



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

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	650	V
Gate-source voltage	$V_{GS}$	$\pm 30$	V
Continuous drain current <sup>1)</sup> , $T_C=25^\circ\text{C}$	$I_D$	11	A
Continuous drain current <sup>1)</sup> , $T_C=100^\circ\text{C}$		7	
Pulsed drain current <sup>2)</sup> , $T_C=25^\circ\text{C}$	$I_{D, pulse}$	33	A
Continuous diode forward current <sup>1)</sup> , $T_C=25^\circ\text{C}$	$I_S$	11	A
Diode pulsed current <sup>2)</sup> , $T_C=25^\circ\text{C}$	$I_{S, pulse}$	33	A
Power dissipation <sup>3)</sup> , $T_C=25^\circ\text{C}$	$P_D$	83	W
Single pulsed avalanche energy <sup>5)</sup>	$E_{AS}$	200	mJ
MOSFET dv/dt ruggedness, $V_{DS} \ll 9$	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS} \ll 9$ $I_{SD}, I_D$	dv/dt	15	V/ns
Operation and storage temperature	$T_{stg}, T_j$	-55 to 150	$^\circ\text{C}$

**Thermal Characteristics**

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta jc}$	1.5	$^\circ\text{C/W}$
Thermal resistance, junction-ambient <sup>4)</sup>	$R_{\theta ja}$	62	$^\circ\text{C/W}$

**Electrical Characteristics** at  $T_j=25^\circ\text{C}$  unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	$BV_{DSS}$	650			V	$V_{GS}=0\text{ V}, I_D=$ A
		700	770			$V_{GS}=0\text{ V}, I_D=$ A, $T_j=150^\circ\text{C}$
Gate threshold voltage	$V_{GS(th)}$	2.9		3.9	V	$V_{DS}=V_{GS}, I_D=$ A
Drain-source on-state resistance	$R_{DS(on)}$		0.35	0.38		$V_{GS}=10\text{ V}, I_D=5.5\text{ A}$
			0.89			$V_{GS}=10\text{ V}, I_D=5.5\text{ A}, T_j=150^\circ\text{C}$
Gate-source leakage current	$I_{GSS}$			100	nA	$V_{GS}=30\text{ V}$
				-100		$V_{GS}=-30\text{ V}$
Drain-source leakage current	$I_{DSS}$			1	A	$V_{DS}=650\text{ V}, V_{GS}=0\text{ V}$

### Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	$C_{iss}$		743.4		pF	$V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=100\text{ kHz}$
Output capacitance	$C_{oss}$		63.3		pF	
Reverse transfer capacitance	$C_{rss}$		6.0		pF	
Turn-on delay time	$t_{d(on)}$		20.3		ns	$V_{GS}=10\text{ V}$ , $V_{DS}=400\text{ V}$ , $R_G$ $I_D=6\text{ A}$
Rise time	$t_r$		5.4		ns	
Turn-off delay time	$t_{d(off)}$		29.5		ns	
Fall time	$t_f$		4.4		ns	

### Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	$Q_g$		12.5		nC	$V_{GS}=10\text{ V}$ , $V_{DS}=400\text{ V}$ , $I_D=6\text{ A}$
Gate-source charge	$Q_{gs}$		3.2		nC	
Gate-drain charge	$Q_{gd}$		4.8		nC	
Gate plateau voltage	$V_{plateau}$		5.7		V	

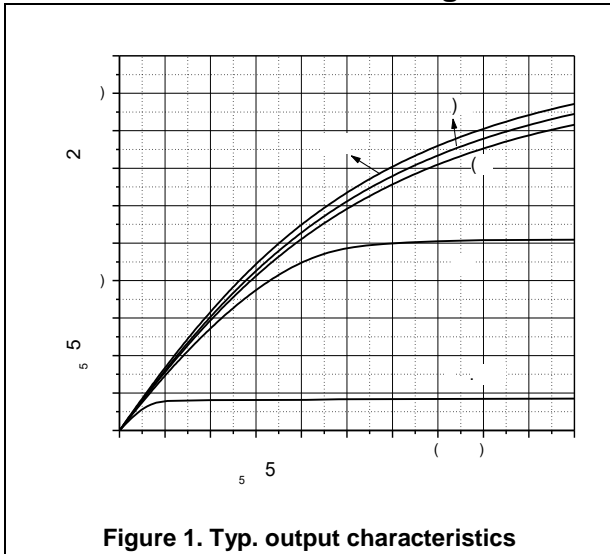
### Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	$V_{SD}$			1.3	V	$I_S=11\text{ A}$ , $V_{GS}=0\text{ V}$
Reverse recovery time	$t_{rr}$		228.6		ns	$I_S=6\text{ A}$ , G L G W
Reverse recovery charge	$Q_{rr}$		2.3		C	
Peak reverse recovery current	$I_{rrm}$		20.4		A	

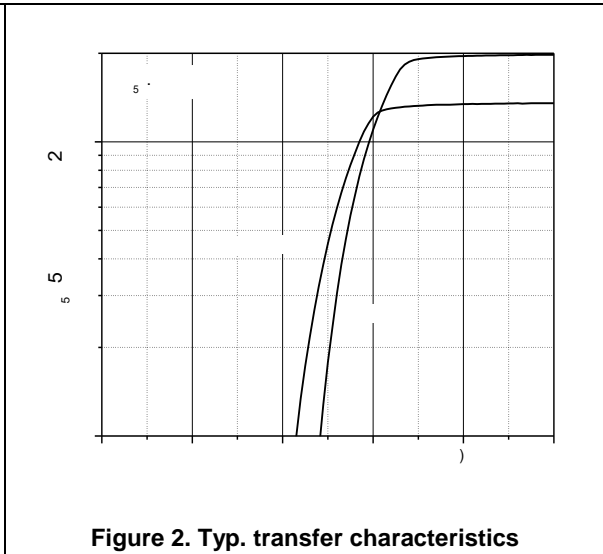
### Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3)  $P_d$  is based on max. junction temperature, using junction-case thermal resistance.
- 4) The value of  $R_{\theta j-c}$  is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_a=25\text{ °C}$ .
- 5)  $V_{DD}=100\text{ V}$ ,  $V_{GS}=10\text{ V}$ ,  $L=80\text{ mH}$ , starting  $T_j=25\text{ °C}$ .

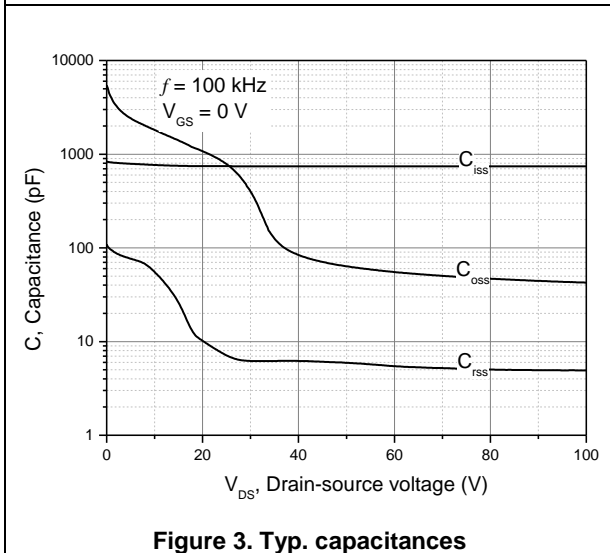
**Electrical Characteristics Diagrams**



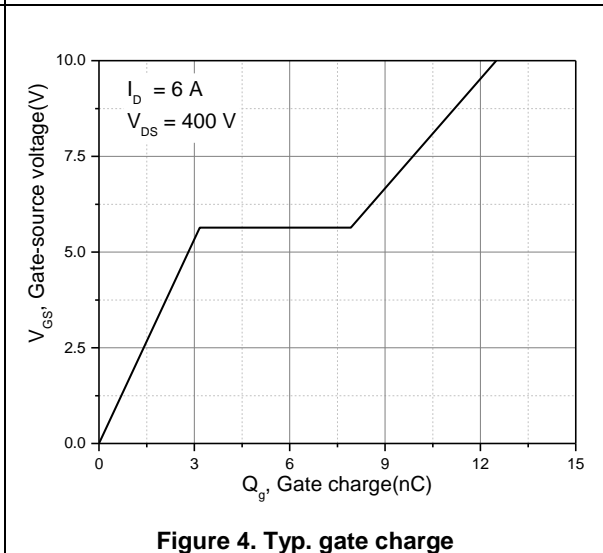
**Figure 1. Typ. output characteristics**



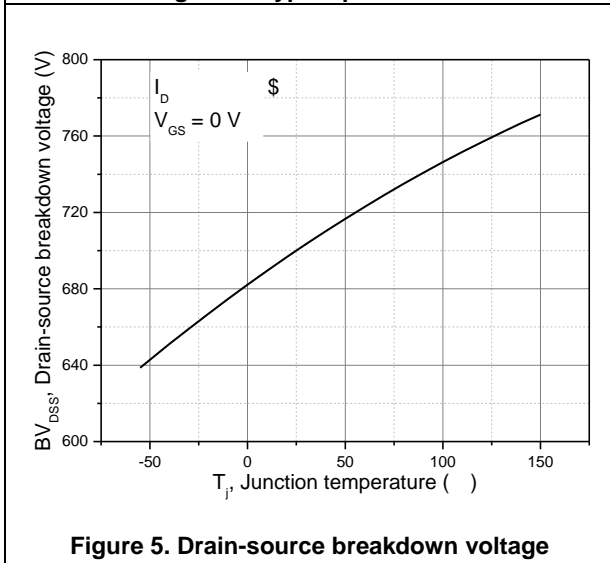
**Figure 2. Typ. transfer characteristics**



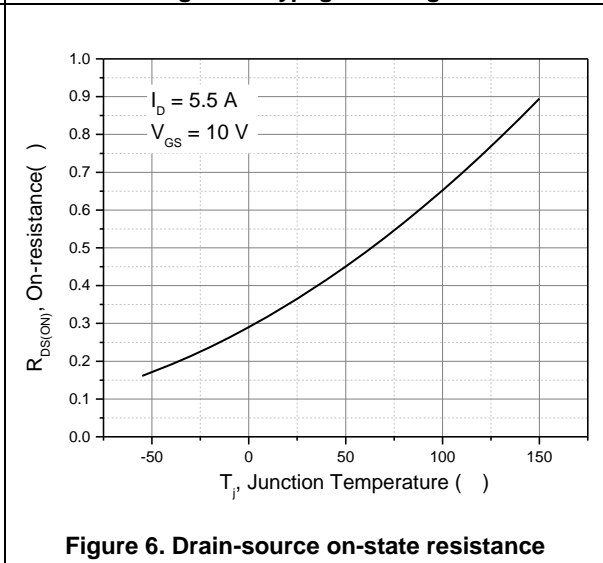
**Figure 3. Typ. capacitances**



**Figure 4. Typ. gate charge**



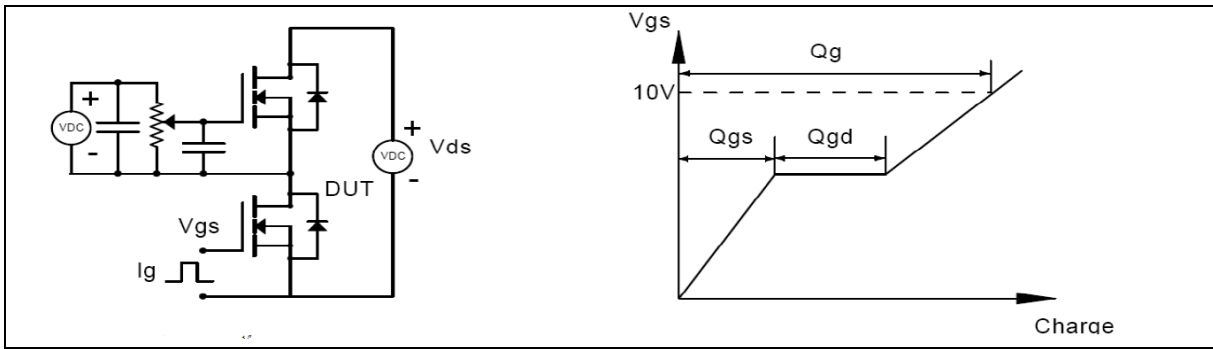
**Figure 5. Drain-source breakdown voltage**



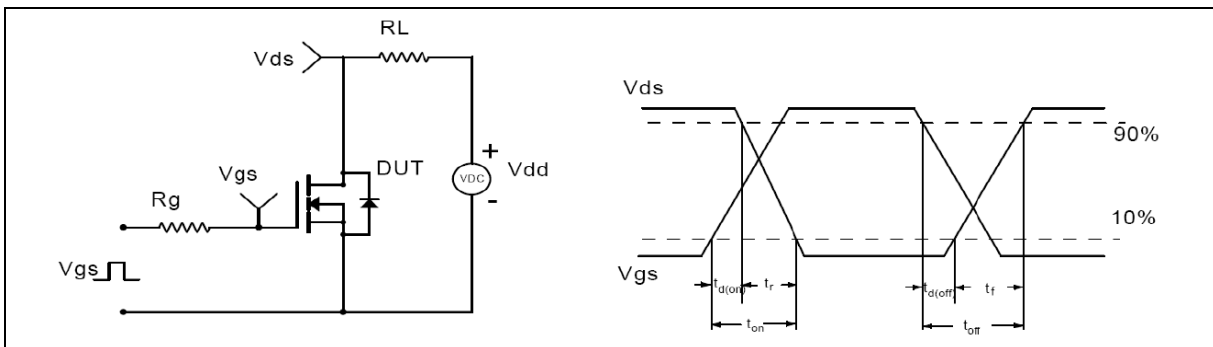
**Figure 6. Drain-source on-state resistance**



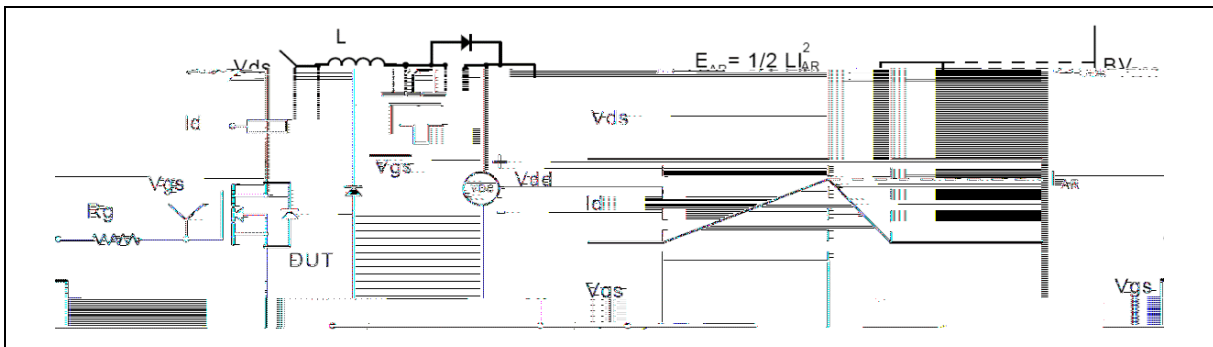
**Test circuits and waveforms**



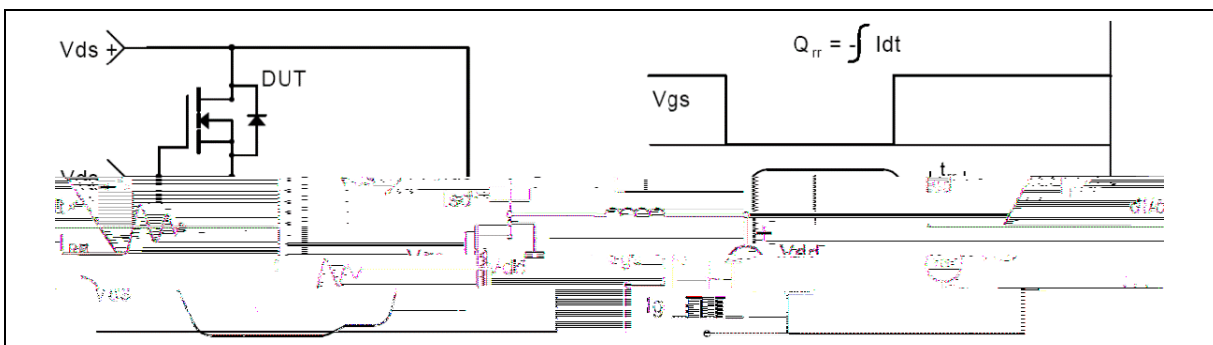
**Figure 1. Gate charge test circuit & waveform**



**Figure 2. Switching time test circuit & waveforms**

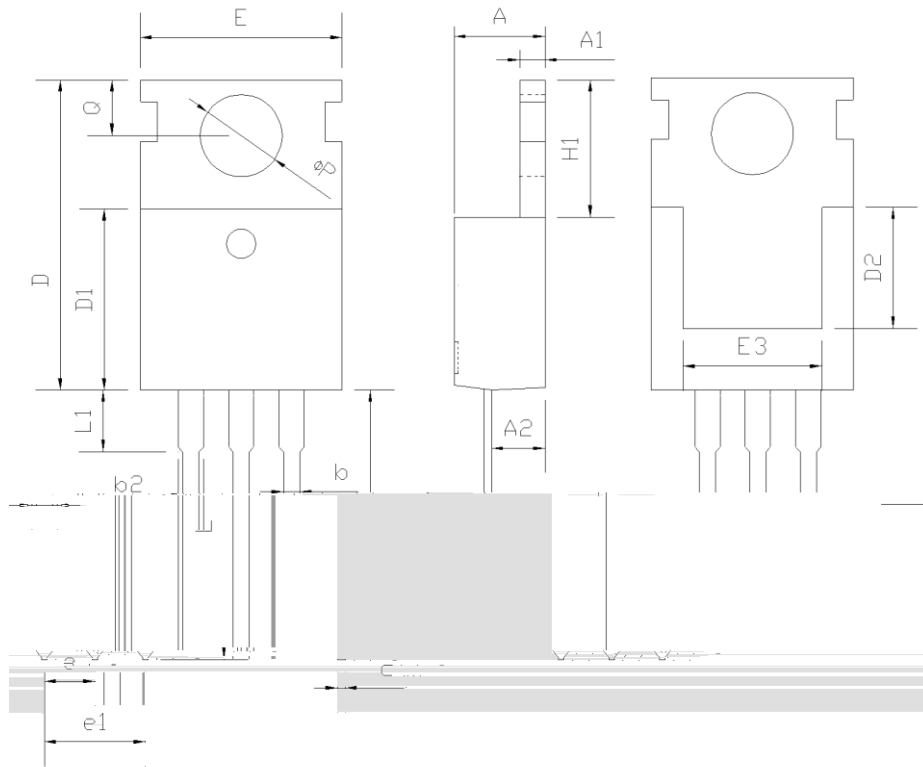


**Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms**



**Figure 4. Diode reverse recovery test circuit & waveforms**

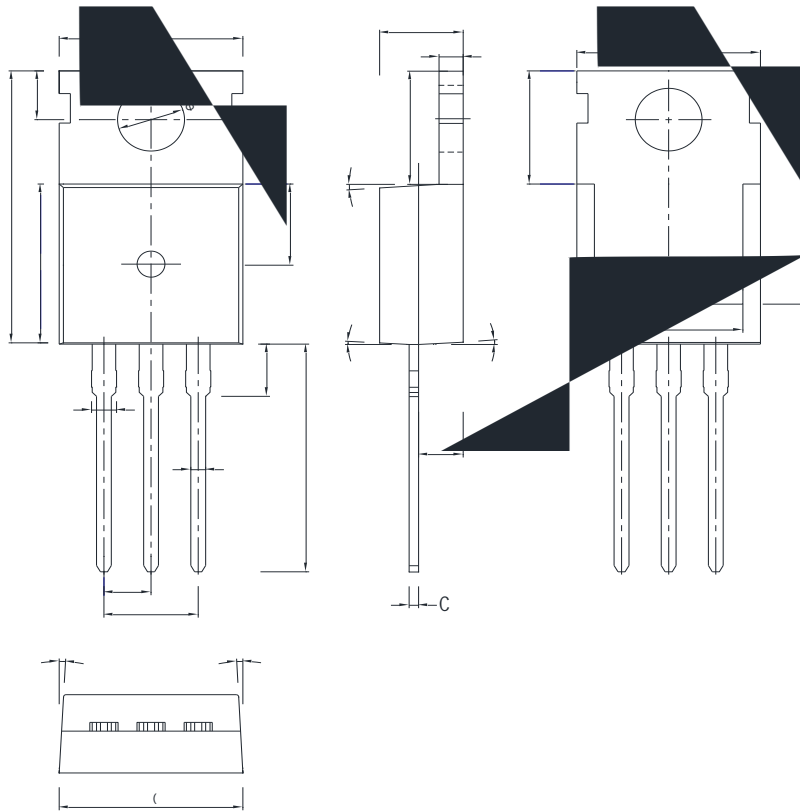
**Package Information**



Symbol	mm		
	Min	Nom	Max
A	4.37	4.57	4.77
A1	1.25	1.30	1.45
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.40	0.50	0.65
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
- 3	3.40	3.60	3.80
Q	2.60	2.80	3.00

Version1: TO220-P package outline dimension

**Package Information**



Symbol	mm		
	Min	Nom	Max
A	4.40	4.50	4.60
A1	1.27	1.30	1.33
A2	2.30	2.40	2.50
b	0.70	-	0.90
b1	1.27	-	1.40
c	0.45	0.50	0.60
D	15.30	15.70	16.10
D1	9.10	9.20	9.30
D2	13.10	-	13.70
E	9.70	9.90	10.20
E1	7.80	8.00	8.20
e	2.54 BSC		
e1	5.08 BSC		
H1	6.30	6.50	6.70
L	12.78	13.08	13.38
L1	-	-	3.50
L2	4.60 REF		
-3	3.55	3.60	3.65
Q	2.73	-	2.87
1	1 $\hat{U}$	$\hat{U}$	$\hat{U}$

Version2: TO220-J package outline dimension



**Ordering Information**

Package Type	Units/ Tube	Tubes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO220-P	50	20	1000	6	6000
TO220-J	50	20	1000	5	5000

**Product Information**

Product	Package	Pb Free	RoHS	Halogen Free
OSG65R380PF	TO220	yes	yes	yes

/HJDO 'LVFODLPHU

7KH LQIRUPDWLRQ JLYHQ LQ WKLV GRFXPHQW VKDOO LQ QR H  
FRQGLWLRQV DUDFWHULVWLFV :LWK UHVSHFW WR DQ\ H[DPSOHV  
YDOXHV K\WUHLRQ DQG RU DQ\ LQIRUPDWLRQ UHJDUGLQJ WKH DSS  
6HPL P