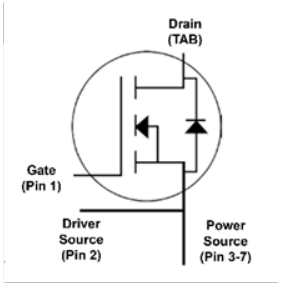
650V 36mΩ SiC MOSFET

Features:

- High blocking voltage with low Rds(on)
- High frequency operation with low Capacitance
- Simple to drive with -4V/+18V gate
- Robust body diode with low Qrr
- 100% Avalanche Tested



Benefits

- Superior robustness and system reliability
- Higher system efficiency
- Easier paralleling without thermal runaway
- Capable of high temperature application
- Faster and more efficient switching

Applications:

- EV motor drives
- EV/HEV charging station
- Energy storage and Battery charging
- High voltage DC-DC converters
- Solar / Wind Inverters
- UPS and PFC

Key Performance and Package Parameters

Type	V_{DS}	$R_{DS(ON)}$	I_D@25°C	I_D@100°C	Tsc	Marking	Package
PG036S065DNC	650V	36mΩ	64A	45A	2.5μs	PG036S065DNC	TO-263-7

Absolute Maximum Ratings(T_C=25°C unless otherwise specified)

Parameter	Symbols	Conditions	Value	Unit
Drain - source voltage	$V_{DS(max)}$	T_C=25°C	650	V
Gate - source voltage	$V_{GS(max)}$	AC (f>1Hz, duty cycle<1%, pulse width<200ns)	-9 / +23	V
Gate – source voltage	$V_{GS(op)}$	Recommend operation	-4 / +18	V
Continuous drain current (limited by $T_{J,max}$)	I_D	V_{GS} =18V, T_C=25°C V_{GS} =18V, T_C=100°C	64 45	A
Pulsed drain current	$I_{D(pulse)}$	T_C=25°C	153	A
Short circuit withstand time	T_{SC}	V_{GS}= 18V, V_{DS}≤400V	2.5	μs
Total power dissipation	P_D	T_C=25°C	197	W
Operating junction temperature	T_J		-55 to 175	°C
Storage temperature	T_{STG}		-55 to 175	°C
Soldering temperature	T_L		260	°C
Avalanche capability, single pulse*	I_{AV}	V_{DD}=100V, V_{GS}=10V, L=2mH	26	A
Avalanche capability, single pulse**	E_{AV}	V_{DD}=100V, V_{GS}=10V, L=2mH	697	mJ

*100% tested in 60% rating
**100% tested in 36% rating

Electrical Characteristics at T_{VJ}= 25°C (unless otherwise specified)

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=100μA	650	-	-	V
Gate threshold voltage	$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=6mA	2.3	2.9	3.8	V
		V_{DS}=V_{GS},I_D=6mA, T_{VJ}=150°C	-	2.2	-	
		V_{DS}=V_{GS},I_D=6mA, T_{VJ}=175°C	-	2.1	-	
Zero gate voltage drain current	I_{DSS}	V_{DS}=650V, V_{GS}= 0V	0	0.5	60	uA
		V_{DS}=650V, V_{GS}= 0V,T_{VJ}=175°C	0	5	200	
Gate-source leakage current	I_{GSS}	V_{GS}=18V, V_{DS}=0V	0	5	100	nA
Gate-source leakage current	I_{GSS}	V_{GS}=-4V, V_{DS}=0V	-100	-5	0	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=18V, I_D=20A	-	36	45	mΩ
		V_{GS}=18V, I_D=20A, T_{VJ}=175°C	-	44	-	
Transconductance	gfs	V_{DS}=20V, I_D=20A	-	19	-	S
		V_{DS}=20V, I_D=20A, T_{VJ}=175°C	-	17	-	S
Input capacitance	C_{iss}	V_{DS}=400V, V_{GS}=0V f=1MHZ, V_{AC}=25mV	-	1260	-	pF
Output capacitance	C_{oss}		-	108	-	pF
Reverse transfer capacitance	C_{rss}		-	7	-	pF
Coss stored energy	E_{oss}		-	10.5	-	μJ
Turn-on switching energy	E_{ON}	V_{DS}=400V, V_{GS}= -4V/18V I_D=20A, $R_{G(ext)}$=2Ω, L=200μH	-	31	-	μJ
Turn-on switching energy	E_{OFF}		-	4.7	-	μJ
Turn-on delay time	td(on)	V_{DS}=400V, V_{GS}=-4V/18V I_D=20A, $R_{G(ext)}$=2Ω, L=200μH	-	6	-	ns
Rise time	tr		-	5	-	ns
Turn-off delaytime	td(off)		-	15	-	ns
Fall time	tf		-	5	-	ns
Total gate charge	Q_g	V_{DS}=400V, V_{GS}=-4V/18V I_D=20A	-	58	-	nC
Gate-source charge	Q_{gs}		-	16	-	nC
Gate-drain charge	Q_{gd}		-	15	-	nC
Internal gate input resistance	$R_{g(int)}$	f=1MHZ, I_D=0A	-	1	-	Ω

***Turn-off with -4V gate bias is highlyrecommended

Reverse Diode Characteristics at T_{VJ}= 25°C (unless otherwise specified)

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_{SD}=20A,T_{VJ}=25°C	-	3.7	-	V
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_{SD}=20A,T_{VJ}=175°C	-	3.3	-	V
Continuous diode forward current	Is	V_{GS}=-4V, T_{VJ}=25°C	-	33	-	A
Reverse recovery time	trr	V_{GS}=-4V, I_{SD}=20A, V_R=400V, L=200μH, dif/dt=2396A/us	-	14	-	ns
Reverse recovery charge	Q_{rr}		-	133	-	nC
Peak reverse recovery current	I_{rrm}		-	20	-	A

Thermal Characteristics

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Thermal resistance	$R_{th(j-c)}$	Junction to case	-	0.76	0.9	°C/W

Typical Characteristics

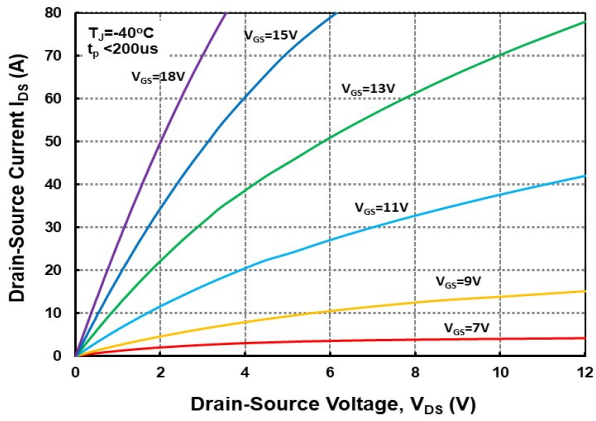


Figure 1: Output Characteristics,T_J=-40°C

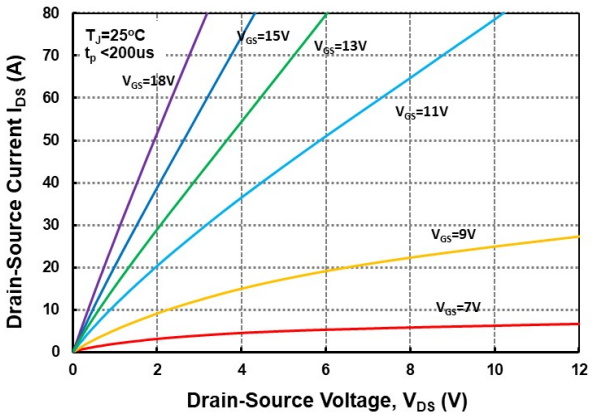


Figure 2: Output Characteristics, T_J=25°C

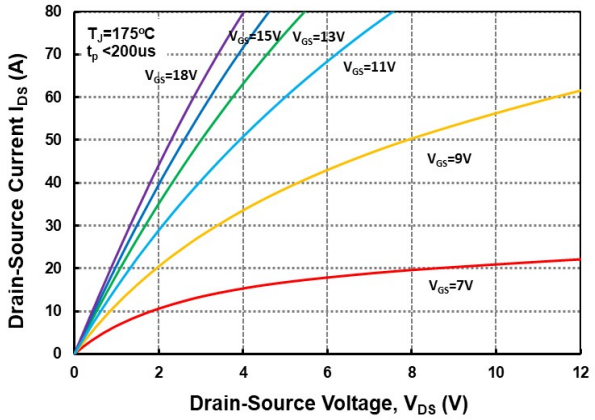


Figure 3: Output Characteristics,T_J=175°C

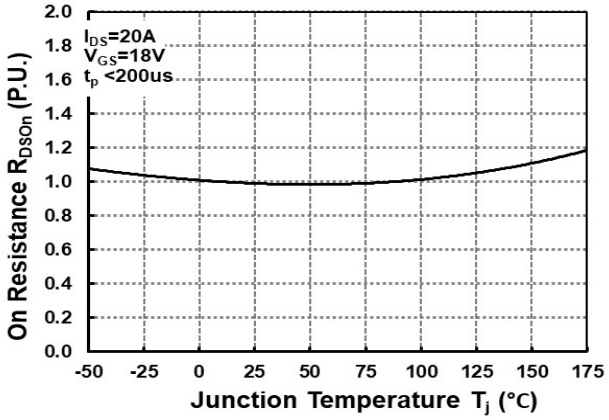


Figure 4: Normalized On-Resistance vs.Temperature

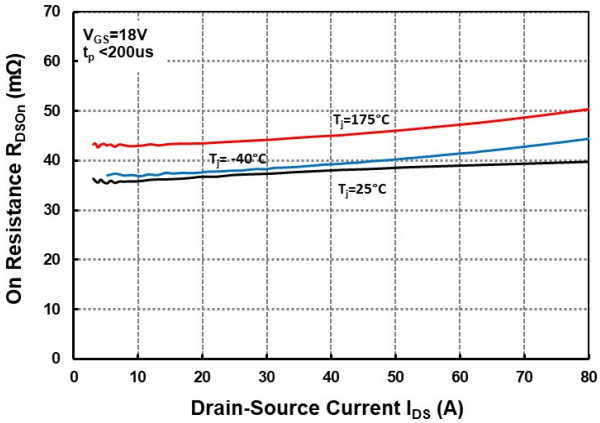


Figure 5: On-Resistance vs.Drain Current for Various Temperatures

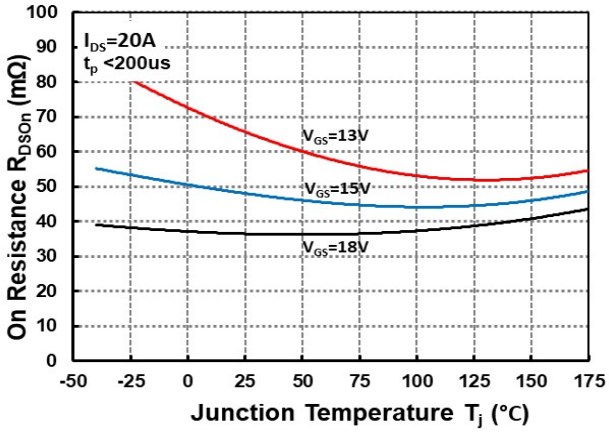


Figure 6: On-Resistance vs.Temperature for Various Gate Voltage

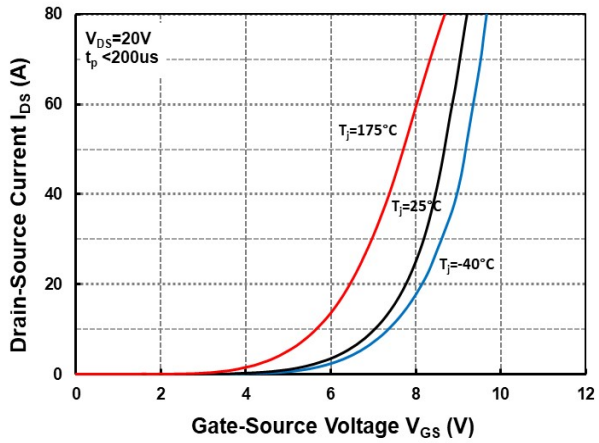


Figure 7. Transfer Characteristic for Various Junction Temperatures

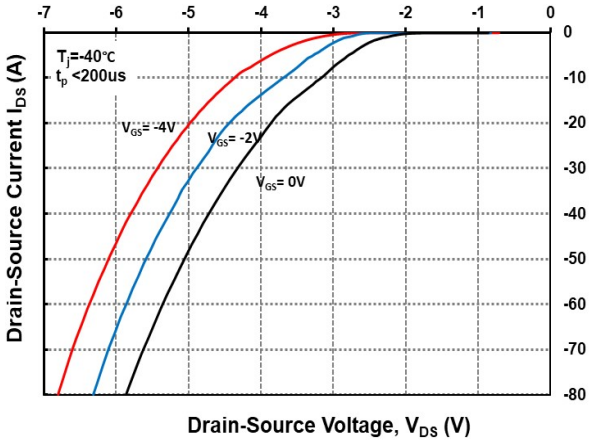


Figure 8. Body Diode Characteristics @ -40°C

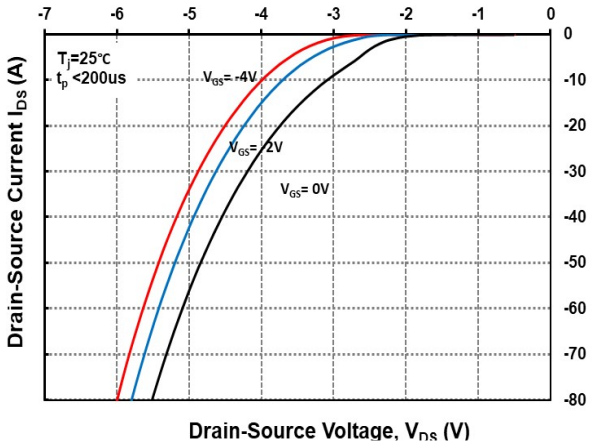


Figure 9. Body Diode Characteristics @ 25°C

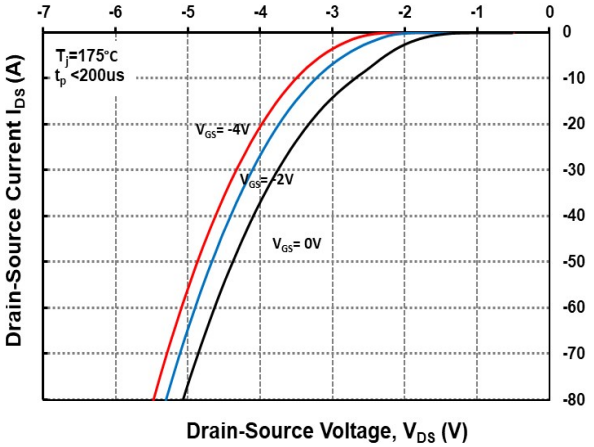


Figure 10. Body Diode Characteristics @ 175°C

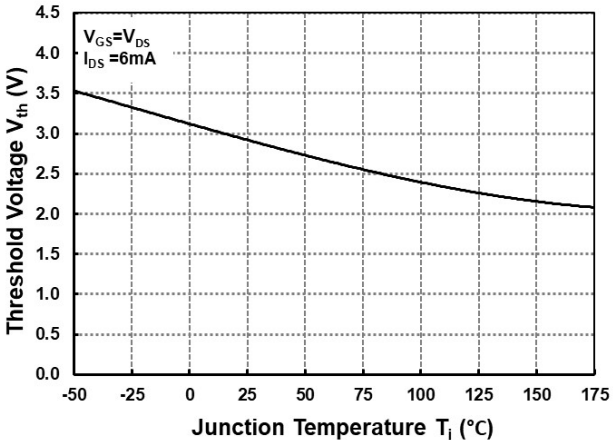


Figure 11. Threshold Voltage vs. Temperature

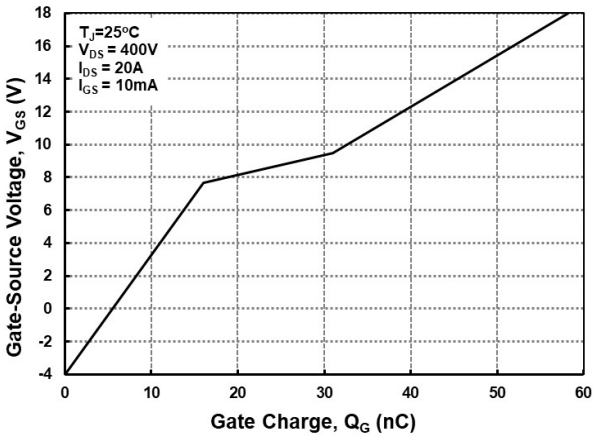


Figure 12. Gate Charge Characteristics

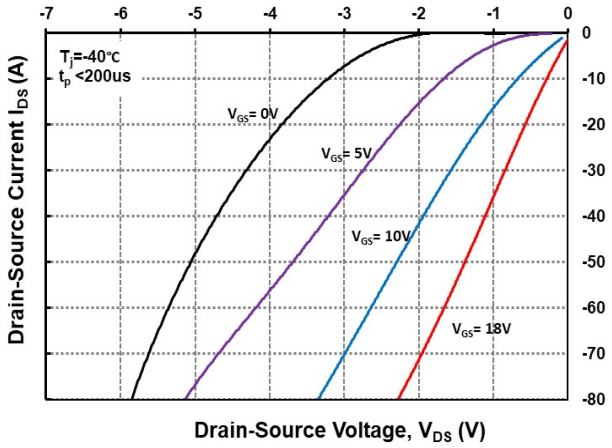


Figure 13. 3rd Quadrant Characteristics @ -40°C

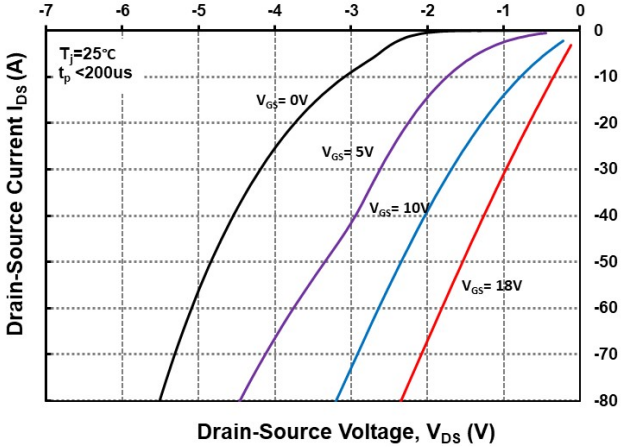


Figure 14. 3rd Quadrant Characteristics @ 25°C

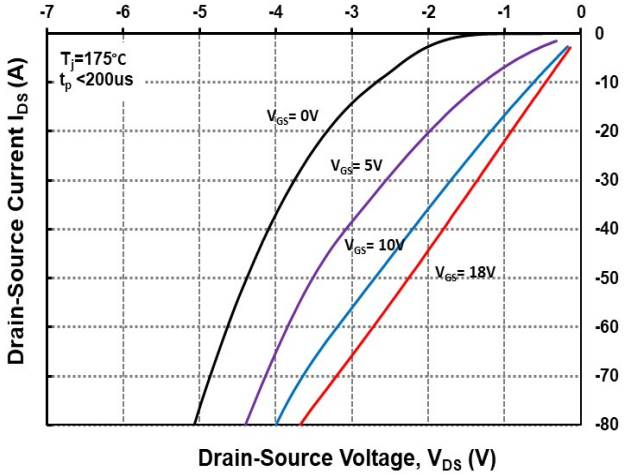


Figure 15. 3rd Quadrant Characteristics @ 175°C

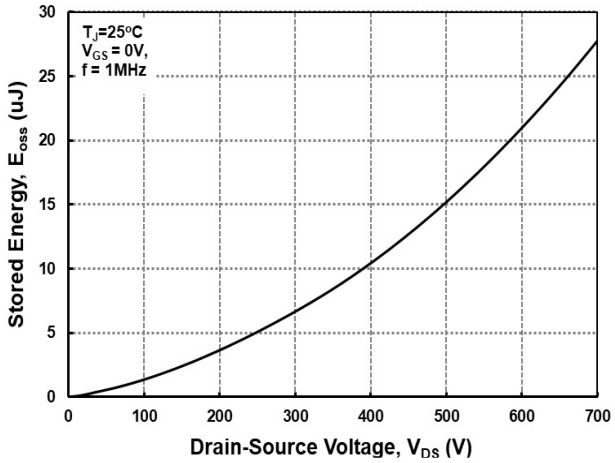


Figure 16. Output Capacitor Stored Energy

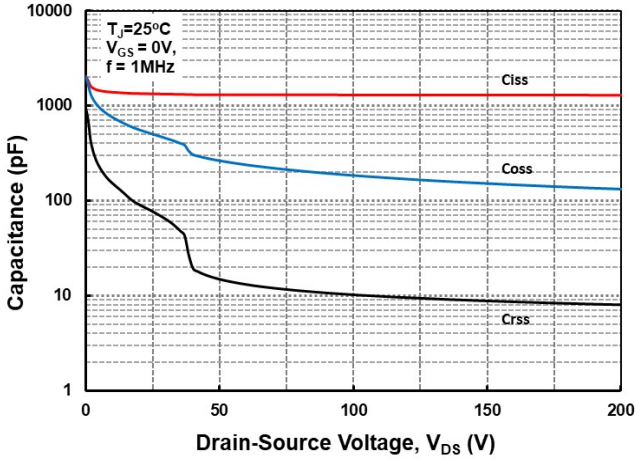


Figure 17. Capacitances vs. Drain-Source Voltage (0-200V)

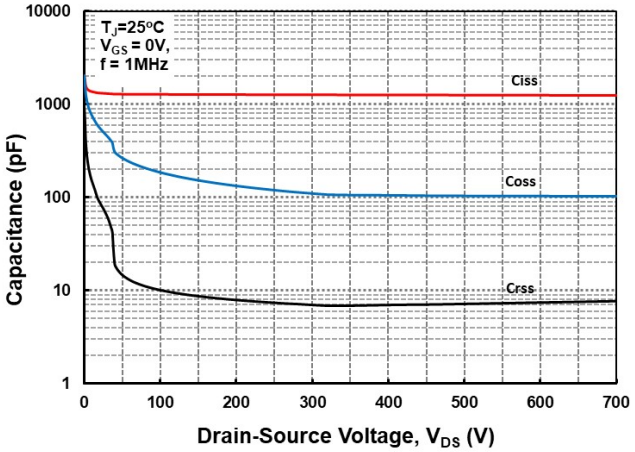


Figure 18. Capacitances vs.Drain-Source Voltage (0-650V)

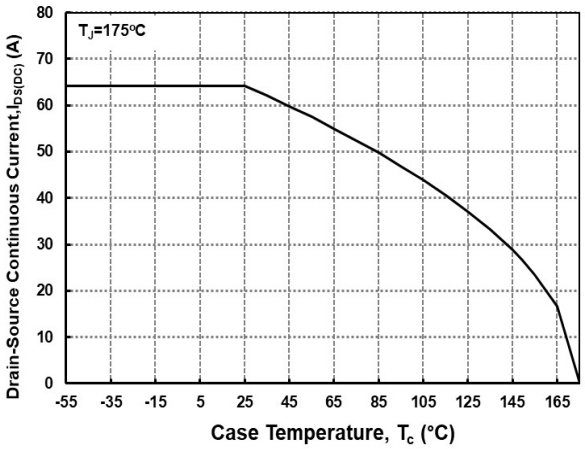


Figure 19. Continuous Drain Current Derating vs.Case Temperature

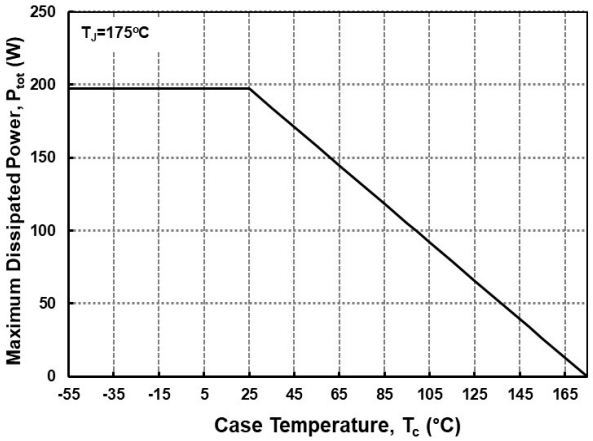


Figure 20. Maximum Power Dissipation Derating vs.Case Temperature

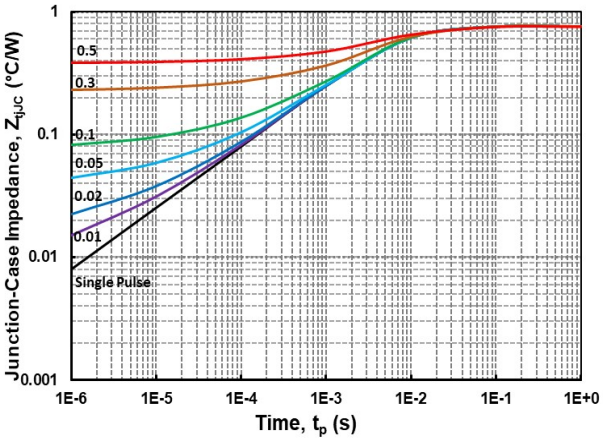


Figure 21. Transient Thermal Impedance (Junction – Case)

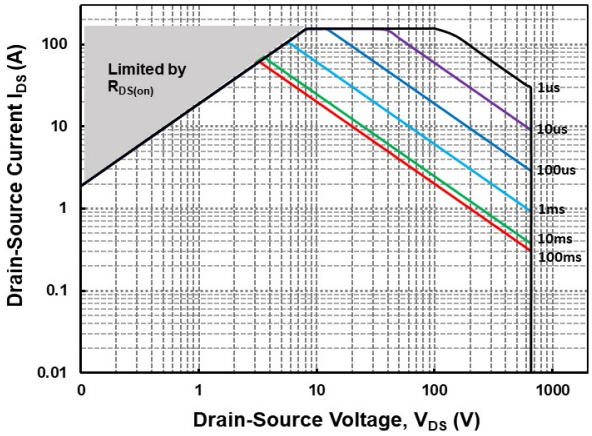


Figure 22. Safe Operating Area

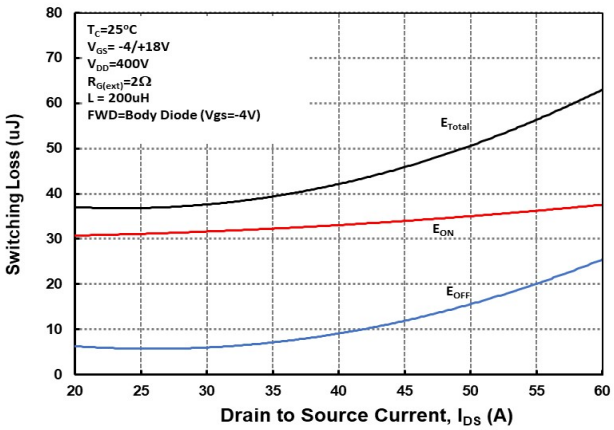


Figure 23. Clamped Inductive Switching Energy vs Drain Current (V_{DD} =400V)

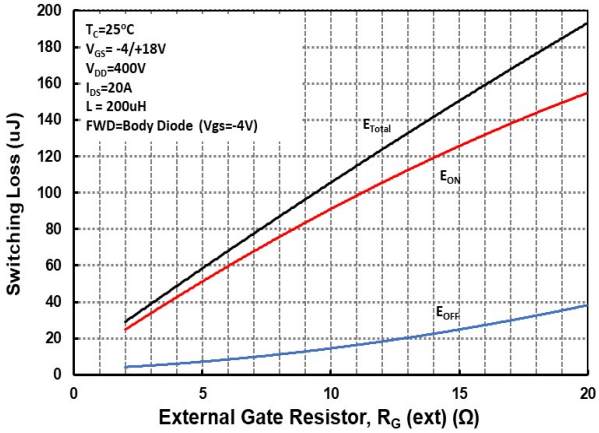


Figure 24. Clamped Inductive Switching Energy vs External Gate Resistor $R_{G(ext)}$

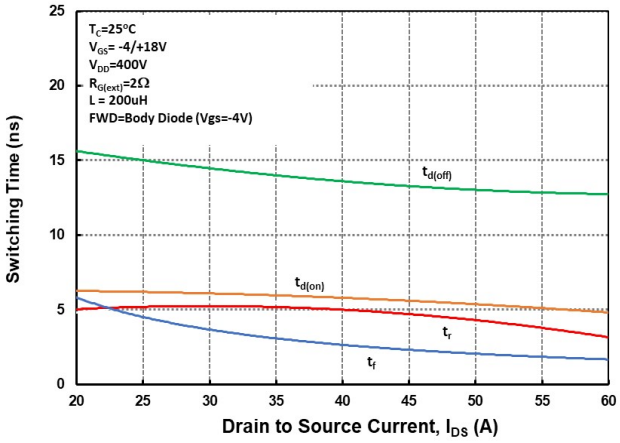


Figure 25. Switching Times vs Drain Current (V_{DD}=400V)

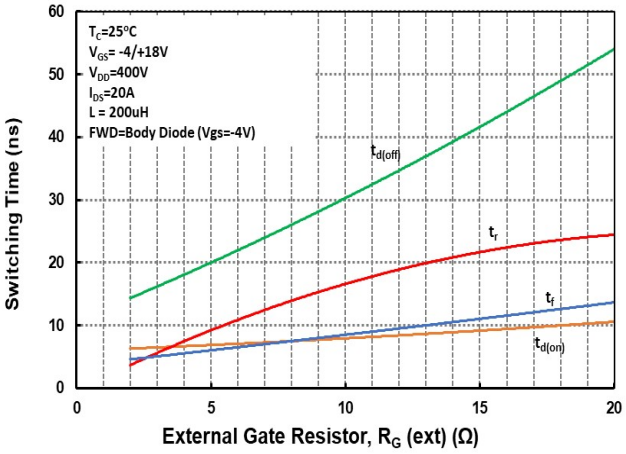
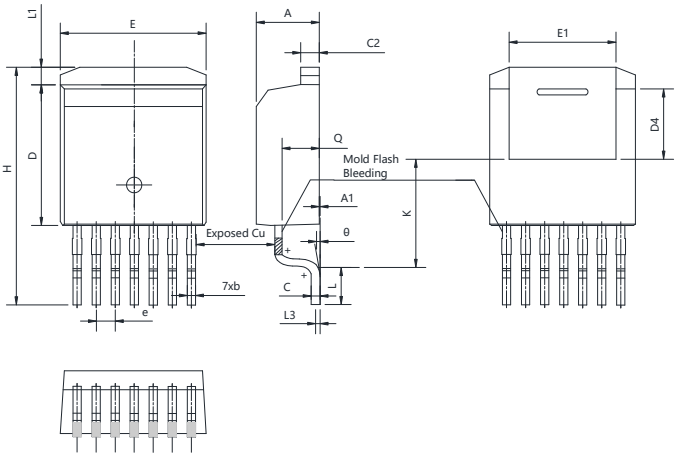
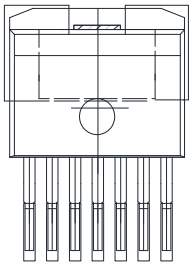


Figure 26. Switching Times vs External Gate Resistor $R_{G(ext)}$

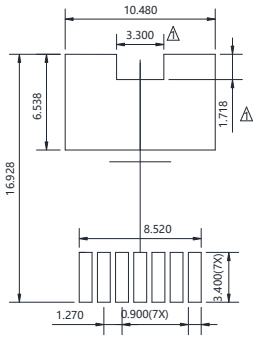
Package Dimensions



Recommended Solder Pad Layout



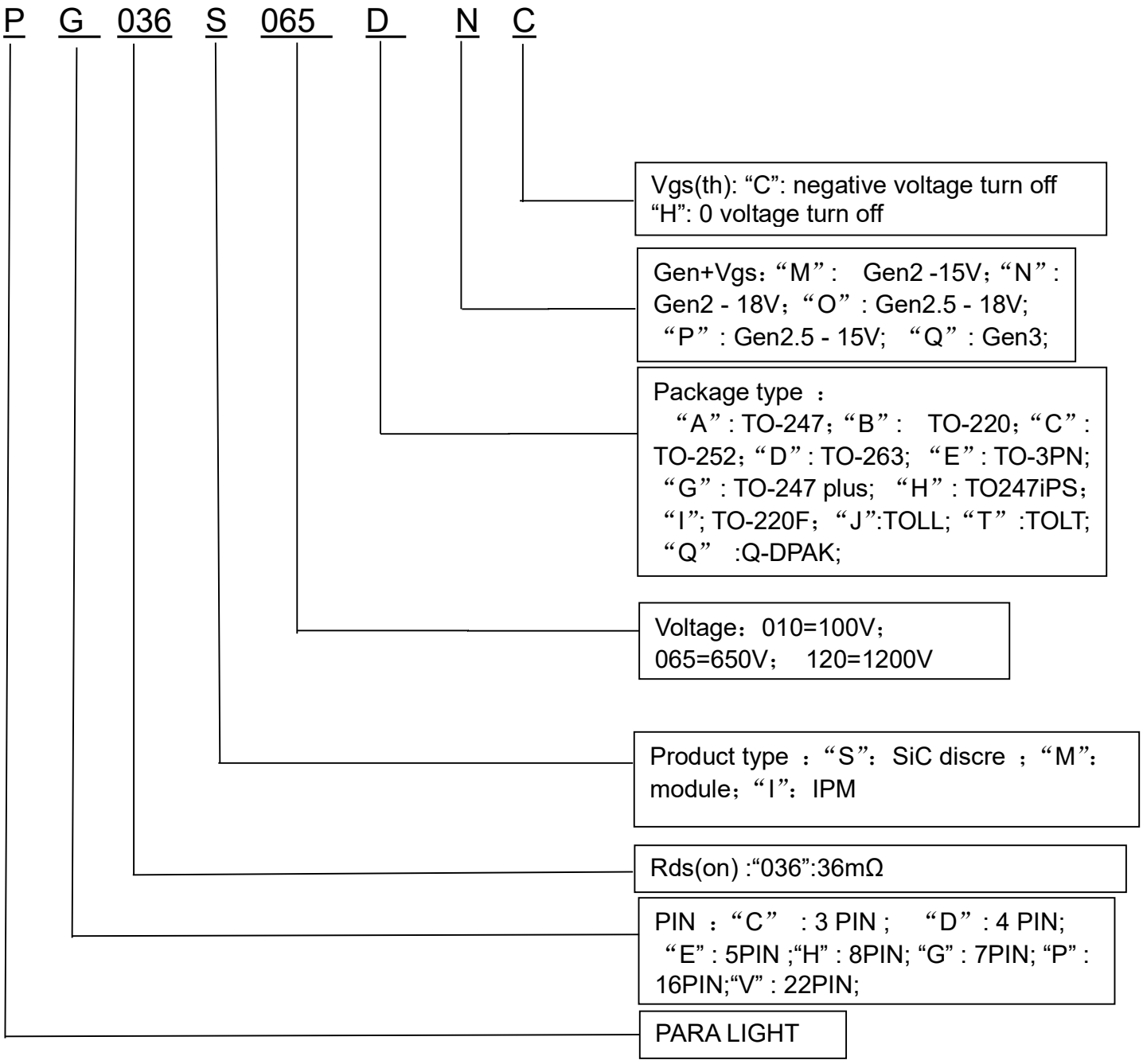
Package Top View When Solder



PCB Pad layout Top View

Common dimensions(mm)							
Symbol	**Min**	**Typ**	**Max**	**Symbol**	**Min**	**Typ**	**Max**
A	4.30	4.40	4.50	H	15.00	15.70	16.00
A1	0.00	0.10	0.20	K		7.30	
b	0.50	0.60	0.70	L	1.90	2.20	2.50
c	0.45	0.50	0.60	L1	1.00	1.20	1.40
c2	1.20	1.30	1.40	L3		0.25BSC	
D	8.93	9.08	9.23	Q	2.45	2.60	2.75
D4	4.65	4.80	4.95	θ	0°	3°	7°
E	10.08	10.18	10.28				
E1	6.82	7.22	7.62				
e		1.27BSC					

PART NO. SYSTEM :



Revision history

Document revision history

Date	Version	Changes
2025.11.5	A / 0	First release.
2026.02.02	A / 1	Update short circuit withstand time