

# GC2M060065K

## N-Channel SiC Power MOSFET

$$\begin{aligned} V_{DS} &= 650 \text{ V} \\ R_{DS(on)} &= 60 \text{ m}\Omega \\ I_{D@25^\circ\text{C}} &= 41 \text{ A} \end{aligned}$$

### Features

- 2<sup>nd</sup> Generation SiC MOSFET Technology
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Fast Intrinsic Diode with Low Reverse Recovery (Qrr)

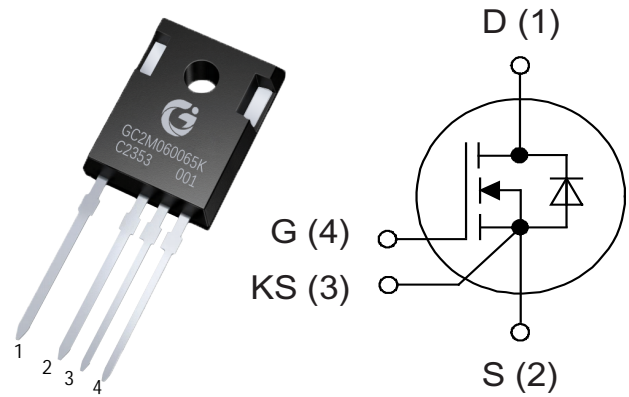
### Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency
- Easy to Parallel and Simple to Drive
- Enable Totem-Pole PFC Topologies

### Applications

- EV Charging
- Server Power Supplies
- Solar PV Inverters
- UPS
- DC/DC Converters

### Package



Part Number	Package
GC2M060065K	TO-247-4

### Maximum Ratings ( $T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
$V_{DSmax}$	Drain-Source Voltage, $T_c=25^\circ\text{C}$	650	V	$V_{GS}=0\text{V}$ , $I_D=100\mu\text{A}$	
$V_{GSmax}$	Gate-Source Voltage	-8/+22	V	Absolute maximum values	
$V_{GSop}$	Gate-Source Voltage	-4/+18	V	Recommended operational values	
$I_D$	Continuous Drain Current	41	A	$V_{GS}=18\text{V}$ , $T_c=25^\circ\text{C}$	
		31		$V_{GS}=18\text{V}$ , $T_c=100^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current	99	A	Pulse width $t_p$ limited by $T_{Jmax}$	
$P_D$	Power Dissipation	166	W	$T_c=25^\circ\text{C}$ , $T_J=175^\circ\text{C}$	
$T_J$ , $T_{STG}$	Operating Junction and Storage Temperature	-40 to +175	$^\circ\text{C}$		
$T_L$	Solder Temperature	260	$^\circ\text{C}$		
$M_d$	Mounting Torque	1	Nm		

**Electrical Characteristics ( $T_c=25^\circ\text{C}$  unless otherwise specified)**

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	650	/	/	V	$V_{GS}=0V, I_D=100\mu A$	
$V_{GS(th)}$	Gate Threshold Voltage	1.8	2.6	4.0	V	$V_{DS}=V_{GS}, I_D=5mA$	
		/	1.8	/		$V_{DS}=V_{GS}, I_D=5mA, T_J=175^\circ\text{C}$	
$I_{DSS}$	Zero Gate Voltage Drain Current	/	1	50	$\mu A$	$V_{DS}=650V, V_{GS}=0V$	
$I_{GSS}$	Gate-Source Leakage Current	/	10	250	nA	$V_{DS}=0V, V_{GS}=18V$	
$R_{DS(on)}$	Drain-Source On-State Resistance	42	60	79	m $\Omega$	$V_{GS}=18V, I_D=13.2A$	
		/	75	/		$V_{GS}=18V, I_D=13.2A, T_J=175^\circ\text{C}$	
$C_{iss}$	Input Capacitance	/	830	/	pF	$V_{GS}=0V, V_{DS}=600V$ $f=1MHz, V_{AC}=25mV$	
$C_{oss}$	Output Capacitance	/	82	/			
$C_{rss}$	Reverse Transfer Capacitance	/	14	/			
$E_{ON}$	Turn-On Switching Energy	/	140	/	$\mu J$	$V_{DS}=400V, V_{GS}=-4V/18V$ $I_D=13.2A, R_{G(ext)}=2.5\Omega, L=200\mu H$	
$E_{OFF}$	Turn-Off Switching Energy	/	52	/			
$t_{d(on)}$	Turn-On Delay Time	/	8	/	ns	$V_{DS}=400V, V_{GS}=-4V/18V, I_D=13.2A$ $R_{G(ext)}=2.5\Omega, R_L=30\Omega$	
$t_r$	Rise Time	/	9	/			
$t_{d(off)}$	Turn-Off Delay Time	/	21	/			
$t_f$	Fall Time	/	8	/			
$R_{G(int)}$	Internal Gate Resistance	/	6	/	$\Omega$	$f=1MHz, V_{AC}=25mV$	
$Q_{GS}$	Gate to Source Charge	/	13	/	nC	$V_{DS}=400V$ $V_{GS}=-4V/18V$ $I_D=13.2A$	
$Q_{GD}$	Gate to Drain Charge	/	12	/			
$Q_G$	Total Gate Charge	/	50	/			

**Reverse Diode Characteristics**

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$V_{SD}$	Diode Forward Voltage	4.2	/	V	$V_{GS}=-4V, I_{SD}=6.6A$	
		3.8	/		$V_{GS}=-4V, I_{SD}=6.6A, T_J=175^\circ\text{C}$	
$I_S$	Continuous Diode Forward Current	/	23	A	$V_{GS}=-4V, T_C=25^\circ\text{C}$	
$t_{rr}$	Reverse Recover Time	28	/	ns	$V_R=400V, I_{SD}=13.2A$	
$Q_{rr}$	Reverse Recovery Charge	47	/	nC		
$I_{rrm}$	Peak Reverse Recovery Current	3	/	A		

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.9	/	$^\circ\text{C/W}$		
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	40	/			

### Typical Performance

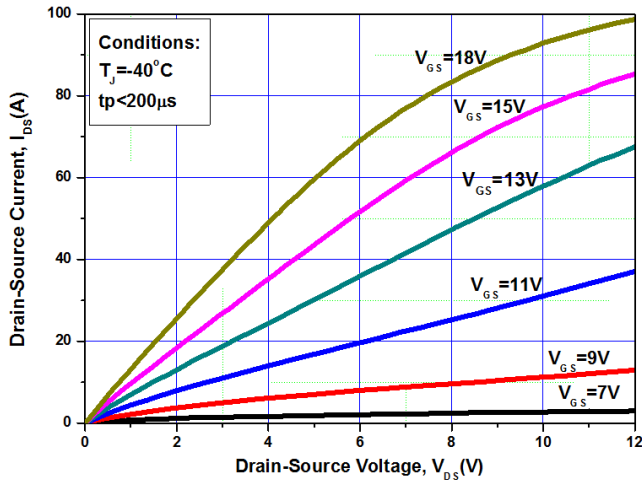


Figure 1. Output Characteristics  $T_j = -40^\circ\text{C}$

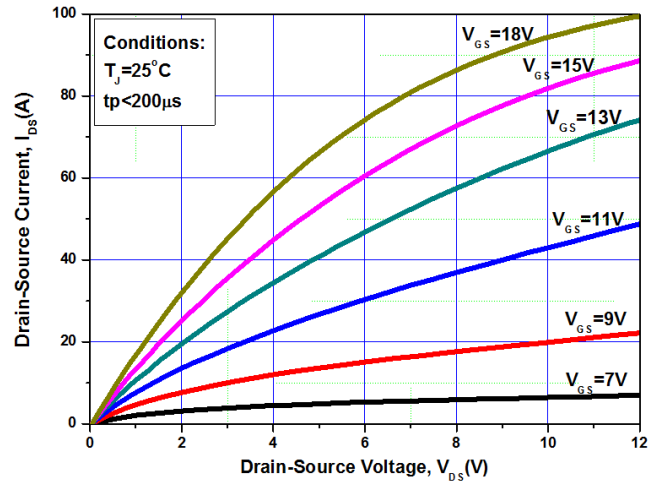


Figure 2. Output Characteristics  $T_j = 25^\circ\text{C}$

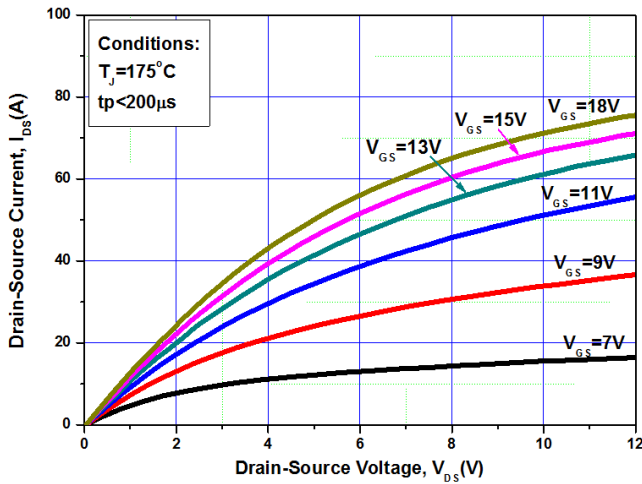


Figure 3. Output Characteristics  $T_j = 175^\circ\text{C}$

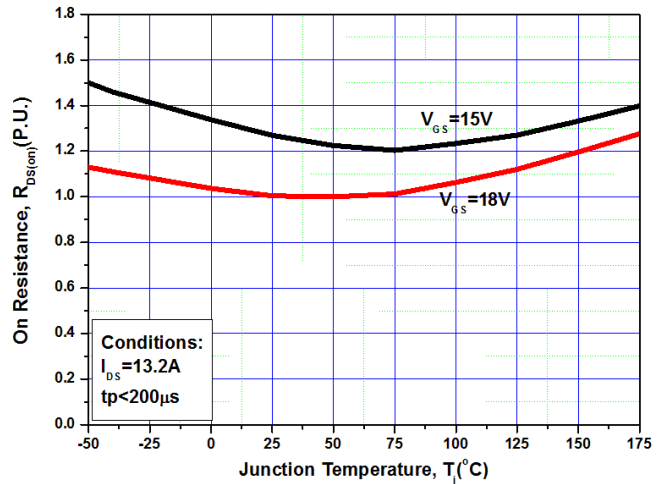


Figure 4. Normalized On-Resistance vs. Temperature

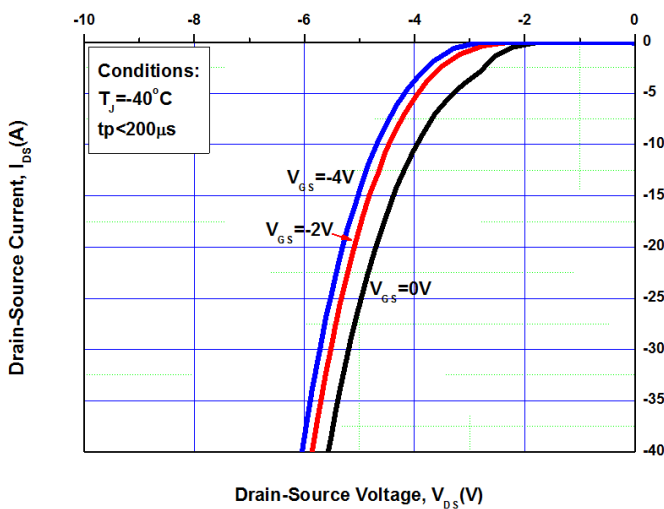


Figure 5. Body Diode Characteristic at  $-40^\circ\text{C}$

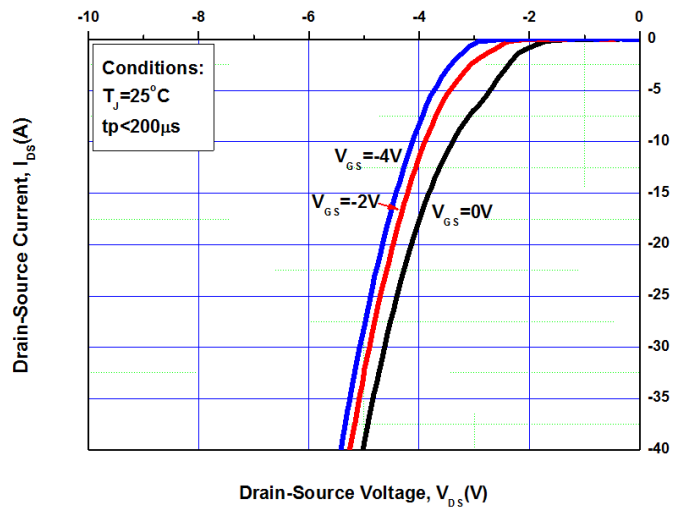


Figure 6. Body Diode Characteristic at  $25^\circ\text{C}$

Typical Performance

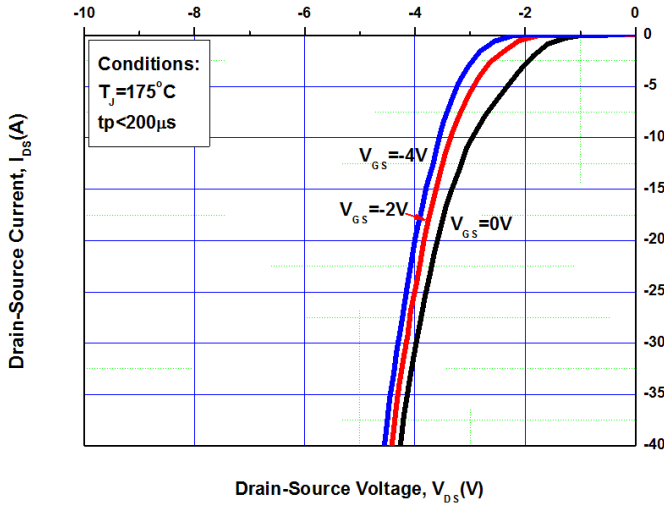


Figure 7. Body Diode Characteristic at 175°C

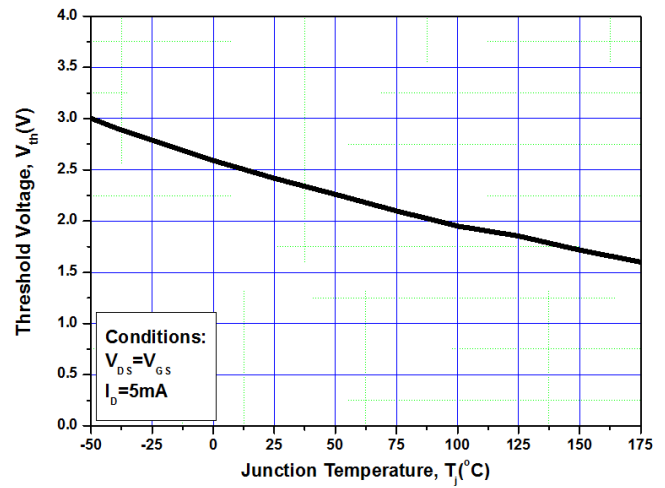


Figure 8. Threshold Voltage vs. Temperature

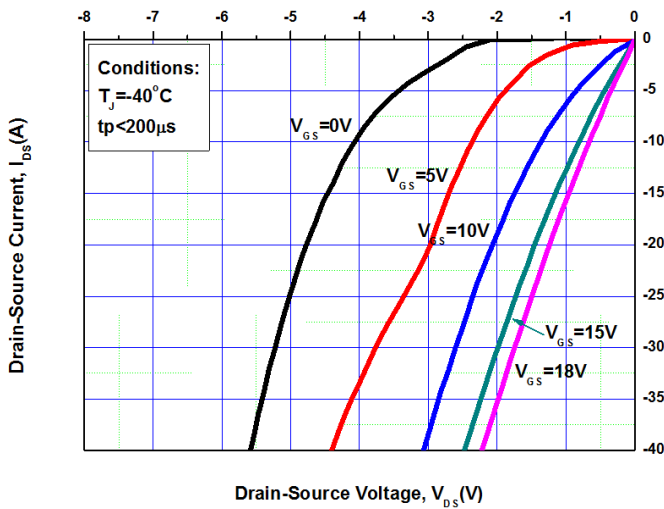


Figure 9. 3rd Quadrant Characteristic at -40°C

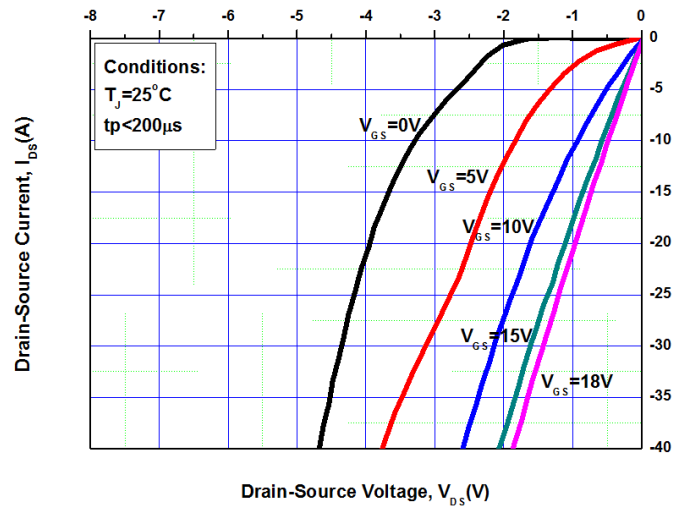


Figure 10. 3rd Quadrant Characteristic at 25°C

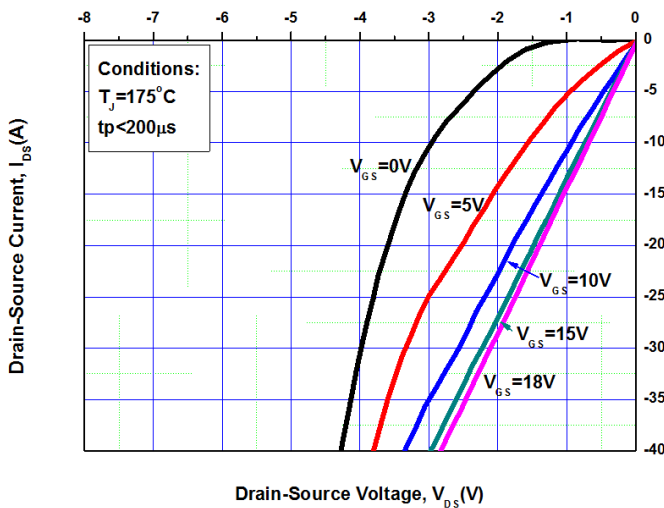


Figure 11. 3rd Quadrant Characteristic at 175°C

### Typical Performance

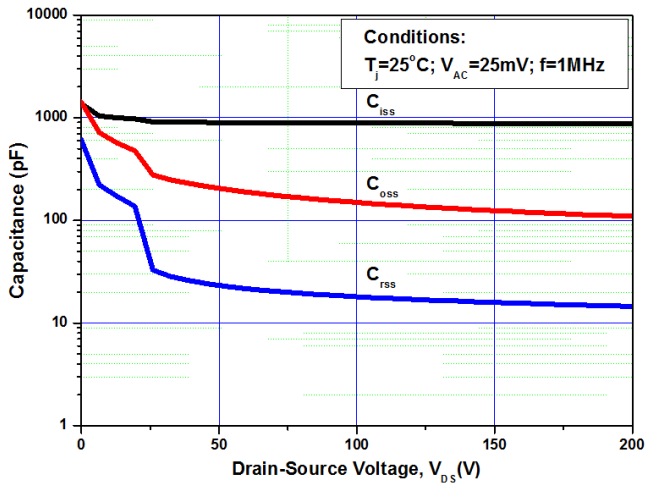


Figure 12. Capacitances vs. Drain-Source Voltage (0 - 200V)

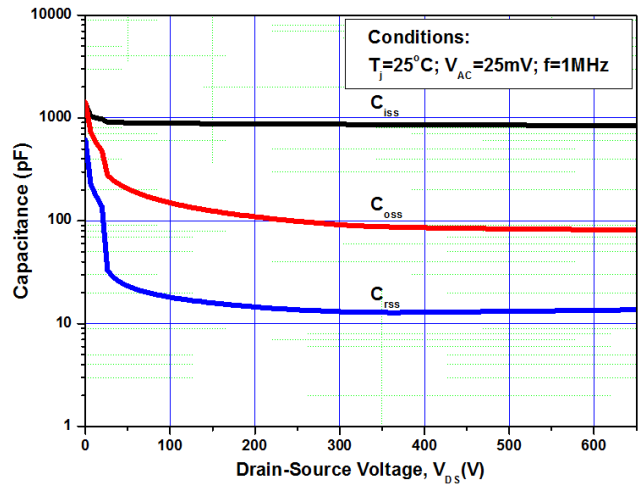
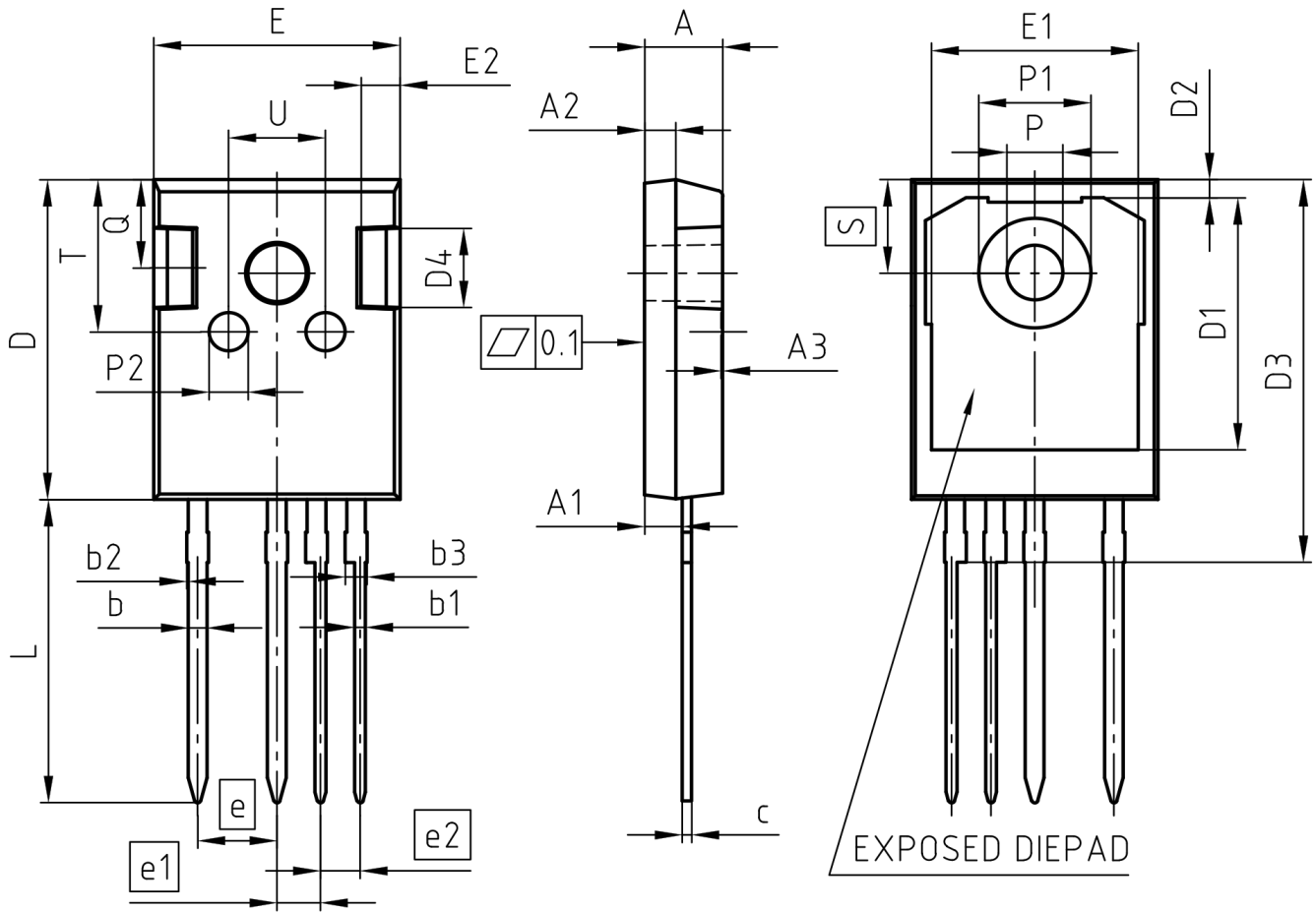


Figure 13. Capacitances vs. Drain-Source Voltage (0 - 650V)

Package Dimensions: TO-247-4



NOTES:  
ALL DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

PACKAGE - GROUP NUMBER:		PG-TO247-4			
DIMENSIONS	MILLIMETERS		DIMENSIONS	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	4.90	5.10	E	15.70	15.90
A1	2.31	2.51	E1	13.10	13.50
A2	1.90	2.10	E2	2.40	2.60
A3	0.05	0.25	e	5.08	
b	1.10	1.30	e1	2.79	
b1	0.65	0.79	e2	2.54	
b2	---	0.20	N	4	
b3	1.34	1.44	L	19.80	20.10
c	0.58	0.66	øP	3.50	3.70
D	20.90	21.10	øP1	7.00	7.40
D1	16.25	16.85	øP2	2.40	2.60
D2	1.05	1.35	Q	5.60	6.00
D3	24.97	25.27	S	6.15	
D4	4.90	5.10	T	9.80	10.20
			U	6.00	6.40