

## Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	$I_D$
1200V	35mΩ@18V	50A

## Feature

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low  $R_{DS(on)}$
- Easy to Parallel
- Simple to Drive
- RoHS Compliant

## Applications

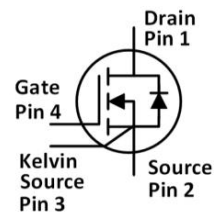
- Power Factor Correction Modules
- Switch Mode Power Supplies
- DC-AC Inverters
- High Voltage DC/DC Converterst

## Package

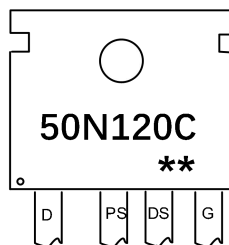


TO-247-4L

## Circuit diagram



## Marking



50N120C  
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=Device Code  
=Week Code

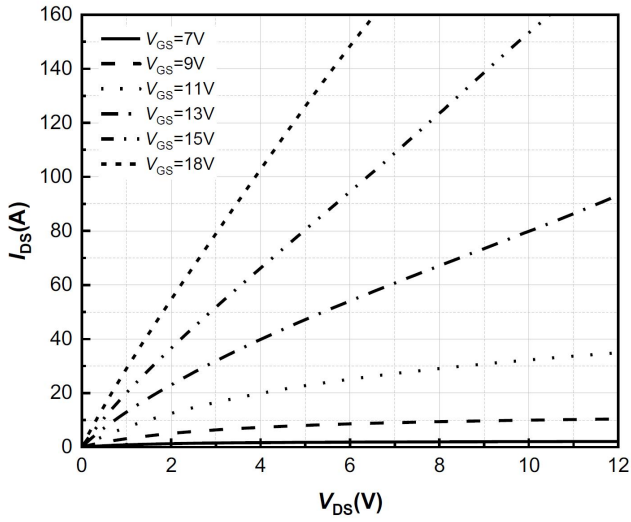
**Absolute maximum ratings (Ta=25°C, unless otherwise noted)**

Parameter	Symbol	Rating	Units
Drain-Source Voltage	$V_{DS}$	1200	V
Gate-Source Voltage	$V_{GSMAX}$	-8/+22	V
Recommend Gate-Source Voltage	$V_{GSop}$	-4/+18	V
Continuous Drain Current(Tc=25°C)	$I_D$	74	A
Continuous Drain Current(Tc=100°C)	$I_D$	50	A
Pulsed Drain Current	$I_{DM}$	150	A
Total Power Dissipation <sup>2</sup> (Tc=25°C)	$P_D$	312	W
Total Power Dissipation <sup>2</sup> (Tc=100°C)	$P_D$	156	W
Thermal Resistance Junction-Case	$R_{\theta JC}$	0.51	°C/W
Storage Temperature Range	$T_{STG}$	-40 to 175	°C
Operating Junction Temperature Range	$T_J$	-40 to 175	°C

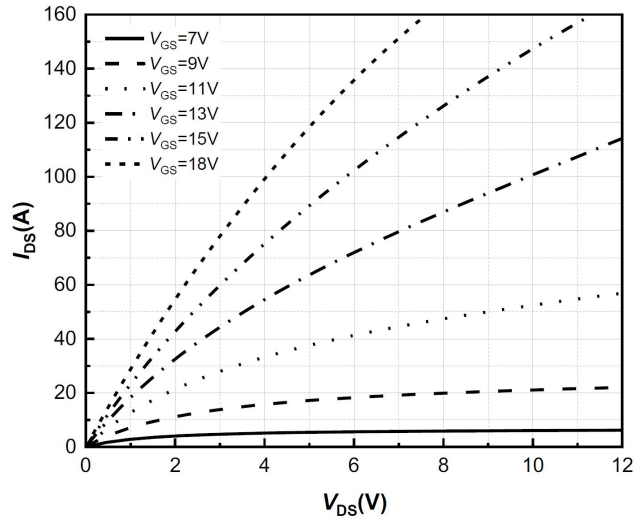
**Electrical characteristics (Ta=25°C, unless otherwise noted)**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	1200	---	---	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=1200V, V_{GS}=0V, T_J=25^\circ C$	---	1	---	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=18V, V_{DS}=0V$	---	---	250	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=5mA, T_J=25^\circ C$	2	2.5	4	V
		$V_{GS}=V_{DS}, I_D=5mA, T_J=100^\circ C$	---	1.8	---	
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=18V, I_D=20A, T_J=25^\circ C$	---	35	45	m $\Omega$
		$V_{GS}=18V, I_D=20A, T_J=150^\circ C$	---	69	---	
<b>Dynamic characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=1000V, V_{GS}=0V, f=1MHz$	---	2975	---	pF
Output Capacitance	$C_{oss}$		---	119	---	
Reverse Transfer Capacitance	$C_{rss}$		---	12	---	
<b>Switching Characteristics</b>						
Total Gate Charge (4.5V)	$Q_g$	$V_{DS}=800V, V_{GS}=-4/+18V, I_D=40A$	---	117	---	nC
Gate-Source Charge	$Q_{gs}$		---	38	---	
Gate-Drain Charge	$Q_{gd}$		---	27	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DS}=800V, V_{GS}=-4/+18V, I_D=40A$ $R_G=2.5\Omega$	---	18	---	ns
Rise Time	$T_r$		---	21	---	ns
Turn-Off Delay Time	$T_{d(off)}$		---	31	---	ns
Fall Time	$T_f$		---	9	---	ns
Turn-On Energy	$E_{on}$		---	485	---	nJ
Turn-Off Energy	$E_{off}$		---	75	---	nJ
<b>Reverse Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS}=-4V, I_{SD}=20A, T_J=25^\circ C$	---	5	---	V
		$V_{GS}=-4V, I_{SD}=20A, T_J=175^\circ C$	---	4.4	---	
Continuous Diode Forward Current	$I_S$	$V_{GS}=-4V, T_c=25^\circ C$	---	45	---	A
		$V_{GS}=-4V, T_c=100^\circ C$	---	25	---	
Reverse Recovery Time	$t_{rr}$	$V_{GS}=-4V, I_{SD}=20A,$ $V_R=800V,$ $di/dt=3900A/\mu s$	---	19	---	ns
Reverse Recovery Charge	$Q_{rr}$		---	500	---	nC
Peak Reverse Recovery Current	$I_{rrm}$		---	50	---	A

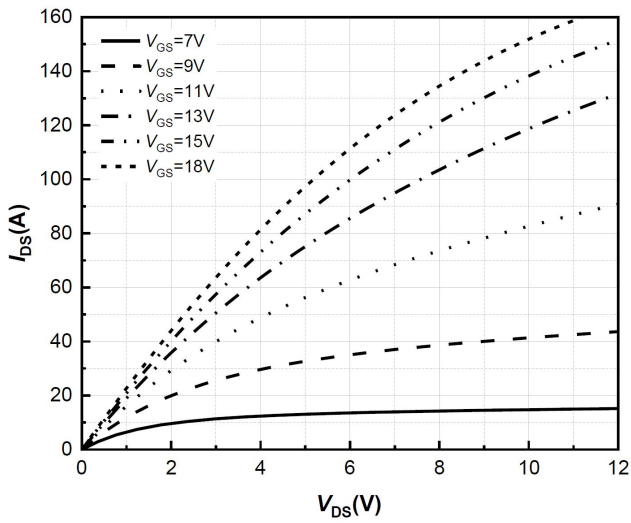
**Typical Characteristics**



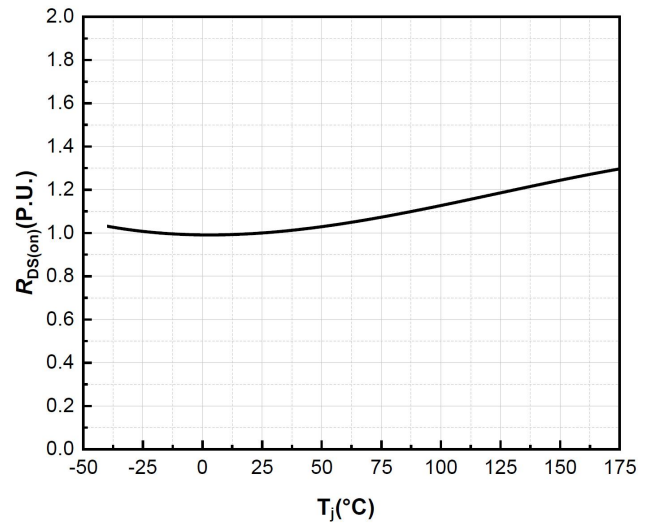
**Output Characteristics  $T_j = -40^\circ\text{C}$**



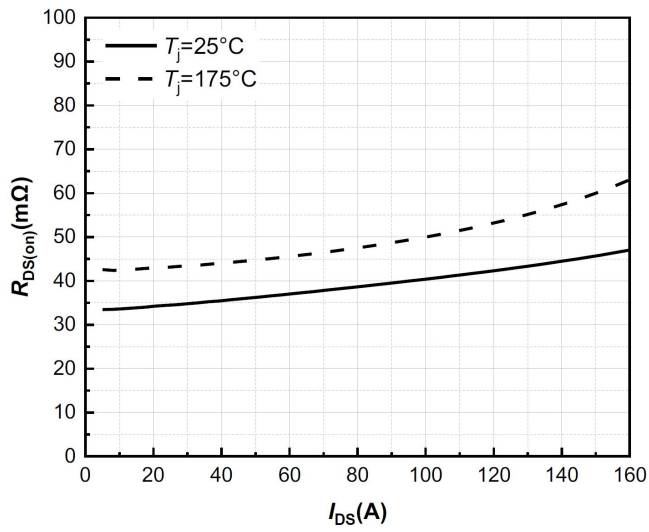
**Output Characteristics  $T_j = 25^\circ\text{C}$**



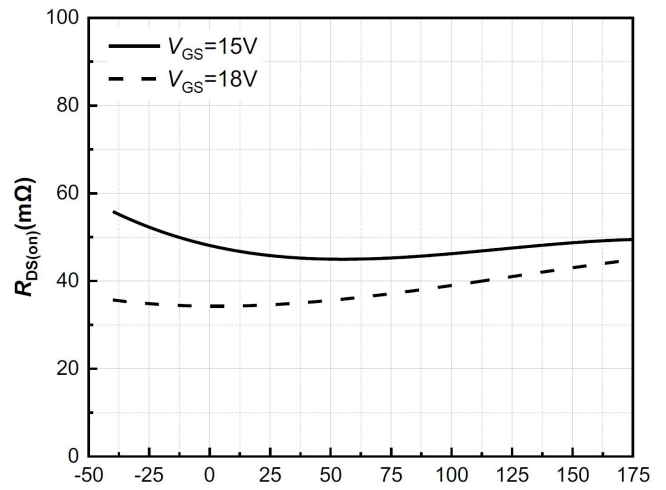
**Output Characteristics  $T_j = 175^\circ\text{C}$**



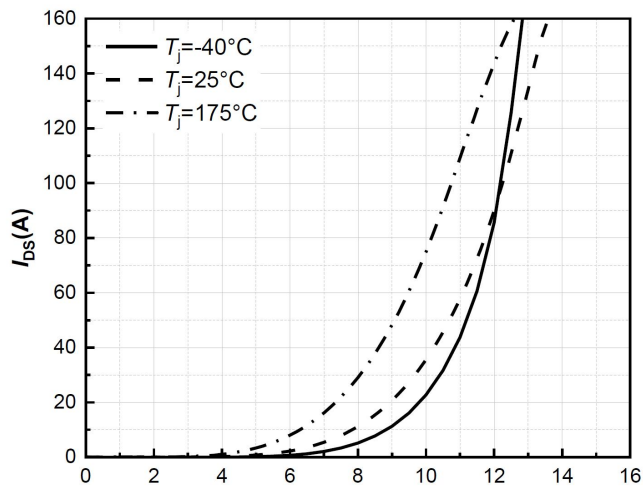
**Normalized On-Resistance vs. Temperature**



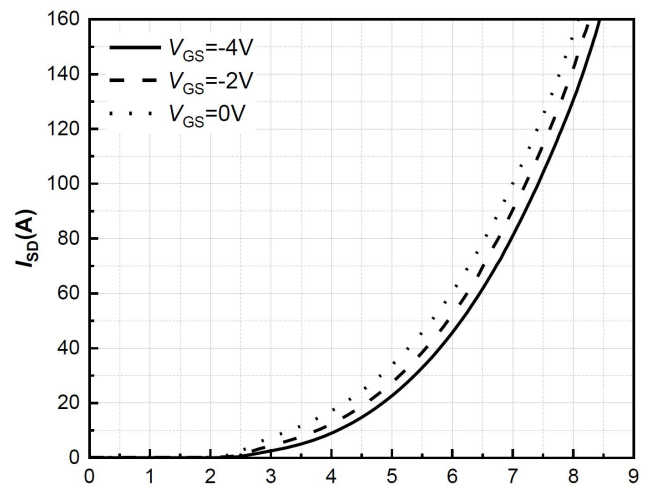
**On-Resistance vs. Drain Current For Various Temperatures**



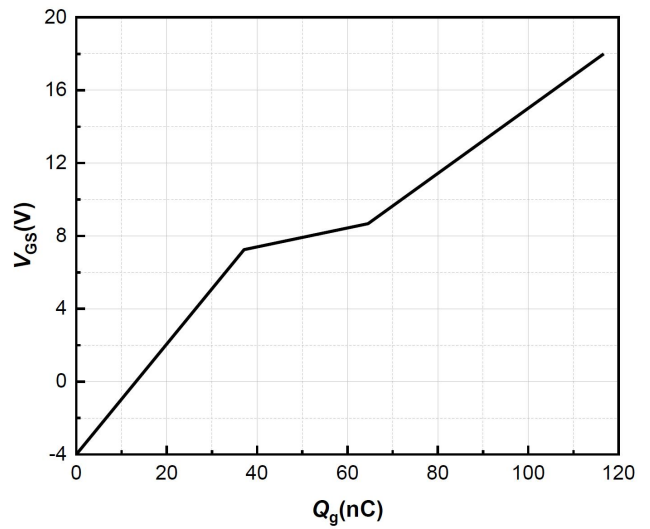
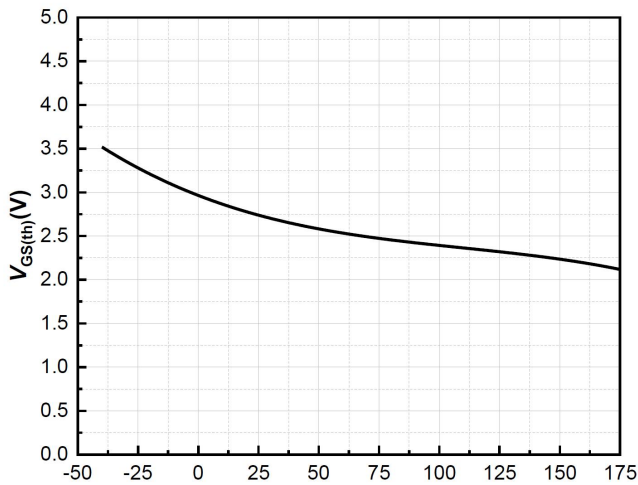
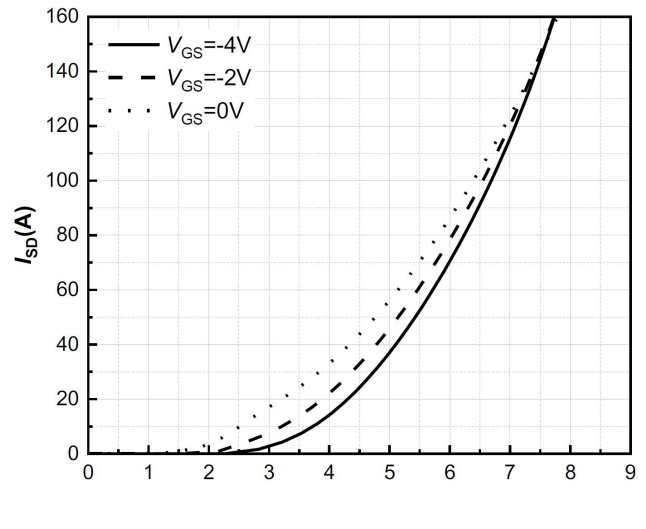
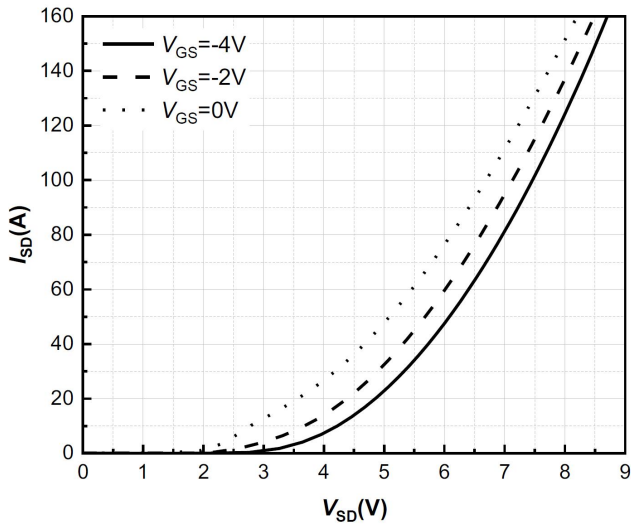
**On-Resistance vs. Temperature For Various Gate Voltage**

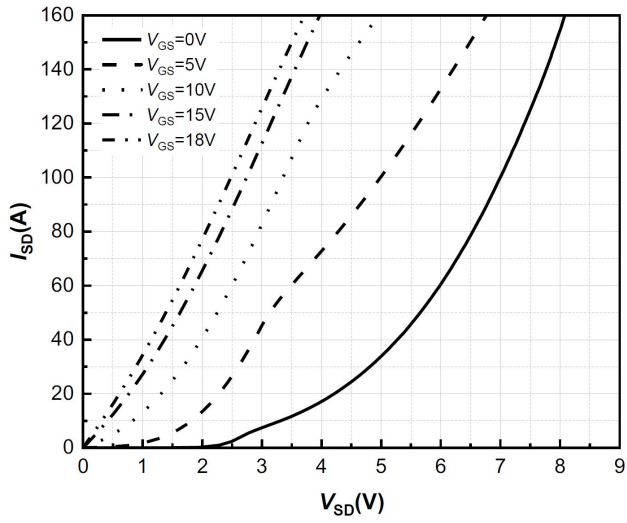


**Transfer Characteristic for Various Junction Temperatures  $V_{DS}=20V$**

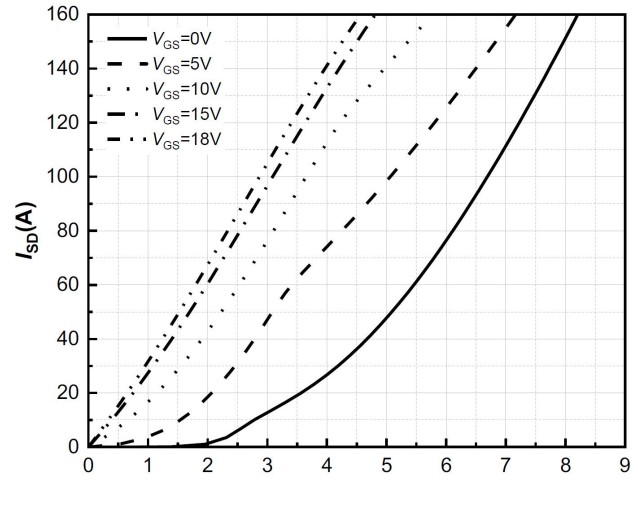


**Body Diode Characteristic  $T_j=-40^\circ C$**

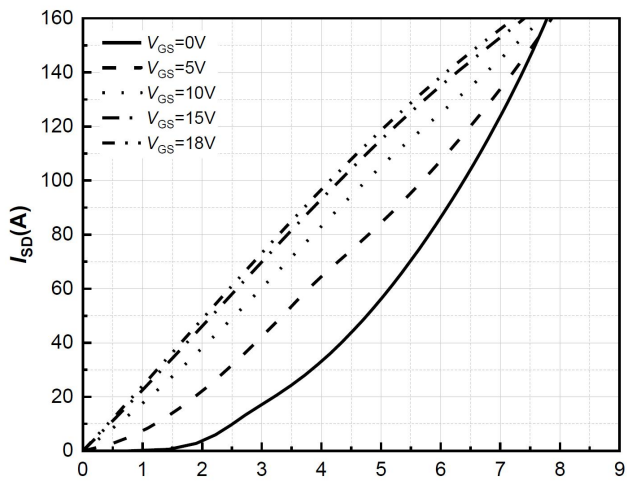




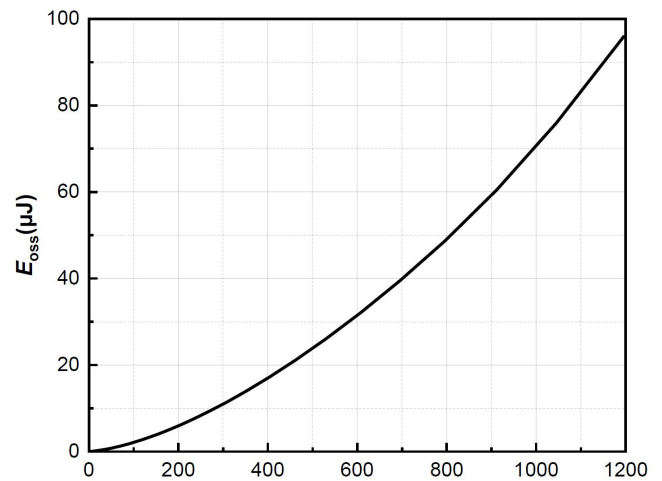
3rd Quadrant Characteristic  $T_j = -40^\circ\text{C}$



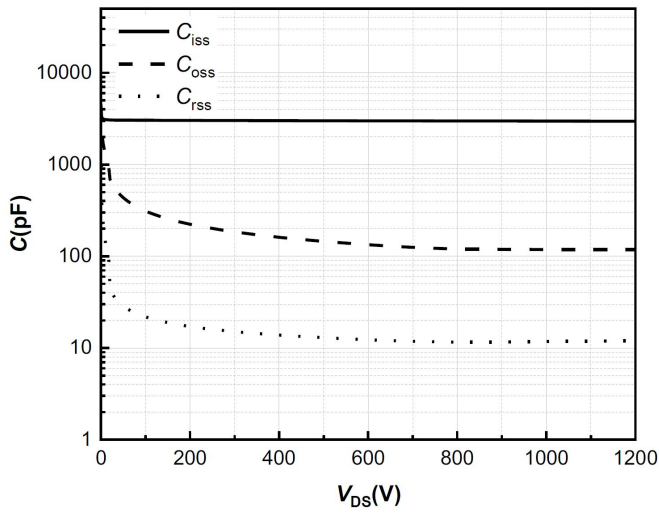
3rd Quadrant Characteristic  $T_j = 25^\circ\text{C}$



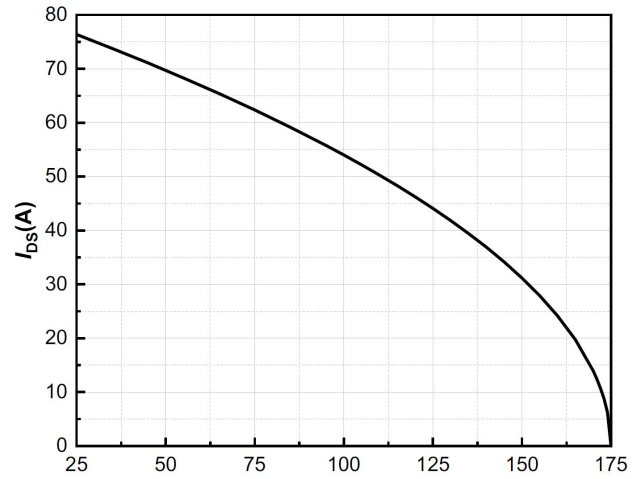
3rd Quadrant Characteristic  $T_j = 175^\circ\text{C}$



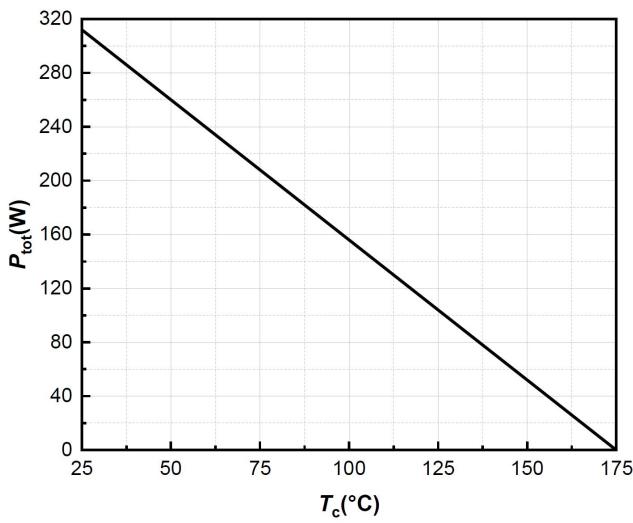
Output Capacitor Stored Energy



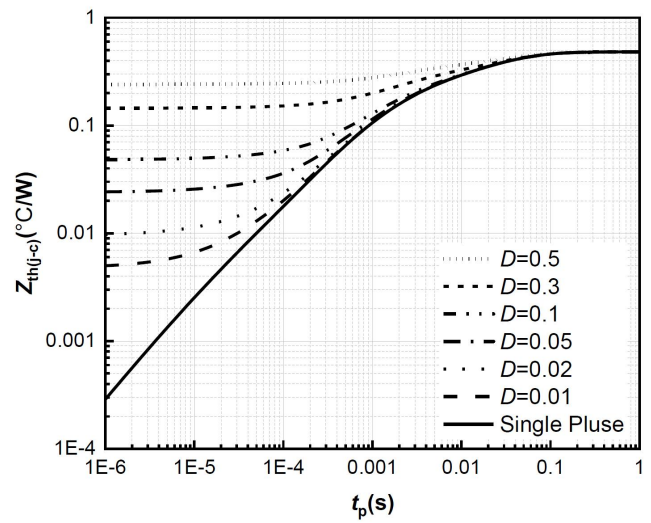
Capacitances vs. Drain-Source



Continuous Drain Current Derating vs. Case Temperature

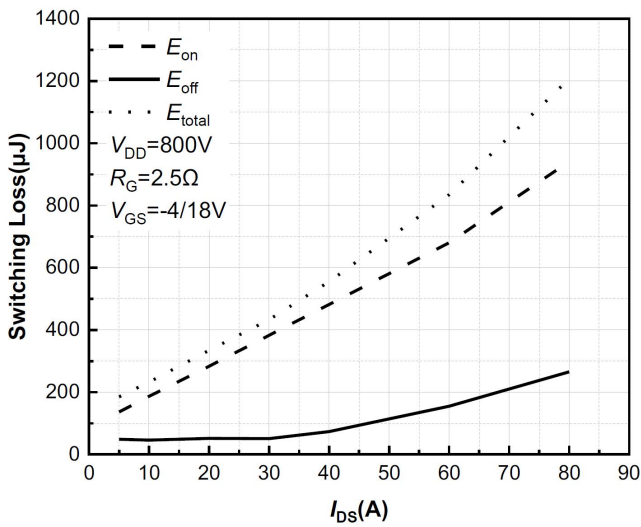


Maximum Power Dissipation Derating vs. Case Temperature

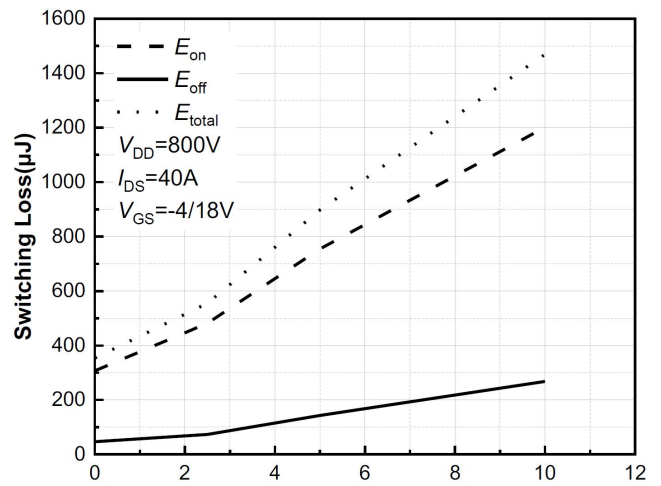


Transient Thermal Impedance

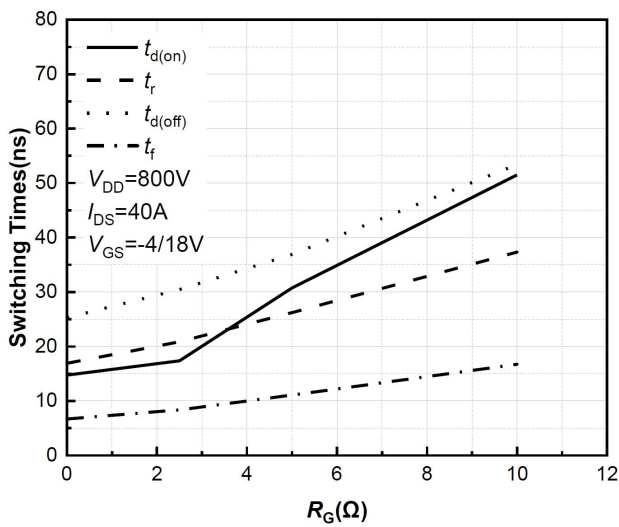




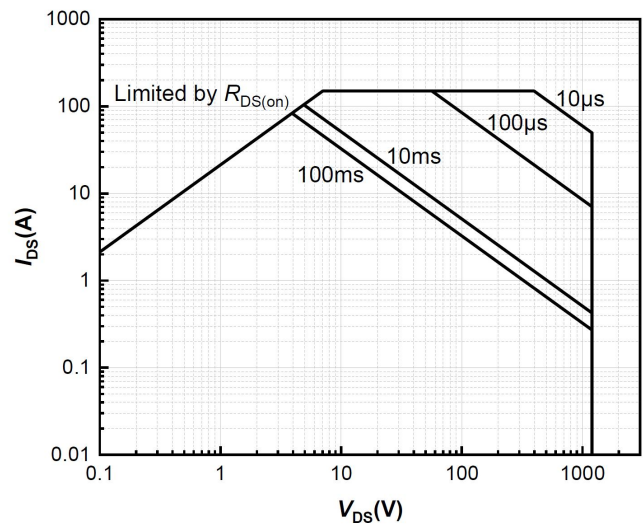
Clamped Inductive Switching Energy vs. Drain Current



Clamped Inductive Switching Energy vs.  $R_G$



Switching Times vs.  $R_G$

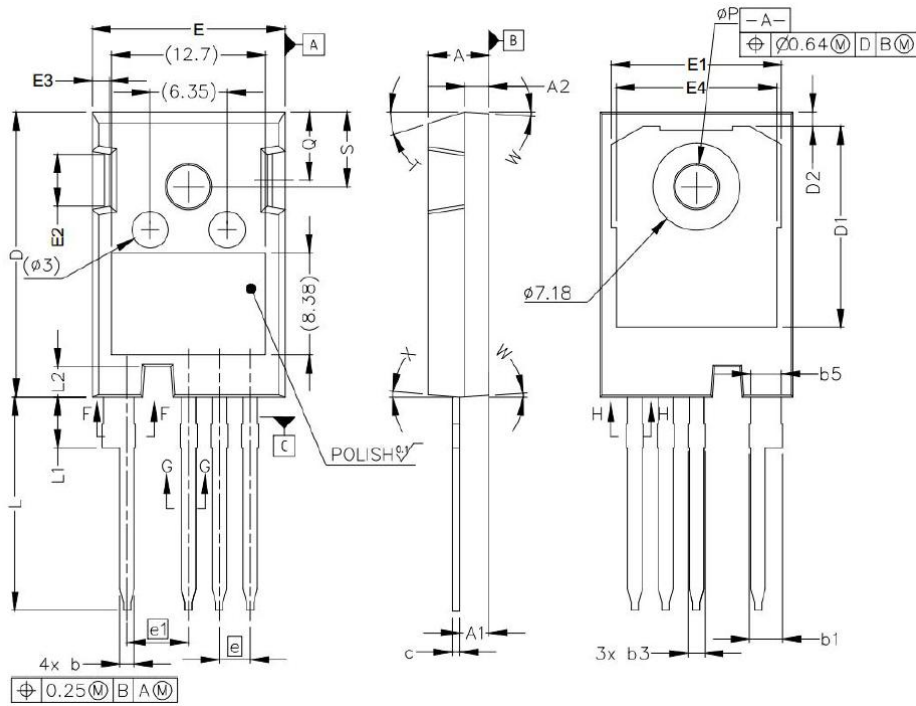


Safe Operating Area





TO-247-4L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.83	5.21	0.19	0.21
A1	2.29	2.54	0.09	0.10
A2	1.91	2.16	0.08	0.09
b1	2.39	2.94	0.09	0.12
b3	1.07	1.60	0.04	0.06
b5	2.39	2.69	0.09	0.11
c	0.55	0.68	0.02	0.03
D	23.30	23.60	0.92	0.93
D1	16.25	17.65	0.64	0.69
D2	0.95	1.25	0.04	0.05
E	15.75	16.13	0.62	0.64
E1	13.10	14.15	0.52	0.56
E2	3.68	5.10	0.14	0.20
E3	1.00	1.90	0.04	0.07
E4	12.38	13.43	0.49	0.53
e	2.54 BSC		0.1 BSC	
e1	5.08 BSC		0.2 BSC	
L	17.31	17.82	0.68	0.70
L1	3.97	4.37	0.16	0.17
L2	2.35	2.65	0.09	0.10
$\phi P$	3.51	3.65	0.14	0.14
Q	5.49	6.00	0.22	0.24
S	6.04	6.30	0.24	0.25
T	17.5° REF.		0.69° REF.	
W	3.5° REF.		0.14° REF.	
X	4.0° REF.		0.16° REF.	

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