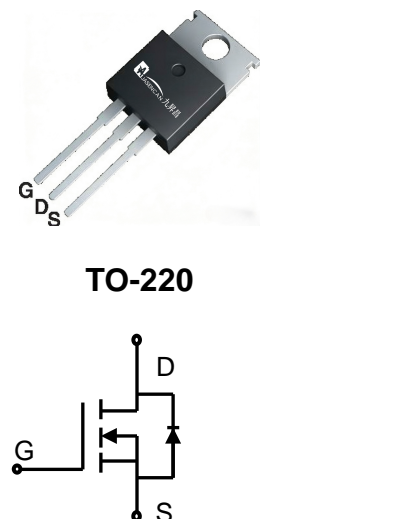



<p>Description</p> <p>These N-Channel enhancement mode power field effect transistors are using shielded gate trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and with stand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.</p> <p>Features</p> <ul style="list-style-type: none"> ● 200V,165A, $R_{DS(on).max}=8.95m\Omega@V_{GS} = 10V$ ● Improved dv/dt capability ● Fast switching ● 100% EAS Guaranteed ● Green device available <p>Applications</p> <ul style="list-style-type: none"> ● Motor Drives ● UPS ● DC-DC Converter ● Telecom ● Battery management 	<p>Product Summary</p> <table> <tr> <td>V_{DSS}</td> <td>200V</td> </tr> <tr> <td>$R_{DS(on).typ}@V_{GS}=10V$</td> <td>8.1mΩ</td> </tr> <tr> <td>I_D</td> <td>165A</td> </tr> </table> <p>Pin Configuration</p>  <p style="text-align: center;">TO-220</p> <p style="text-align: center;">N-Channel MOSFET</p> <div style="text-align: right;">  </div>	V_{DSS}	200V	$R_{DS(on).typ}@V_{GS}=10V$	8.1mΩ	I_D	165A
V_{DSS}	200V						
$R_{DS(on).typ}@V_{GS}=10V$	8.1mΩ						
I_D	165A						

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

Parameter	Symbol	Value	Unit	
Drain-Source Voltage	V_{DSS}	200	V	
Continuous drain current ¹⁾ ($T_c = 25^\circ\text{C}$, Silicon limit)	I_D	165	A	
		($T_c = 25^\circ\text{C}$, Package limit)	180	A
		($T_c = 100^\circ\text{C}$, Silicon limit)	116	A
Pulsed drain current ²⁾	I_{DM}	660	A	
Gate-Source voltage	V_{GSS}	± 20	V	
Avalanche energy ³⁾	E_{AS}	1122	mJ	
Power Dissipation	P_D	577	W	
Storage Temperature Range	T_{STG}	-55 to +175	$^\circ\text{C}$	
Operating Junction Temperature Range	T_J	-55 to +175	$^\circ\text{C}$	

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.26	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient ⁴⁾	$R_{\theta JA}$	62	$^\circ\text{C/W}$
Soldering temperature, wave soldering only allowed at leads. (1.6mm from case for 10s)	T_{sold}	260	$^\circ\text{C}$

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube
JSGC20R089	TO-220	JSGC20R089	50

Electrical Characteristics
 $T_J = 25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	200	---	---	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	3.5	4.5	V
Drain-source leakage current	I_{DSS}	$V_{DS}=200V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=200V, V_{GS}=0V, T_J=175^\circ\text{C}$	---	---	10	mA
Gate leakage current, Forward	I_{GSSF}	$V_{GS}=20V, V_{DS}=0V$	---	---	100	nA
Gate leakage current, Reverse	I_{GSSR}	$V_{GS}=-20V, V_{DS}=0V$	---	---	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=50A, T_J=25^\circ\text{C}$	---	8.1	8.95	$m\Omega$
		$T_J=175^\circ\text{C}$	---	19.04	---	
Forward transconductance	g_{fs}	$V_{DS}=50V, I_D=50A$	---	86	---	S
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS}=100V, V_{GS}=0V, f=250kHz$	---	4947	---	pF
Output capacitance	C_{oss}		---	513	---	
Reverse transfer capacitance	C_{rss}		---	7.8	---	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=100V, V_{GS}=10V, I_D=50A, R_G=10\Omega$	---	51.2	---	ns
Rise time	t_r		---	98.8	---	
Turn-off delay time	$t_{d(off)}$		---	62	---	
Fall time	t_f		---	16.5	---	
Gate resistance	R_g	$V_{GS}=0V, V_{DS}=0V, f=1MHz$	---	1.3	---	Ω
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DS}=100V, I_D=50A, V_{GS}=10V$	---	23.5	---	nC
Gate to drain charge	Q_{gd}		---	9.9	---	
Gate charge total	Q_g		---	63.5	---	
Gate plateau voltage	$V_{plateau}$		---	4.9	---	V
Output Charge	Q_{oss}	$V_{DS}=50V, V_{GS}=0V$	---	170	---	nC
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I_S		---	---	165	A
Pulsed Source Current	I_{SM}		---	---	660	A
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=50A, T_J=25^\circ\text{C}$	---	---	1.1	V
Reverse Recovery Time	t_{rr}	$I_S=50A, di/dt=200A/\mu s, T_J=25^\circ\text{C}$	---	121	---	ns
Reverse Recovery Charge	Q_{rr}		---	1167	---	nC

Notes:

- Limited by maximum junction temperature and duty cycle.
- Repetitive Rating: Pulse width limited by maximum junction temperature.
- $V_{DD}=50V, V_{GS}=10V, L=0.5mH, I_{AS}=67A$, 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

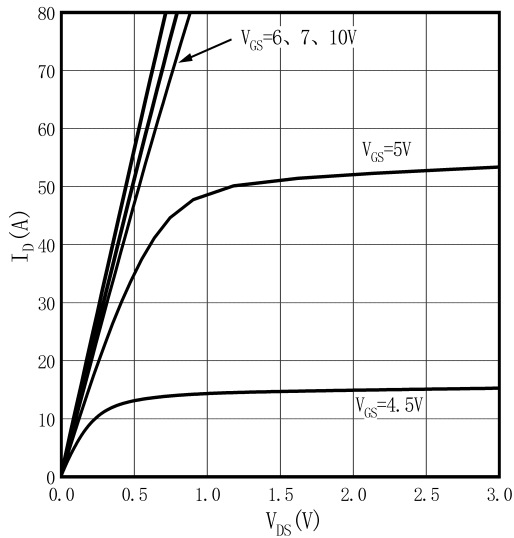


Figure 2. Transfer Characteristics

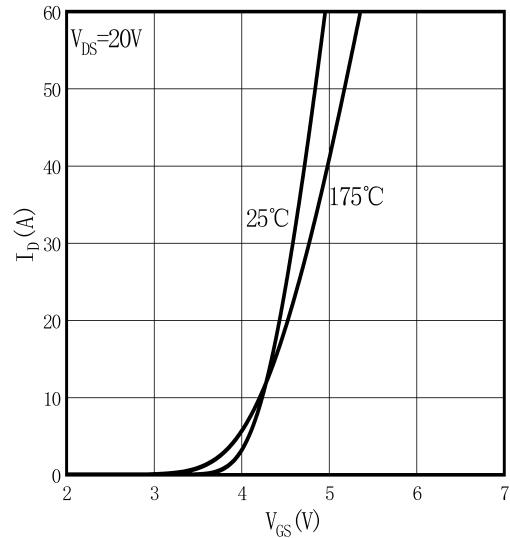


Figure 3. On-Resistance vs. Drain Current

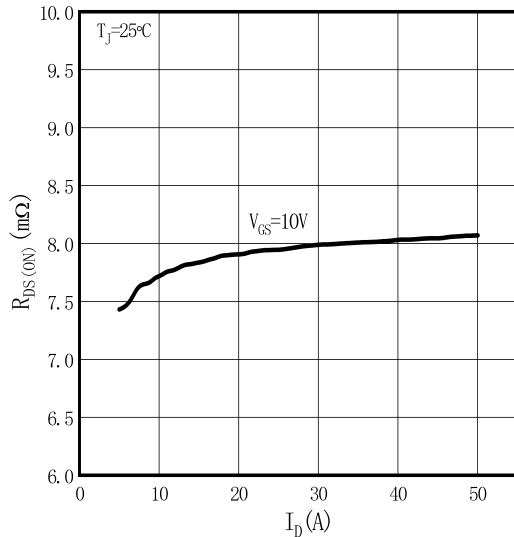


Figure 4. On-Resistance vs. Temperature

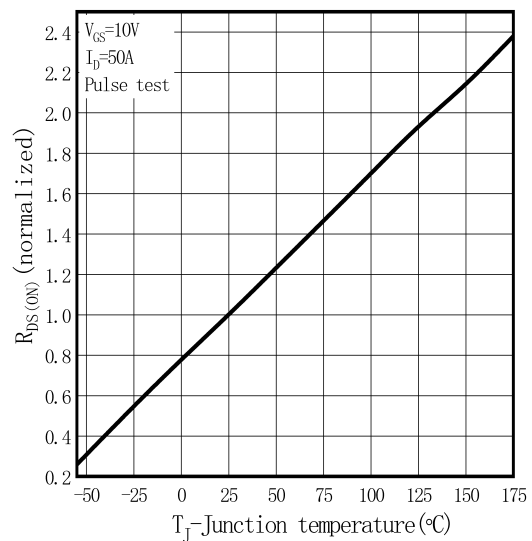


Figure 5. Breakdown Voltage vs. Temperature

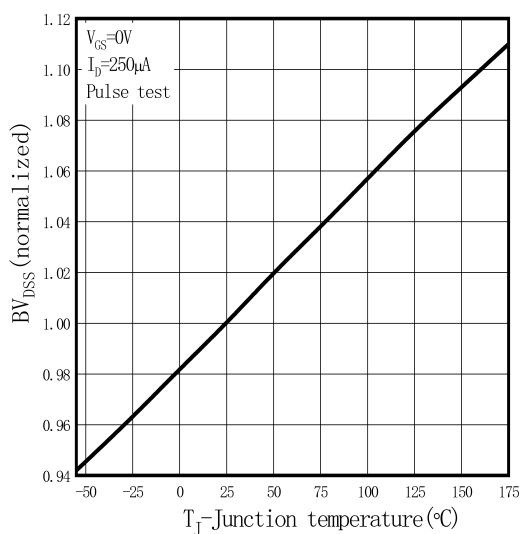


Figure 6. Threshold Voltage vs. Temperature

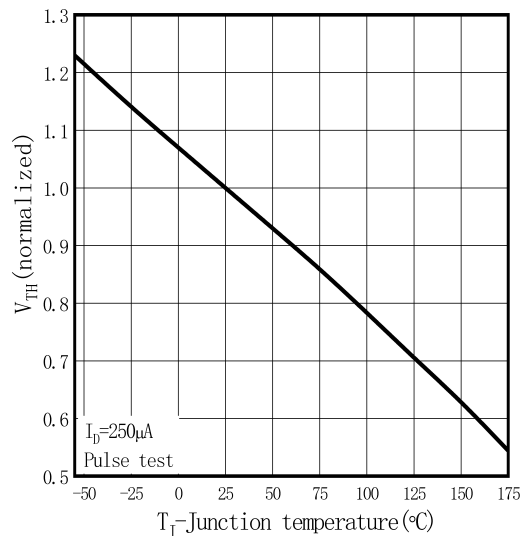


Figure 7. Rds(on) vs. Gate Voltage

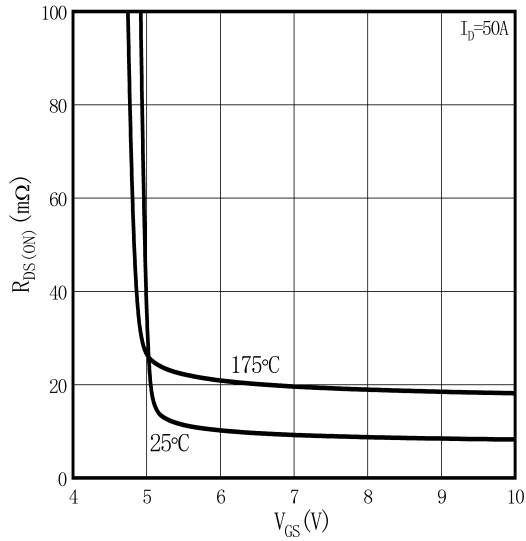


Figure 8. Body-Diode Characteristics

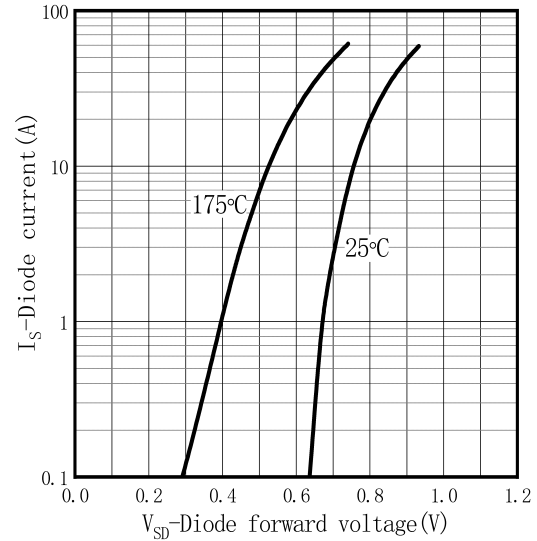


Figure 9. Capacitance Characteristics

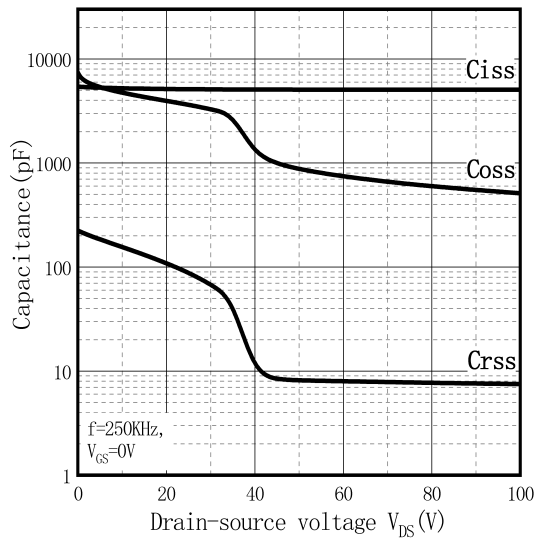


Figure 10. Gate Charge Characteristics

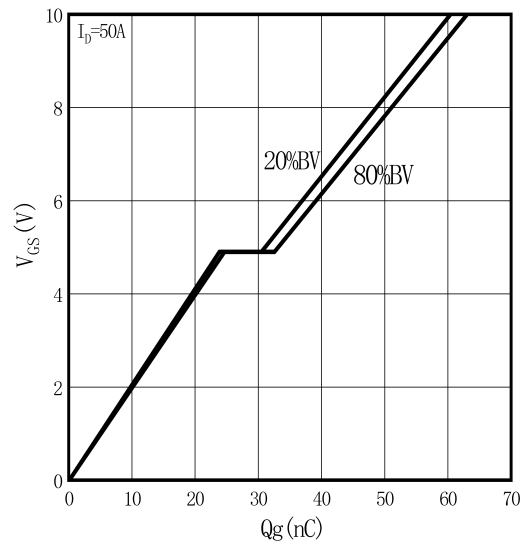


Figure 11. Drain Current Derating

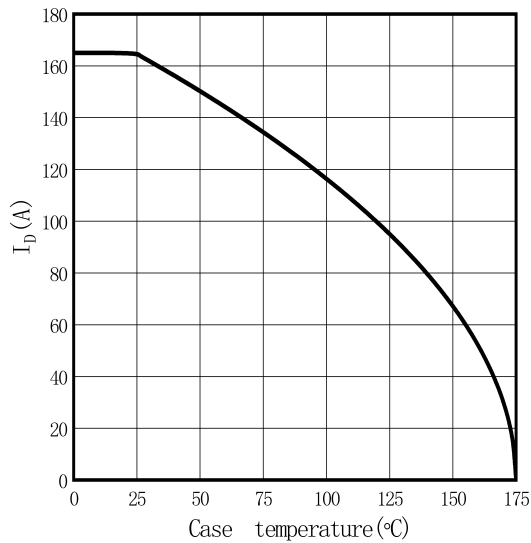


Figure 12. Power Dissipation vs. Temperature

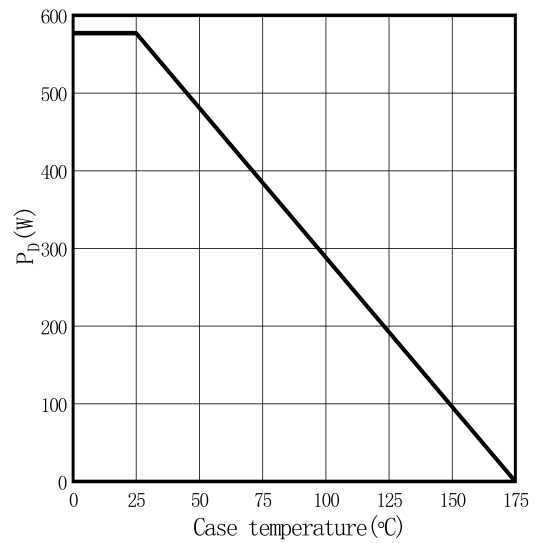


Figure 13. Safe Operating Area

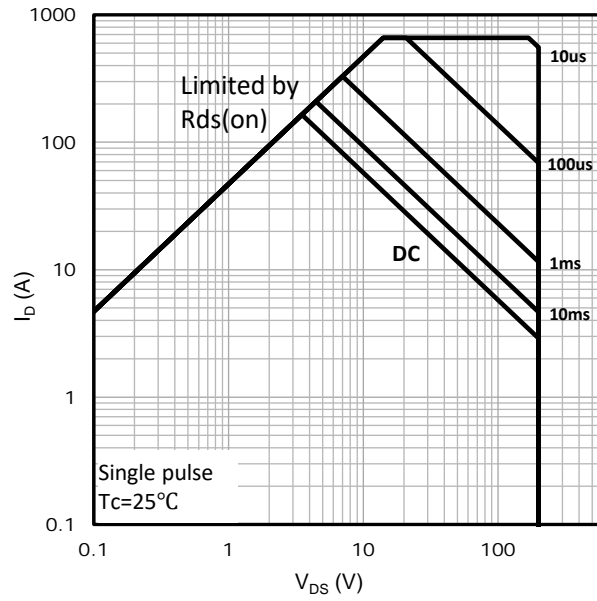
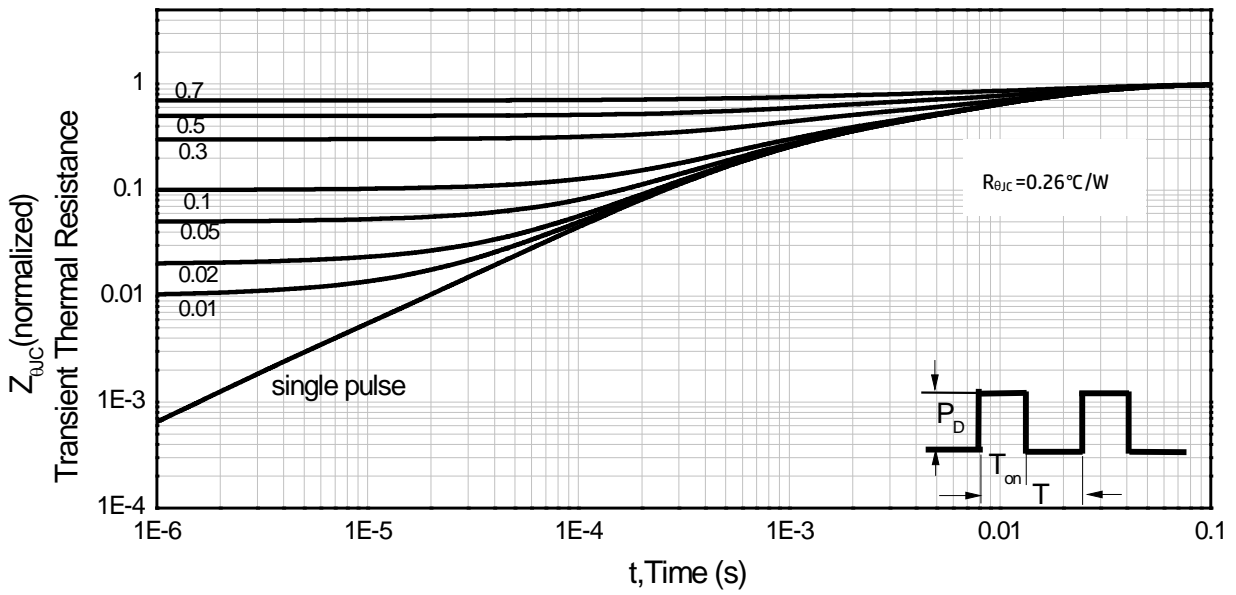
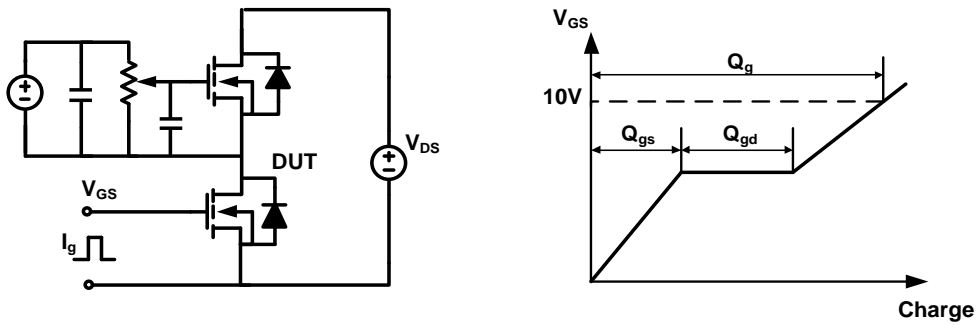


Figure 14. Normalized Maximum Transient Thermal Impedance (R_{thJC})

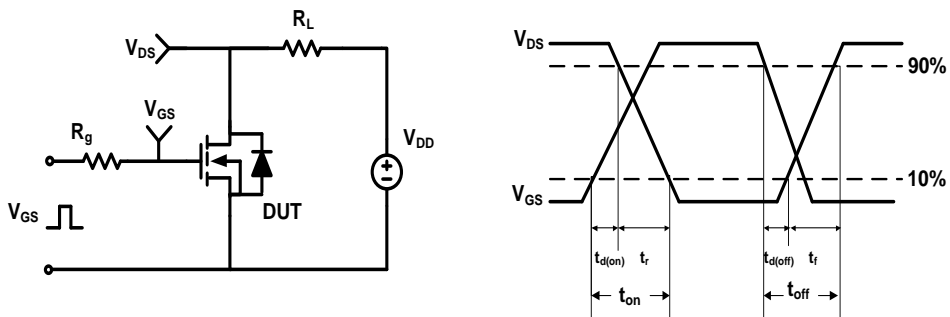


Test Circuit & Waveforms

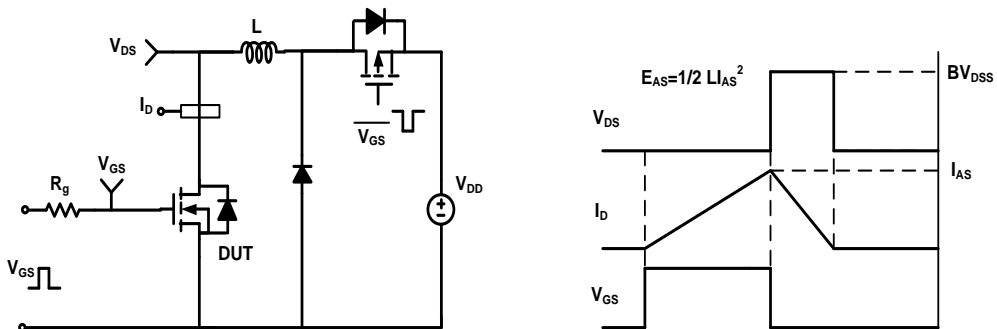
Gate Charge Test Circuit & Waveform



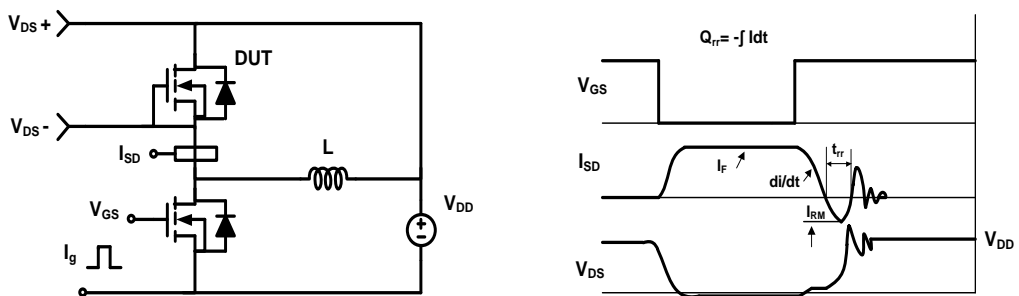
Resistive Switching Test Circuit & Waveform

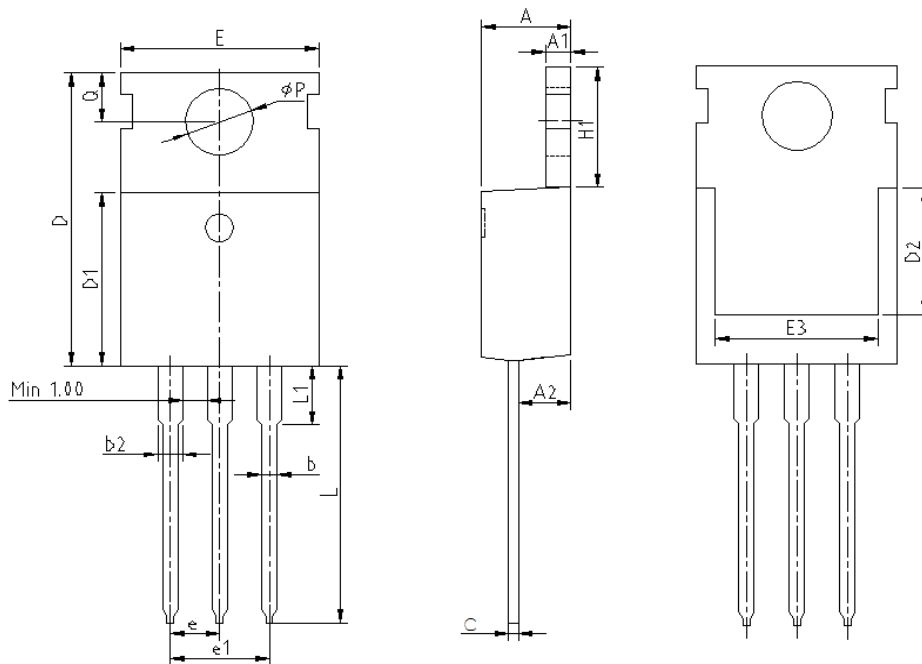


Unclamped Inductive Switching (UIS) Test Circuit & Waveform



Diode Recovery Test Circuit & Waveform



Mechanical Dimensions for TO-220


DIMENSIONS IN MILLIMETERS		
SYMBOL	MIN	MAX
A	4.25	4.7
A1	1.2	1.4
A2	2.2	2.92
b	0.7	0.97
b2	1.14	1.78
c	0.4	0.61
D	14.32	16.1
D1	8.39	9.4
D2	5.5	7
E	9.7	10.36
E3	7	8.78
e	2.54BSC	
e1	5.08BSC	
H1	6.25	6.85
L	12.75	14.4
L1	-	4.05
ΦP	3.4	3.8
Q	2.54	3