

HCZ120N31M2

N-Channel SiC Silicon Carbide Power MOSFET

1200 V, 68 A, 31 mΩ

Features

- High switching speed with a low gate charge
- Fast intrinsic diode with low reverse recovery
- Robust Avalanche Capability
- 100% Avalanche Tested
- Pb-free, Halogen Free, and RoHS Compliant

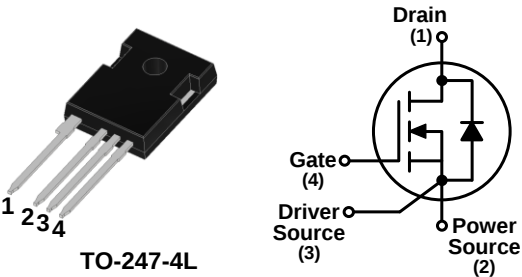
$BV_{DSS}, T_C=25^{\circ}C$	$I_D, T_C=25^{\circ}C$	$R_{DS(on),typ}$	$Q_{g,typ}$
1200 V	68 A	31 mΩ	75 nC

Benefits

- System efficiency improvement
- Higher frequency applicability
- Increased power density
- Reduced cooling effort

Applications

- Solar inverter
- EV charging station
- UPS
- Industrial power supply



Absolute Maximum Ratings ($T_C = 25^{\circ}C$ unless otherwise noted)

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		1200	V
V_{GS}	Gate to Source Voltage (DC)		-10 / +22	V
V_{GSop}	Recommended Operation Value		-5...-3 / +18	V
I_D	Drain Current	Continuous ($T_C = 25^{\circ}C$)	68	A
		Continuous ($T_C = 100^{\circ}C$)	48	
I_{DM}	Drain Current	Pulsed (Note1)	170	A
P_D	Power Dissipation	($T_C = 25^{\circ}C$)	319	W
		Derate Above 25°C	2.1	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 10 Seconds		260	°C

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.47	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
HCZ120N31M2	HCZ120N31M2	TO-247-4L	Tube	30 units

Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	1200			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$		1	100	μA
		$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}, T_J = 175^\circ\text{C}$		10		
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = +22\text{ V}, V_{DS} = 0\text{ V}$			+100	nA
		$V_{GS} = -10\text{ V}, V_{DS} = 0\text{ V}$			-100	

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 14\text{ mA}$ (tested after $V_{GS} = 22\text{ V}, 1\text{ ms pulse}$)	2.0	3.0	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 18\text{ V}, I_D = 34\text{ A}$		31.0	43.4	m Ω
		$V_{GS} = 18\text{ V}, I_D = 34\text{ A}, T_J = 175^\circ\text{C}$		49.6		
		$V_{GS} = 15\text{ V}, I_D = 34\text{ A}$		41.0		
g_{fs}	Transconductance	$V_{DS} = 20\text{ V}, I_D = 34\text{ A}$		23.9		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}, f = 250\text{ kHz}$		2117		pF
C_{oss}	Output Capacitance			124		
C_{rss}	Reverse Capacitance			4		
E_{oss}	Stored Energy in Output Capacitance	$V_{DS} = 0\text{ V to } 800\text{ V}, V_{GS} = 0\text{ V}$		53		μJ
$C_{o(er)}$	Energy Related Output Capacitance			165		pF
$C_{o(tr)}$	Time Related Output Capacitance			260		
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 800\text{ V}, I_D = 34\text{ A},$ $V_{GS} = -3\text{ V} / 18\text{ V},$ Inductive load		75		nC
Q_{gs}	Gate to Source Charge			24		
Q_{gd}	Gate to Drain "Miller" Charge			13		
R_G	Internal Gate Resistance	$f = 1\text{ MHz}, V_{AC} = 30\text{ mV}$		2.9		Ω

Switching Characteristics

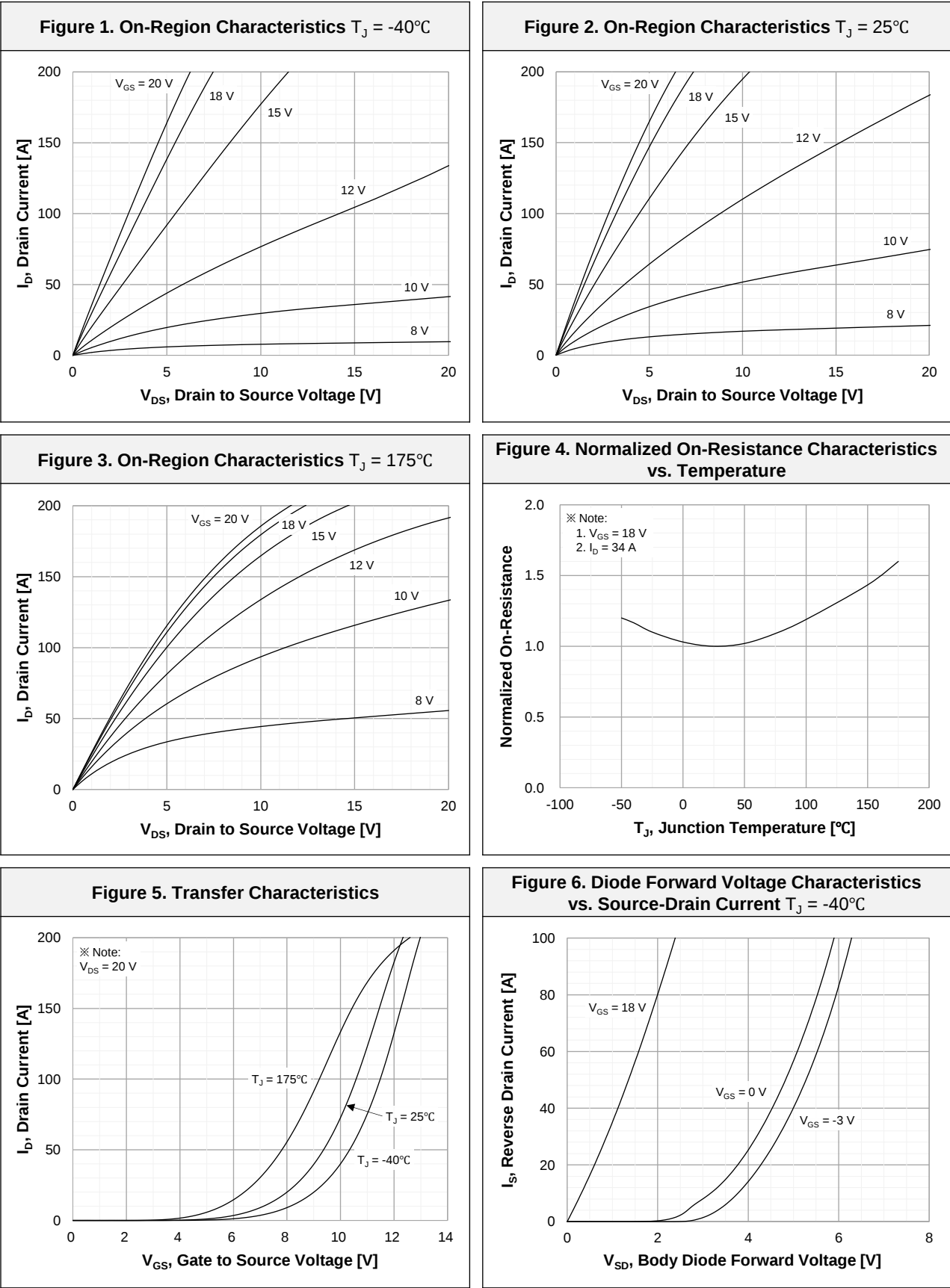
$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 800\text{ V}, I_D = 34\text{ A},$ $V_{GS} = -3\text{ V} / 18\text{ V}, R_G = 4.7\text{ }\Omega,$ FWD : HCH120S20D1, Inductive load		21		ns
t_r	Turn-On Rise Time			15		
$t_{d(off)}$	Turn-Off Delay Time			40		
t_f	Turn-Off Fall Time			7		
E_{on}	Turn-on Switching Energy			212		μJ
E_{off}	Turn-off Switching Energy			95		
E_{tot}	Total Switching Energy			307		

Electrical Characteristics (T_C = 25°C unless otherwise noted)

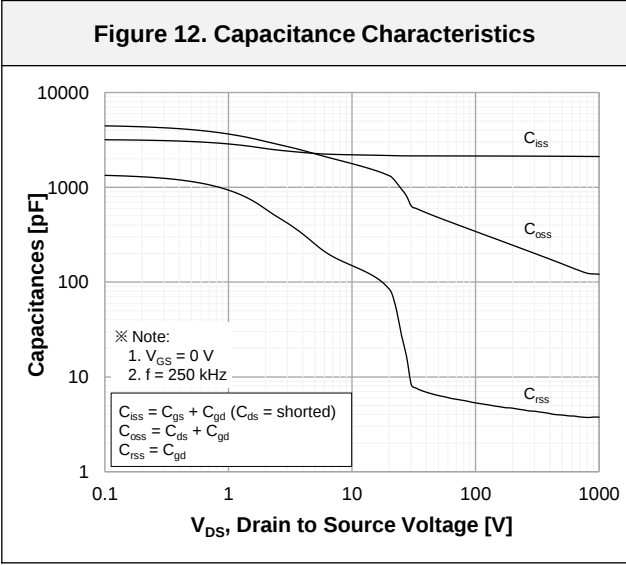
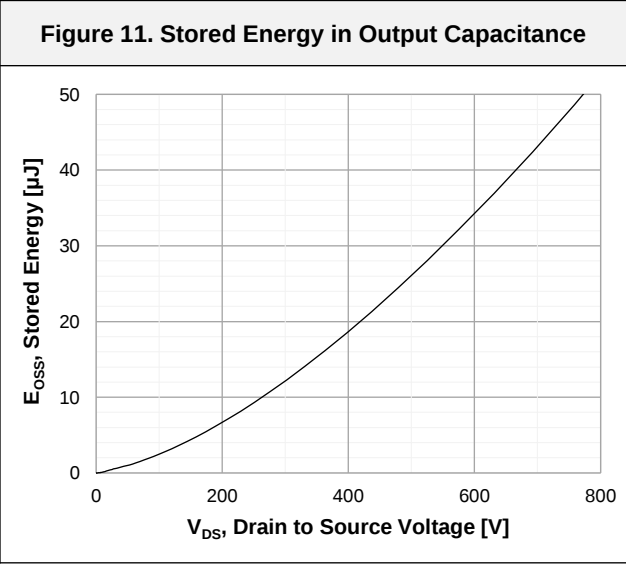
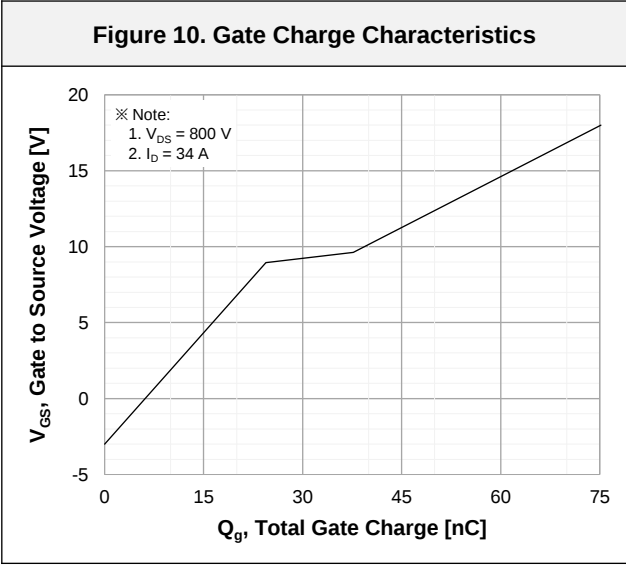
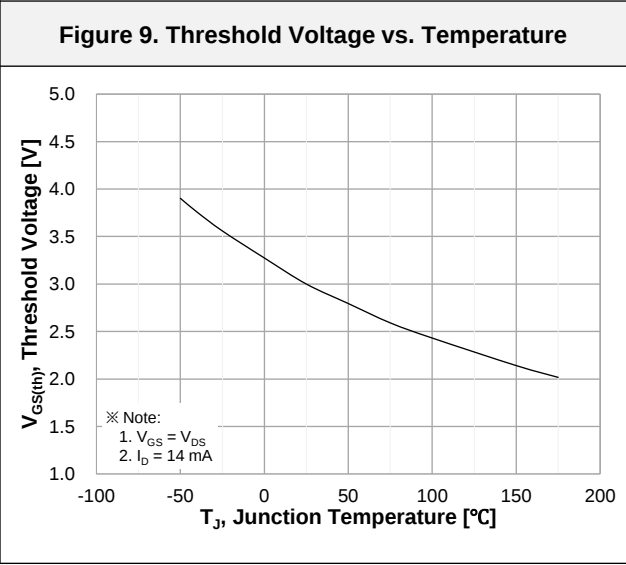
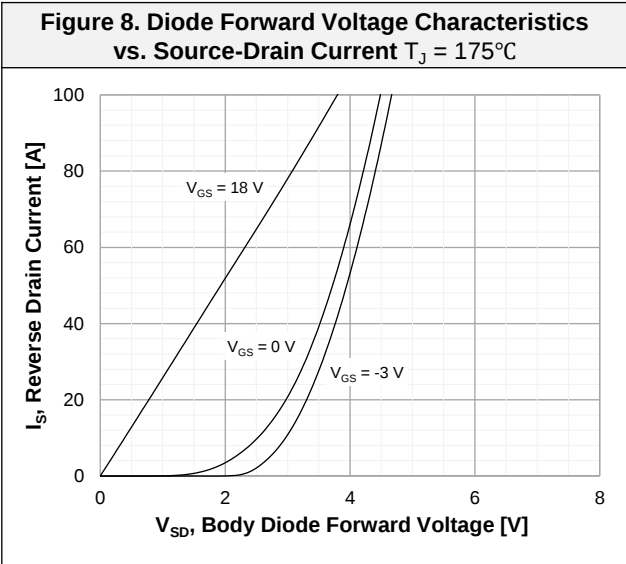
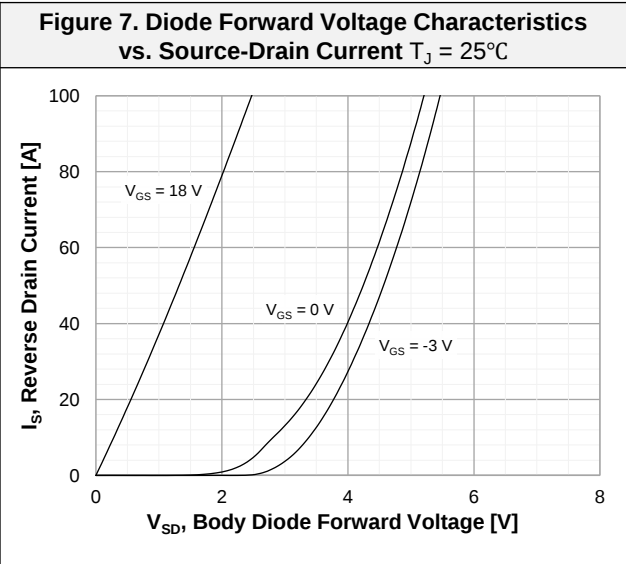
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Source-Drain Diode Characteristics						
I _S	Continuous Diode Forward Current	V _{GS} = -3 V			68	A
I _{SM}	Pulsed Diode Forward Current	V _{GS} = -3 V (Note 1)			170	
V _{SD}	Diode Forward Voltage	V _{GS} = -3 V, I _{SD} = 34 A		4.1		V
t _{rr}	Reverse Recovery Time	V _{DD} = 800 V, I _{SD} = 34 A, dI _F /dt = 3000 A/μs, Includes Q _{oss}		16		ns
Q _{rr}	Reverse Recovery Charge			275		nC
I _{rrm}	Peak Reverse Recovery Current			28		A

※Note 1 : Limited by maximum junction temperature.

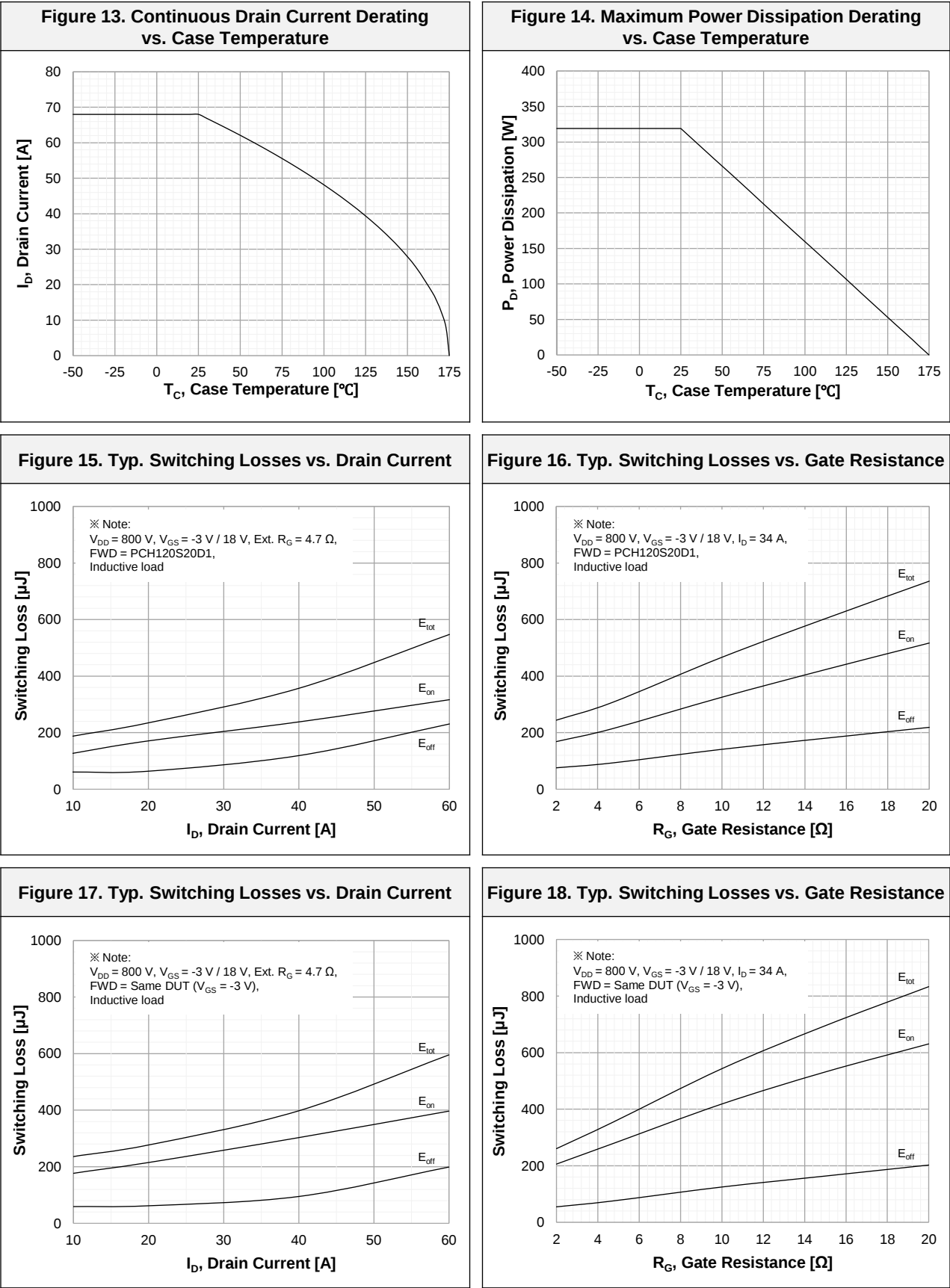
Typical Performance Characteristics



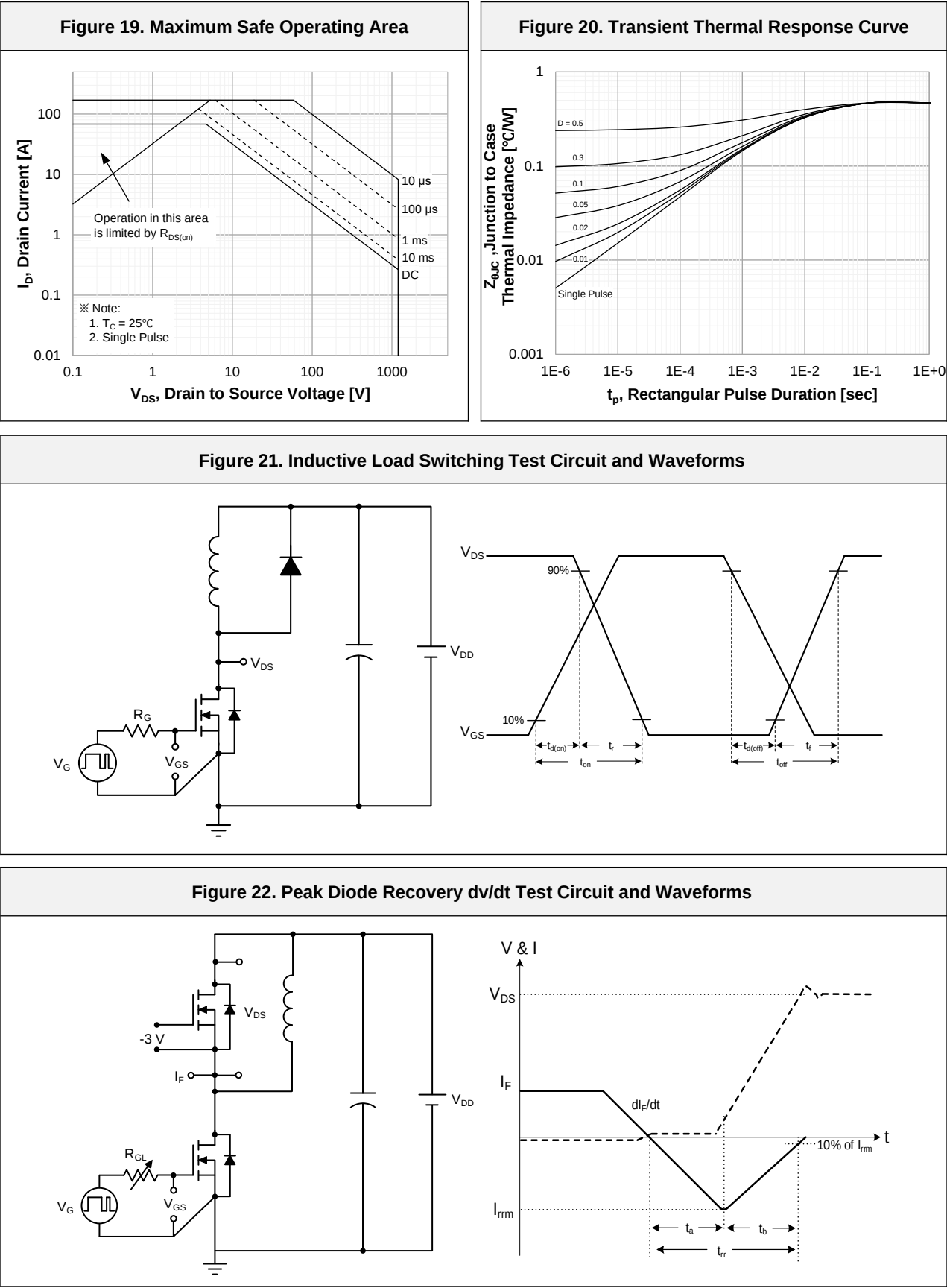
Typical Performance Characteristics



Typical Performance Characteristics

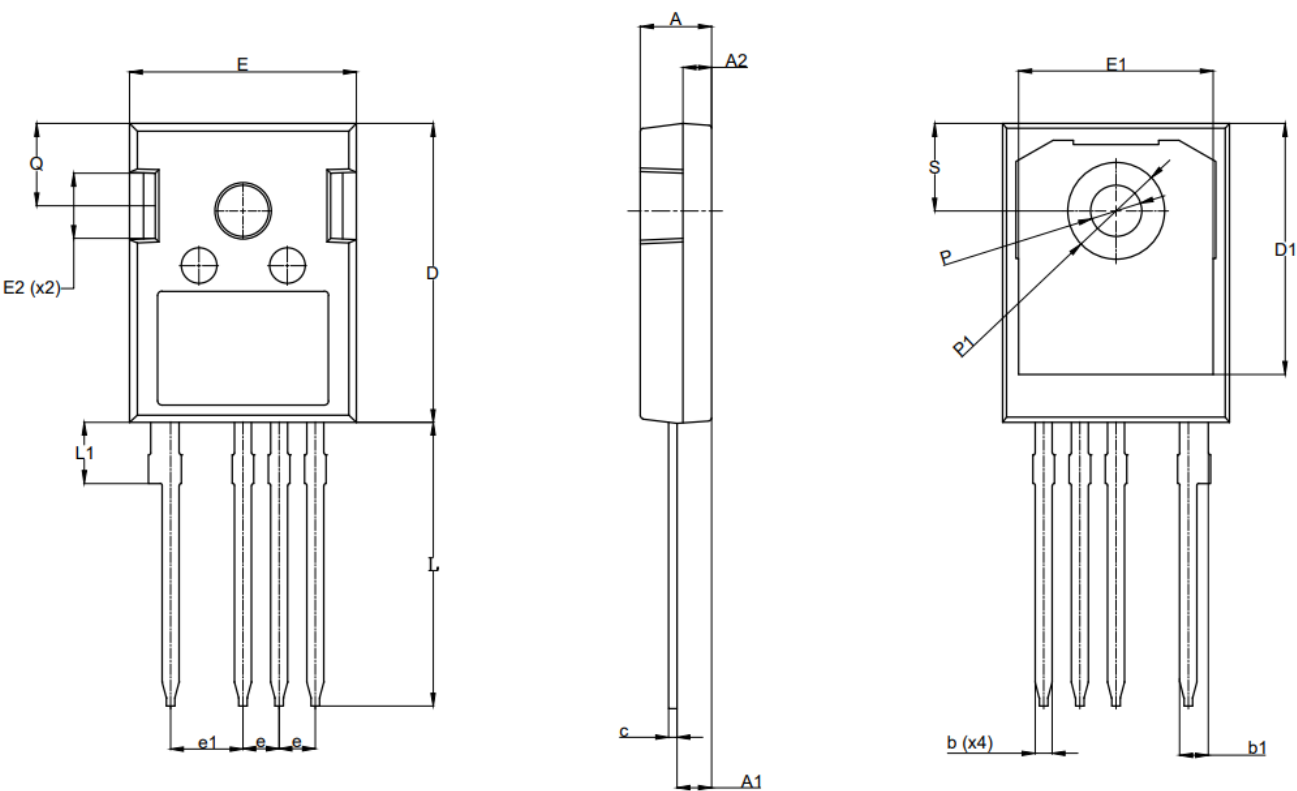


Typical Performance Characteristics



Package Outlines

TO-247-4L



SYMBOL	Common		
	DIMENSIONS MILLIMETER		
	MIN.	NOM.	MAX.
A	4.80	5.00	5.20
A1	2.29	2.42	2.54
A2	1.90	2.00	2.10
b	1.10	1.20	1.30
b1	1.86	2.01	2.15
c	0.50	0.60	0.70
D	20.90	21.00	21.10
D1	17.43	17.63	17.83
E	15.75	15.94	16.13
E1	13.46	13.66	13.86
E2	4.32	4.58	4.83
e	2.54 BSC.		
e1	5.08 BSC.		
L	19.80	19.95	20.10
L1	-	-	4.30
P	3.56	3.61	3.66
P1	6.75	6.80	6.85
Q	5.38	5.79	6.20
S	6.15 BSC.		