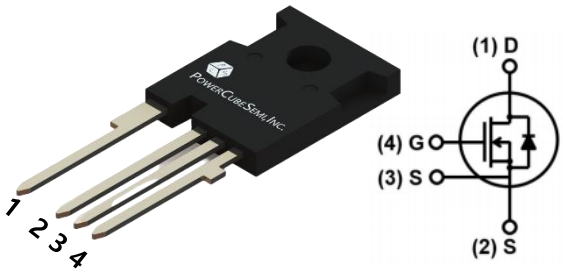
PowerCubeSemi, Inc.
Potential · Convergence · Smart

PCM030R120EP
1,200V 80A 30mΩ Silicon Carbide MOSFET

Features

- Low Switching losses
- Low Gate Charge
- High frequency operation
- Fast reverse recovery body diode
- Little temperature-dependent on-resistance variation

Package Outline



Applications

- Photovoltaic Inverter
- Electric Vehicle Charging Station
- Switching Power Supply
- Motor Drives
- Uninterruptible Power Supply, UPS

(1) D (Drain)
(2) S (Source)
(3) S (Driver Source)
(4) G (Gate)

RoHS

Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	1200	V
I_D	Drain Current - Continuous (T_C = 25℃)	80	A
	Drain Current - Continuous (T_C = 100℃)	60	A
I_{DM}	Drain Current - Pulsed	170	A
$V_{GSS\ Max}$	Gate-Source Voltage	-10 / +22	V
V_{GSS}	Gate-Source Voltage (Recommended operational)	-3 / +18	V
P_D	Power Dissipation - Continuous (T_C = 25℃)	577	W
	Power Dissipation - Continuous (T_C = 100℃)	288	W
T_J	Operating Temperature Range	-55 to +175	℃
T_{STG}	Storage Temperature Range	-55 to +150	℃

Thermal Characteristics

Symbol	Parameter	Value			Units
		Min	Typ	Max	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	-	0.26	-	℃/W

Electrical Characteristics

Static Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 100μA	1200	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 1200V, V_{GS} = 0V	-	1	100	μA
		V_{DS} = 1200V, V_{GS} = 0V, T_J=175℃	-	10	100	
I_{GSS} (+)	Gate-Source Leakage Current	V_{GS} = 22V, V_{DS} = 0V	-	-	±100	nA
I_{GSS} (-)		V_{GS} = -10V, V_{DS} = 0V	-	-		
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 15mA	2.0	3.2	5.0	V
$R_{DS(on)}$	Drain-Source On-Resistance	V_{GS} = 18V, I_D = 40A	-	26	45	mΩ
R_G	Gate Resistance	f=1 MHz, V_{AC}=25mV	-	1.72	-	Ω

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 800V, V_{GS} = 0V, f = 1MHz, V_{AC}=25mV	-	3505	-	pF
C_{oss}	Output Capacitance		-	232	-	
C_{rss}	Reverse Transfer Capacitance		-	39	-	

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 800V, V_{GS} = -3 / 18V, I_D = 30A, L = 100uH, R_G = 4.7Ω	-	23.13	-	ns
t_r	Turn-On Rise Time		-	38.25	-	
$t_{d(off)}$	Turn-Off Delay Time		-	59.94	-	
t_f	Turn-Off Fall Time		-	24.3	-	
E_{on}	Turn-On Switching loss		-	681.03	-	uJ
E_{off}	Turn-Off Switching loss		-	248.22	-	
Q_g	Total Gate Charge	V_{DS} = 800V, I_D = 30A, V_{GS} = -3 / 18V	-	243	-	nC
Q_{gs}	Gate-Source Charge		-	37	-	
Q_{gd}	Gate-Drain Charge		-	113	-	

Body Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_{SD}	Maximum Continuous Diode Forward Current	V_{GS} = - 3V, T_j=25℃	-	-	76	A
V_{SD}	Diode Forward Voltage	V_{GS} = - 3V, I_S = 30A	-	5	-	V
T_{rr}	Reverse Recovery Time	V_R = 800V, V_{GS} = -3V, I_S = 30A, di/dt = 1,000A/ns	-	32	-	ns
Q_{rr}	Reverse Recovery Charge		-	344	-	nC
I_{rr}	Reverse Recovery Current		-	18	-	A

Typical Characteristics

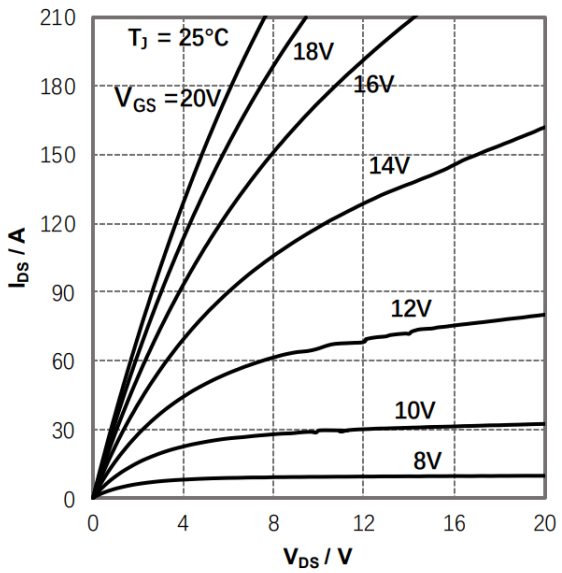


Figure 1. Output Characteristics at T_J=25℃

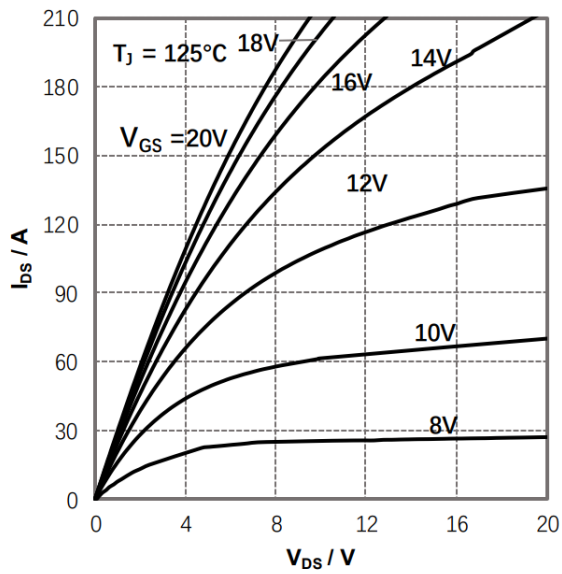


Figure 2. Output Characteristics at T_J=125℃

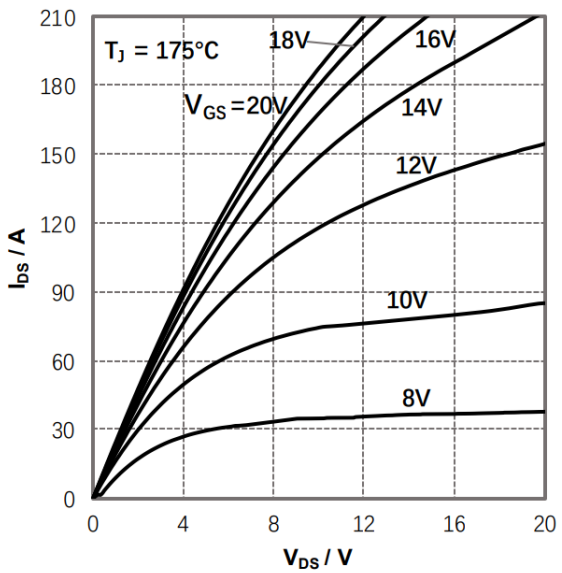


Figure 3. Output Characteristics at T_J=175℃

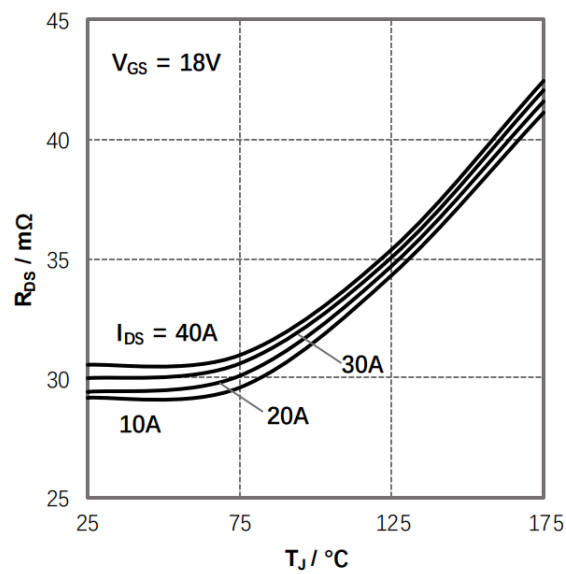


Figure 4. On-resistance vs. Temperature at various Drain Current

Typical Characteristics

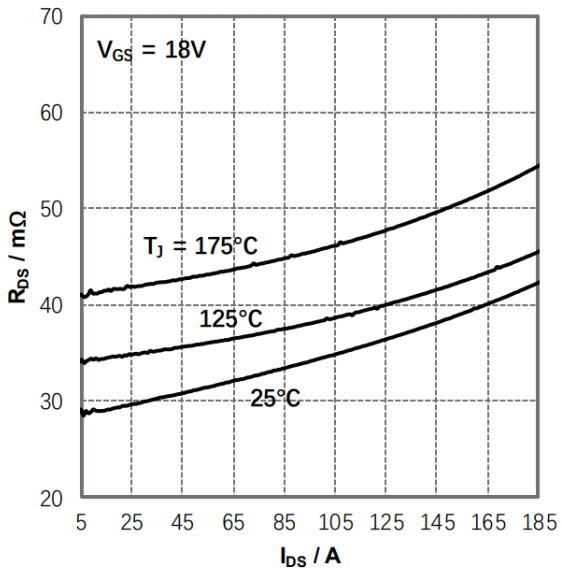


Figure 5. On-Resistance vs. Drain Current at Various Temperature

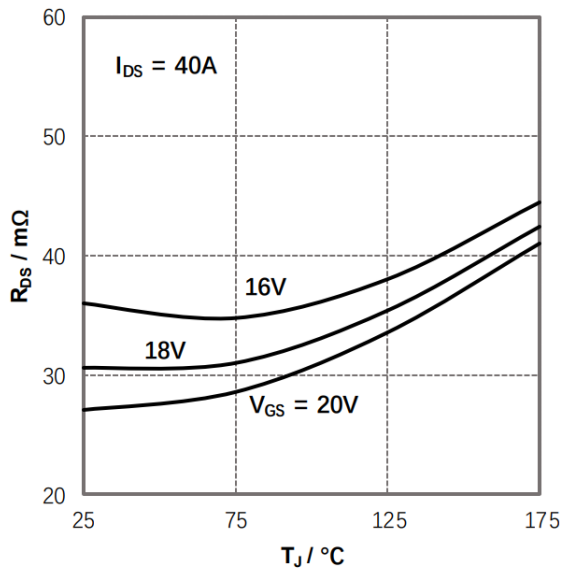


Figure 6. On-Resistance vs. Temperature at Various Gate Voltages

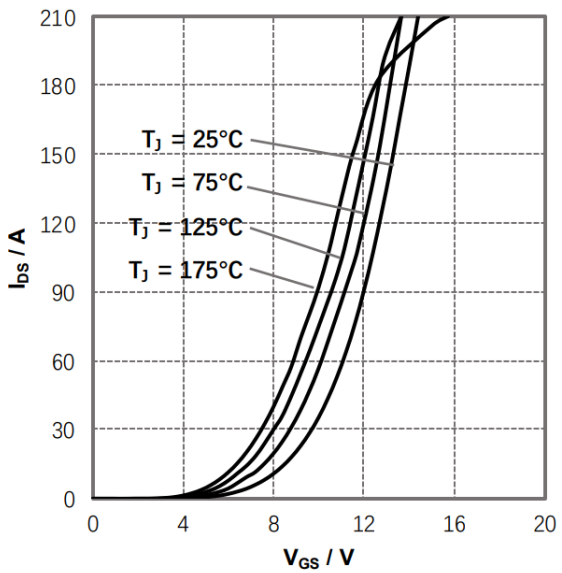


Figure 7. Transfer Characteristics

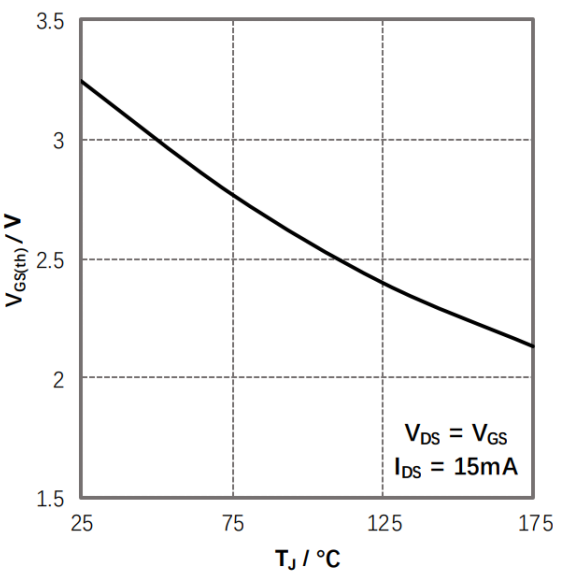


Figure 8. Threshold Voltage vs. Temperature

Typical Characteristics

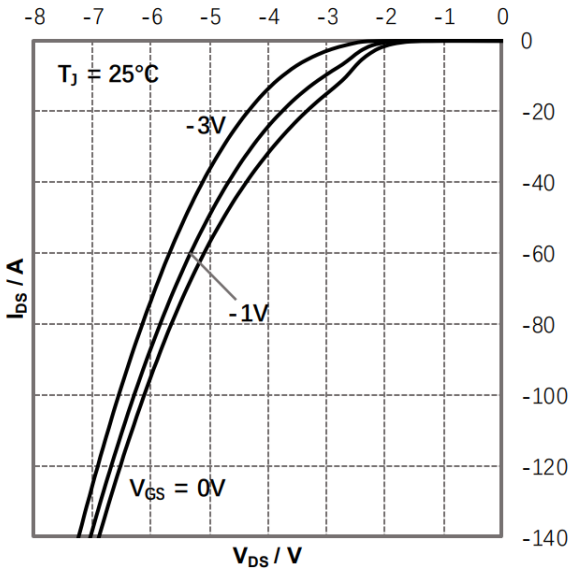


Figure 9. Body Diode Characteristics at T_J=25℃

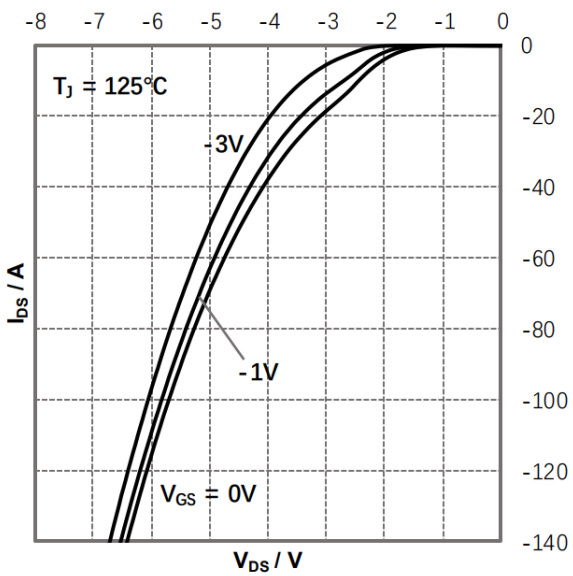


Figure 10. Body Diode Characteristics at T_J=125℃

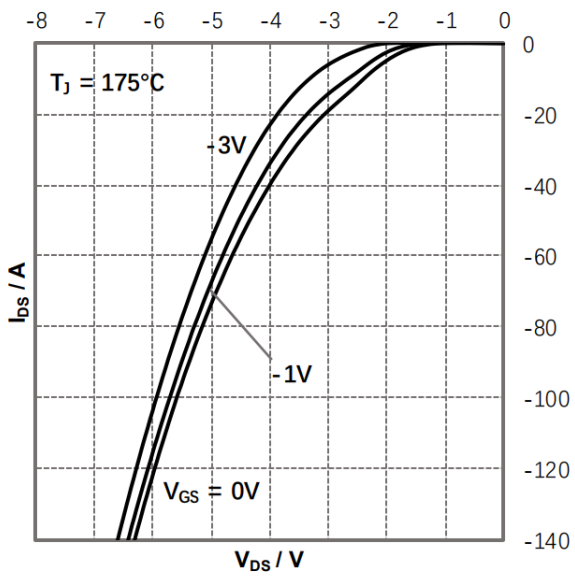


Figure 11. Body Diode Characteristics at T_J=175℃

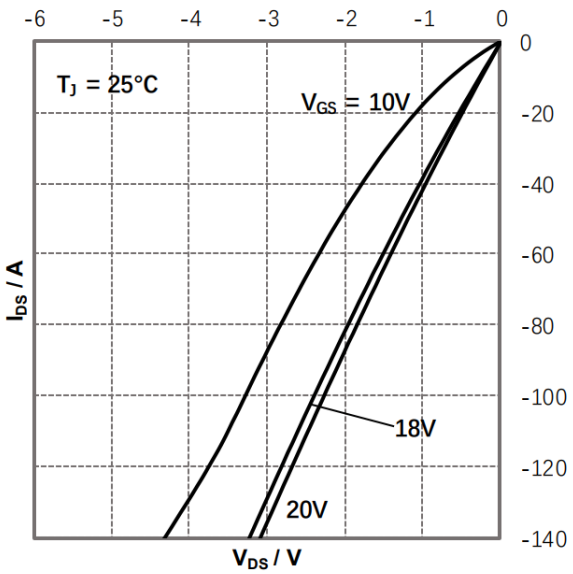


Figure 12. Third-quadrant Conduction Characteristics at T_J=25℃

Typical Characteristics

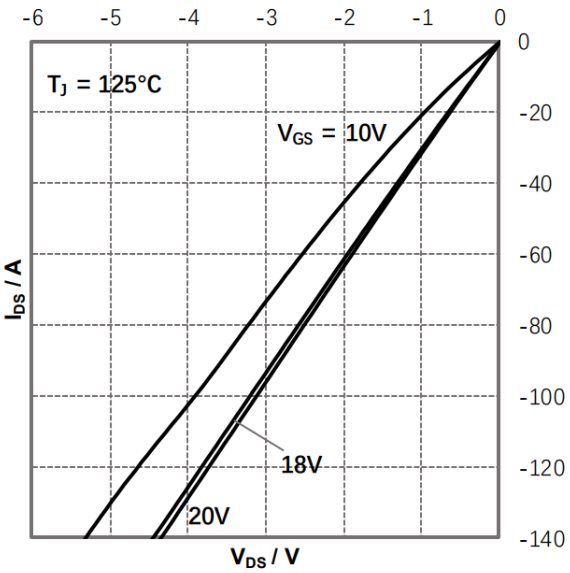


Figure 13. Third-quadrant Conduction Characteristics at T_J=125℃

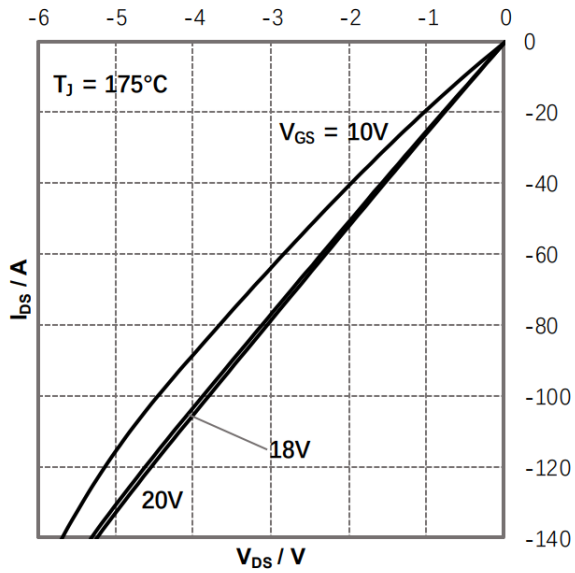


Figure 14. Third-quadrant Conduction Characteristics at T_J=175℃

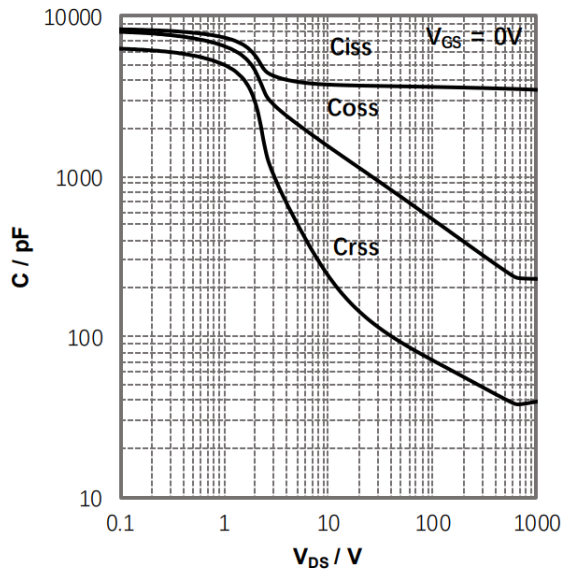


Figure 15. Junction Capacitance vs. Drain to Source Voltage

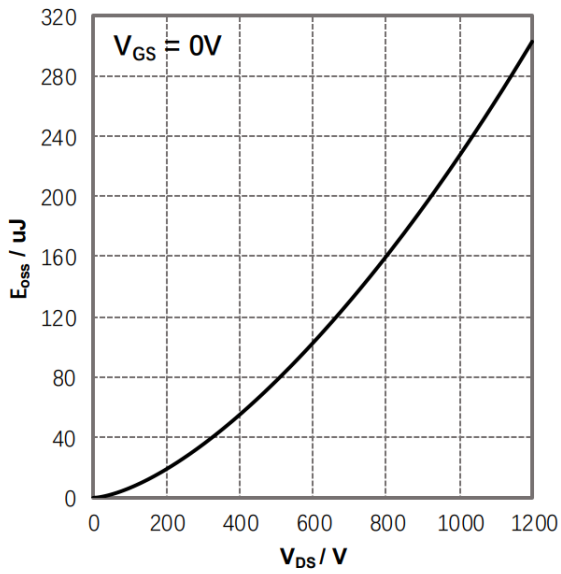


Figure 16. Output Capacitor Energy Storage

Typical Characteristics

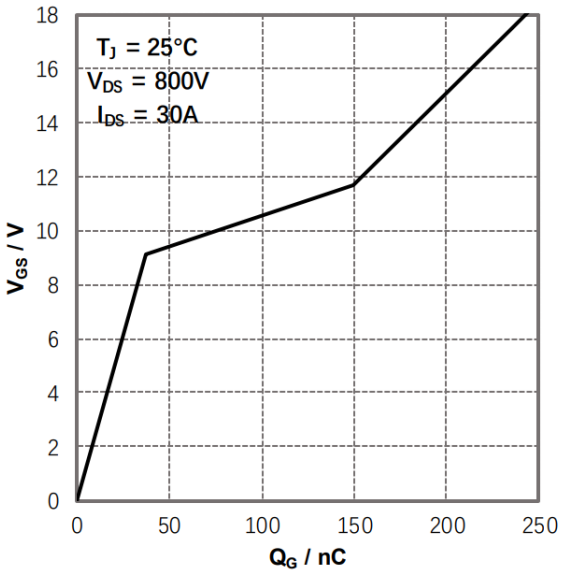


Figure 17. Gate Charge Characteristics

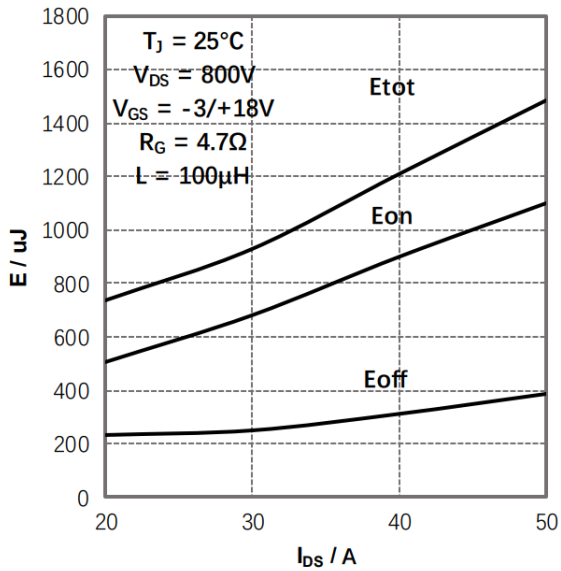


Figure 18. Switching Energy vs. Drain Current

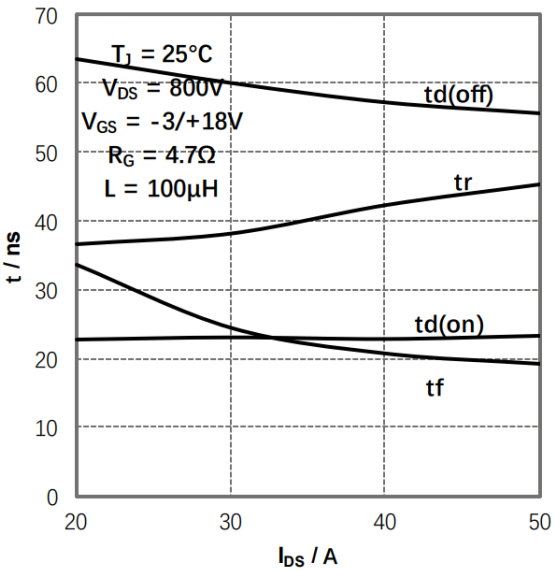


Figure 19. Switching Times vs. Drain Current

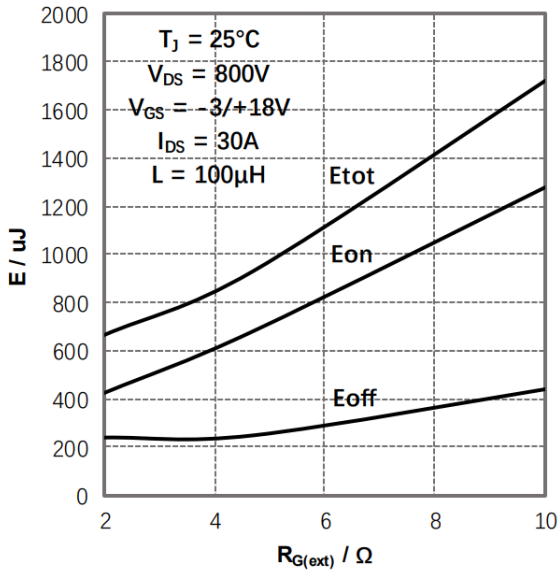


Figure 20. Switching Energy vs. Gate Resistance

Typical Characteristics

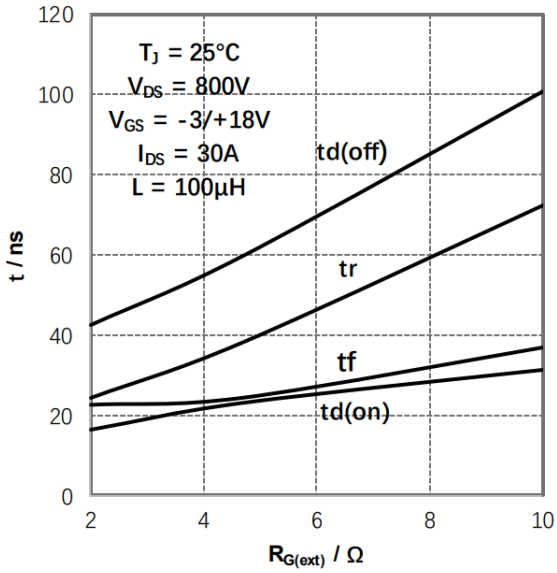


Figure 21. Switching Times vs. Gate Resistance

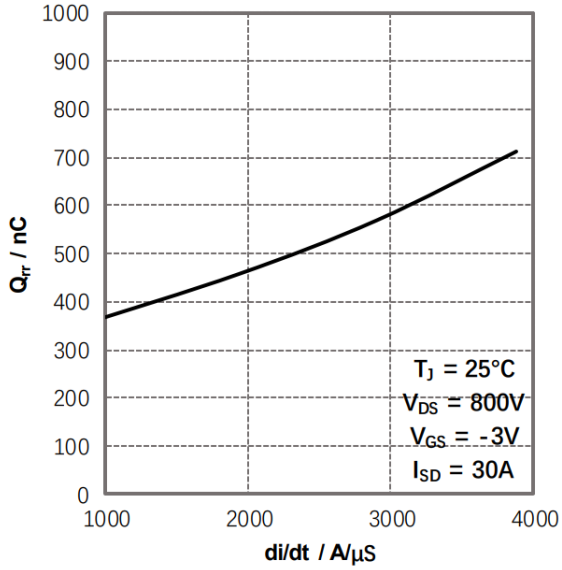


Figure 22. Reverse Recovery Charge vs. di/dt

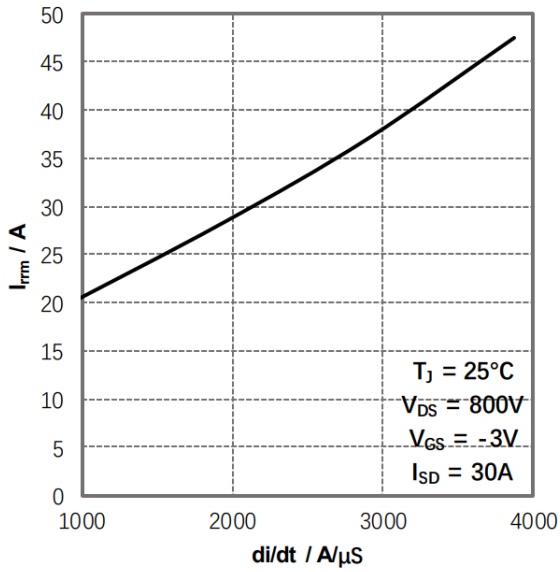


Figure 23. Reverse Recovery Current vs. di/dt

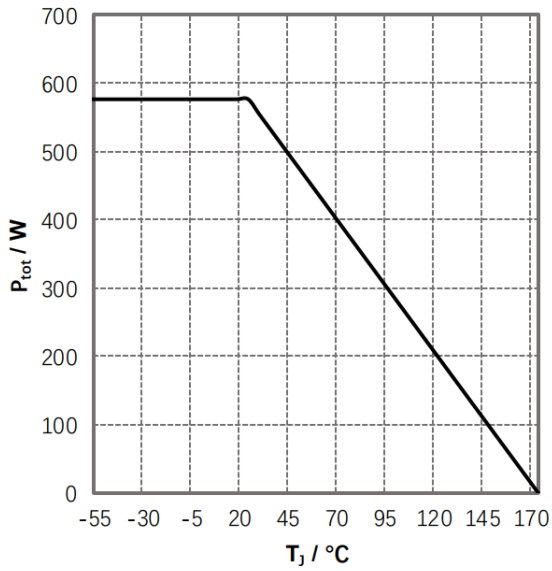


Figure 24. Power Dissipation Derating

Typical Characteristics

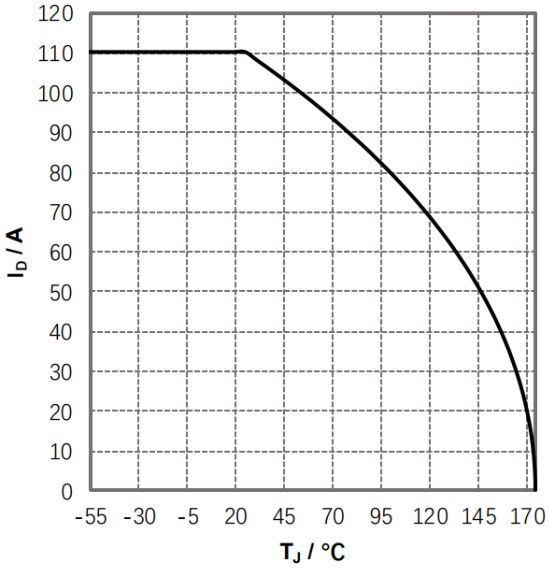


Figure 25. Continuous Drain Current Derating

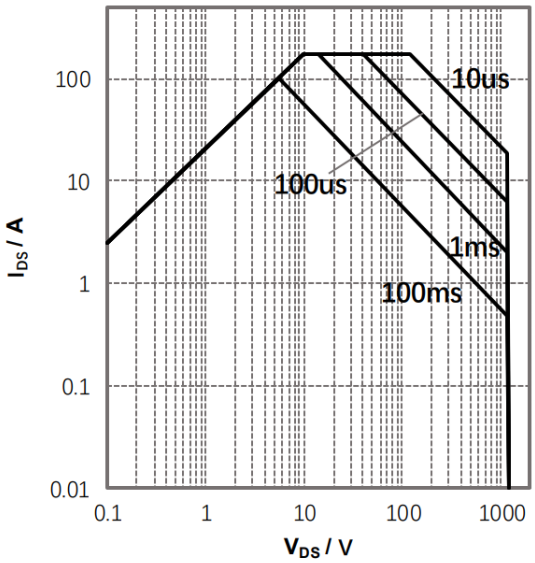


Figure 26. Safe Operation Area

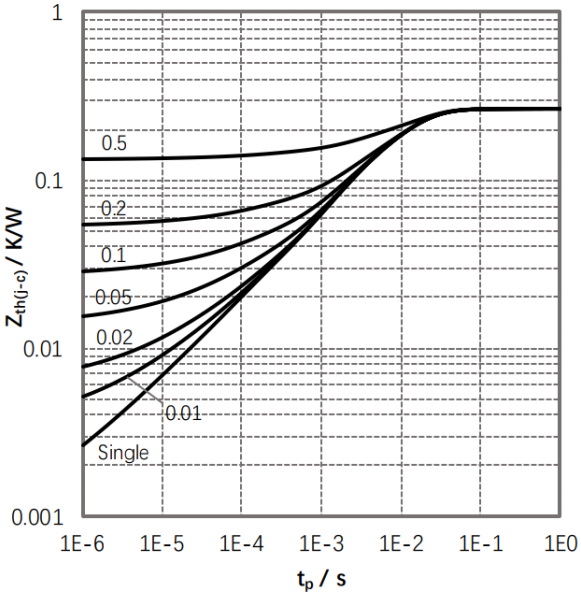
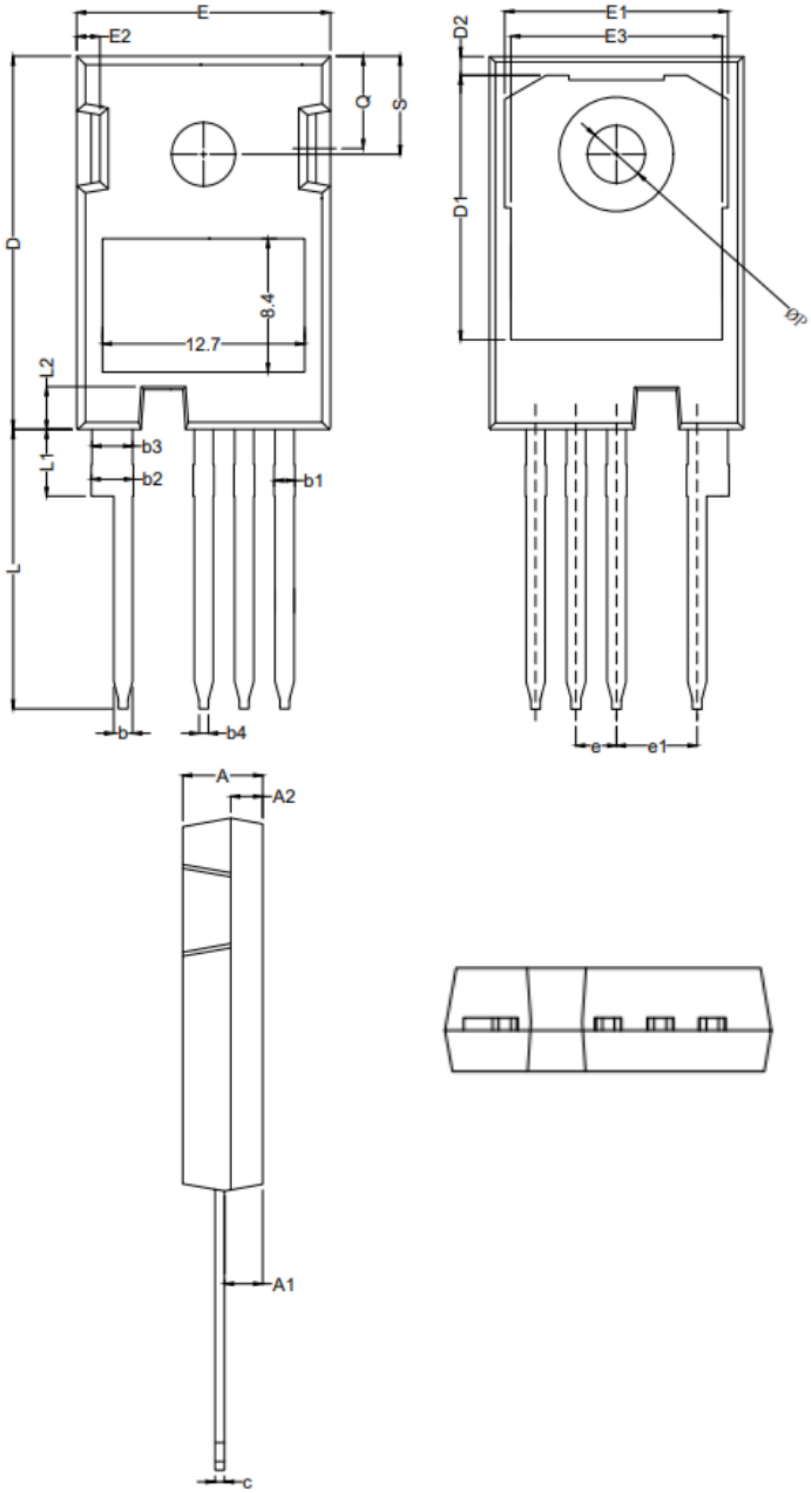


Figure 27. Transient Thermal Impedance

Package Information

Package Outline



Unit : mm

SYMBOL	DIMENSIONS	
	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.07	1.33
b1	1.07	1.60
b2	2.39	2.94
b3	2.39	2.69
b4	0.45	0.75
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	1.00	1.90
E3	12.38	13.45
e	2.54 BSC	
e1	5.08 BSC	
L	17.27	17.82
L1	-	4.37
L2	2.35	2.65
ØP	3.51	3.71
Q	5.49	6.00
S	6.04	6.30