



Features

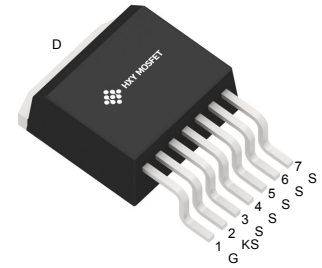
- Wide bandgap SiC MOSFET technology
- Low On-Resistance with High Blocking Voltage
- Low Capacitances with High-Speed switching
- Low reverse recovery(Qrr)
- Halogen free, RoHs compliant

Benefits

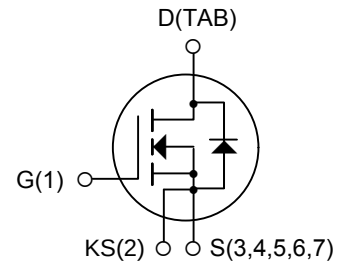
- Reduce switching losses
- Increased system Switching Frequency
- Increased power density
- Reduction of heat sink requirements

Applications

- Switch mode power supplies
- Renewable energy
- On Board Charger
- High Voltage DC/DC Converters



TO-263-7L



Ordering Part Number	Package	Brand
IPBE65R099CFD7AATMA1	TO-263-7L	HXY MOSFET

Maximum Ratings (T_c = 25 °C unless otherwise specified)

Symbol	Parameter	Test conditions	Value	Unit	Note
V _{DSmax}	Drain-Source Voltage	V _{GS} = 0V, I _D = 100μA	650	V	
V _{GS}	Gate-Source voltage(transient)	t _p ≤ 500ns, duty cycle ≤ 1%	-8/+20	V	
V _{GSop}	Recommend Gate-Source Voltage	Static	-4/+15	V	
EAS	Single pulse avalanche energy	V _{DS} =650V, V _{DD} =50V, V _{GS} =15V, L=10mH, T _C =25°C	451	mJ	
I _D	Continuous Drain current	V _{GS} = 18V, T _C = 25°C	34	A	Fig. 14
		V _{GS} = 18V, T _C = 100°C	24		
I _{D,pulse}	Pulsed Drain Current	Pulse with t _p limited by T _{jmax}	54	A	
P _D	Power Dissipation	T _C = 25°C, T _j = 175°C	163	W	Fig. 16
T _j	Operating junction temperature		-55~175	°C	
T _{stg}	Storage temperature		-55~175	°C	



Thermal Characteristics

Symbol	Parameter	Value			Unit	Note
		Min.	Typ.	Max.		
$R_{th(jc)}$	Thermal resistance from Junction to Case		0.92		K/W	Fig. 15
$R_{th(ja)}$	Thermal resistance from Junction to Ambient		40		K/W	

Electrical Characteristics (T_C = 25°C unless other wise specified)

Static Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
$V_{(BR)DSS}$	Drain-Source Breakdown voltage	$V_{GS} = 0V, I_D = 100\mu A$	650			V	
$V_{GS(th)}$	Gate Threshold voltage	$V_{GS} = V_{DS}, I_D = 4mA$		3.0		V	Fig. 9
		$V_{GS} = V_{DS}, I_D = 4mA, T_j = 175^\circ C$		2.0			
I_{GSS}	Gate-Source Leakage current	$V_{GS} = 18V, V_{DS} = 0V$			250	nA	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650V, V_{GS} = 0V, T_j = 25^\circ C$		1	50	μA	
$R_{DS(on)}$	Drain-Source On-state Resistance	$V_{GS} = 18V, I_D = 10A$		95	125	m Ω	Fig. 3, 4, 5
		$V_{GS} = 18V, I_D = 10A, T_j = 175^\circ C$		135			
g_{fs}	Transconductance	$V_{DS} = 18V, I_D = 10A$		7		S	Fig. 6
		$V_{DS} = 18V, I_D = 10A, T_j = 175^\circ C$		6			



Gate Charge Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
Q_{GS}	Gate to Source Charge	$V_{DS} = 400V$ $I_D = 10A$ $V_{GS} = -4V/18V$		7.8		nC	Fig. 10
Q_{GD}	Gate to Drain Charge			9			
Q_G	Total Gate Charge			34			

AC Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
C_{iss}	Input Capacitance	$V_{GS} = 0V, V_{DS} = 600V$ $f = 1MHz$ $V_{AC} = 25mV$		803		pF	Fig. 13
C_{oss}	Output Capacitance			77		pF	
C_{rss}	Reverse Transfer Capacitance			5		pF	
$R_{G(int)}$	Internal Gate Resistance	$f = 1 MHz, V_{AC} = 25mV$		3.8		Ω	



Reverse Diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
V_{SD}	Diode Forward Voltage	$V_{GS} = -5V, I_{SD} = 5A$		1.4	4.0	V	Fig. 7,8
		$V_{GS} = -5V, I_{SD} = 5A, T_j = 175^{\circ}C$		1.9	4.5		
I_S	Continuous Diode Forward Current	$V_{GS} = -5V, T_C = 25^{\circ}C$		30		A	
$I_{S, pulse}$	Diode pulse Current	$V_{GS} = -5V$, pulse width t_p limited by T_{jmax}		54		A	
t_{rr}	Reverse Recovery Time	$V_{GS} = -4V, I_{SD} = 10A, V_R = 400V$ $diff/dt = 1000A/us$		43		nS	
Q_{rr}	Reverse Recovery Charge			93		nC	
I_{rm}	Peak Reverse Recovery Current			5		A	

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 400V, V_{GS} = -4/+18V$ $I_D = 10A, R_{G(ext)} = 5\Omega$ $L = 294\mu H$		6		nS	Fig.21
t_r	Rise Time			13		nS	
$t_{d(off)}$	Turn-Off Delay Time			15		nS	
t_f	Fall Time			9		nS	
E_{on}	Turn-On Energy			31		μJ	Fig.19
E_{off}	Turn-Off Energy			14		μJ	
E_{tot}	Total switching energy			45		μJ	



Typical Performance

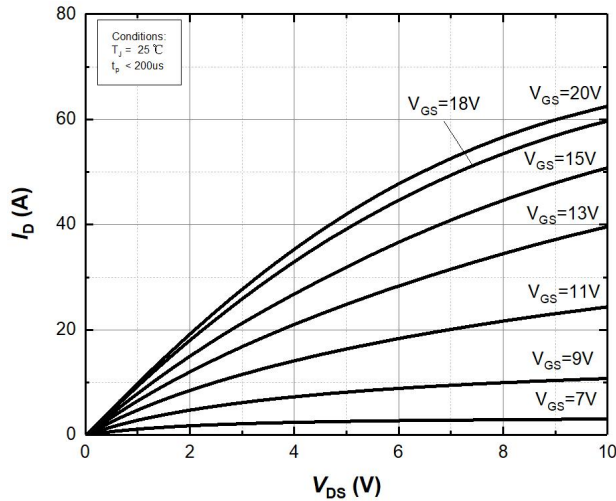


Figure 1. Output characteristics at $T_j=25^\circ\text{C}$

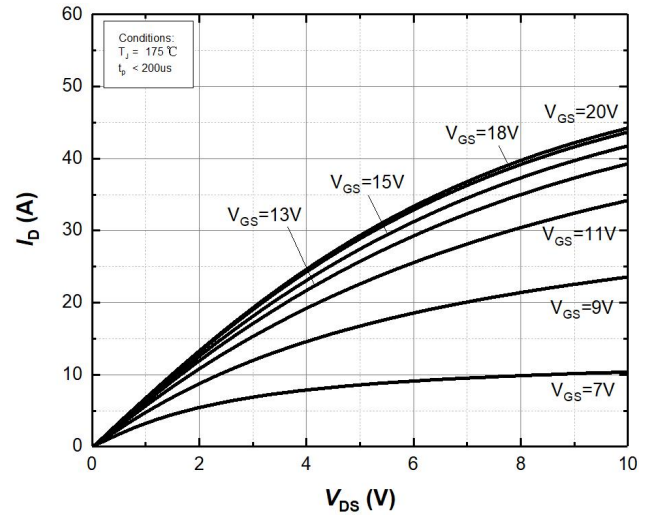


Figure 2. Output characteristics at $T_j=175^\circ\text{C}$

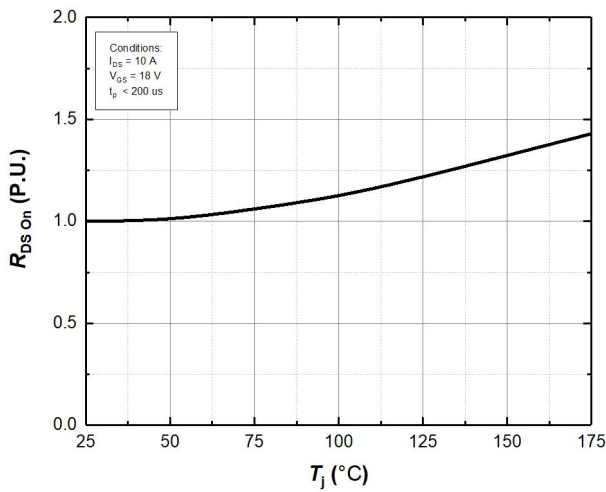


Figure 3. Normalized On-Resistance vs. Temperature

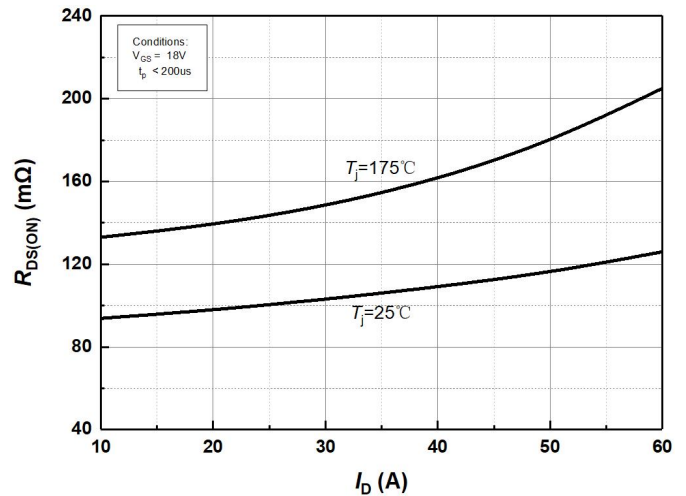


Figure 4. On-Resistance vs. Drain current for Various Temperature

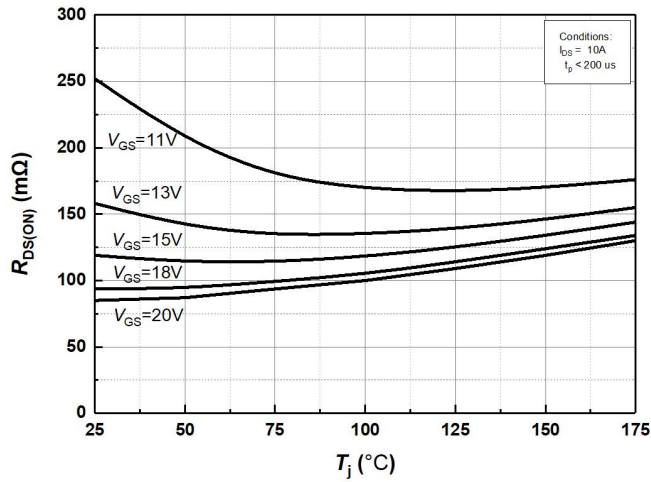


Figure 5. On-Resistance vs. Temperature for Various Gate Voltage

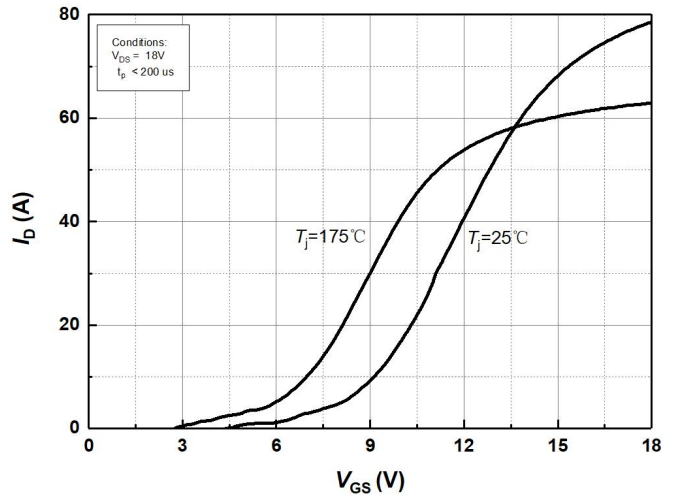


Figure 6. Transfer Characteristics for Various Junction Temperatures

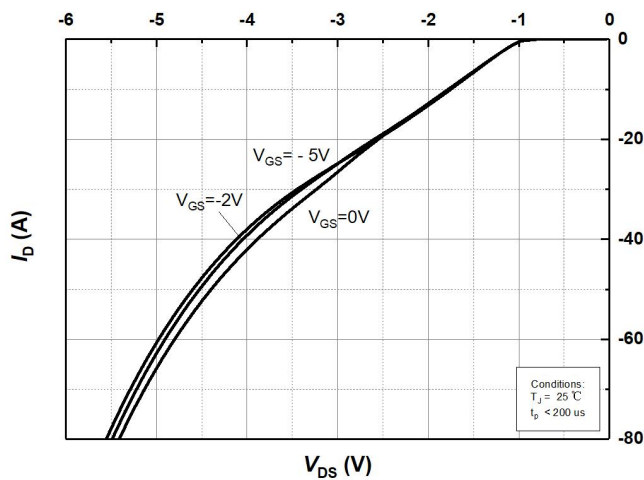


Figure 7. Body Diode Characteristics at $T_j=25^\circ C$

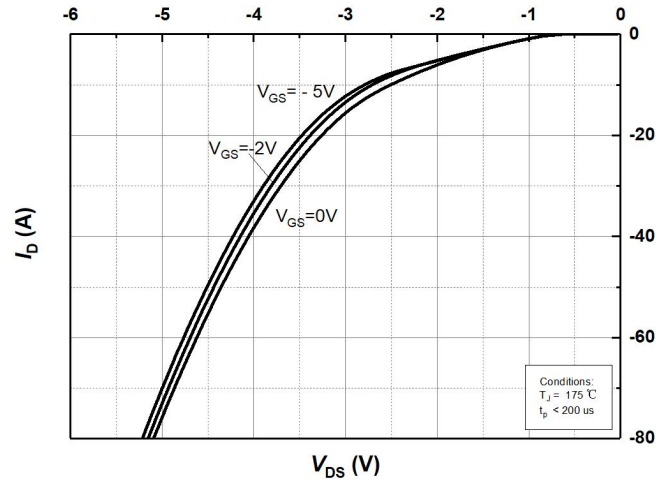


Figure 8. Body Diode Characteristics at $T_j=175^\circ C$

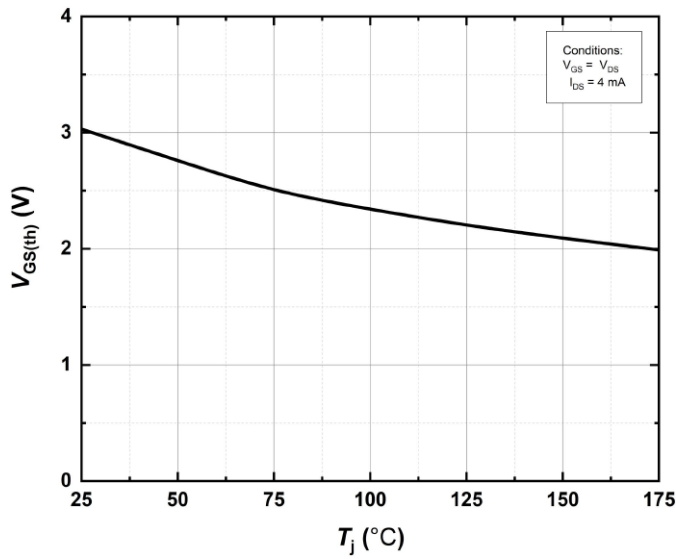


Figure 9. Threshold Voltage vs. Temperature

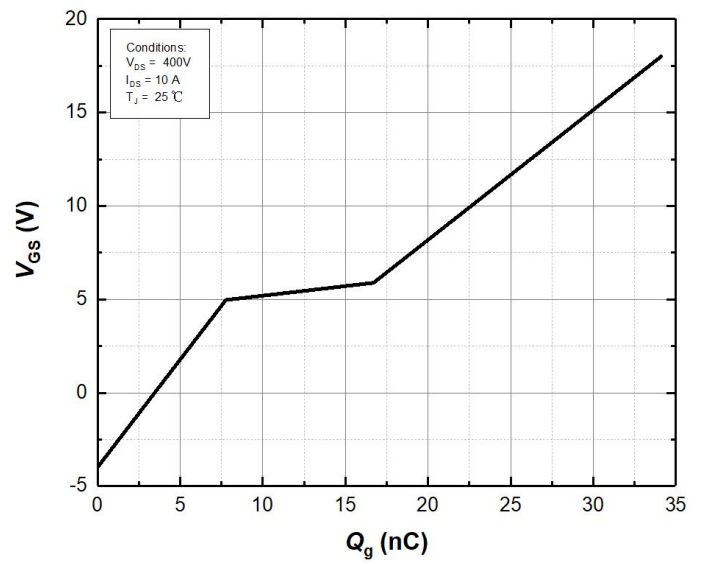


Figure 10 Gate Charge Characteristics

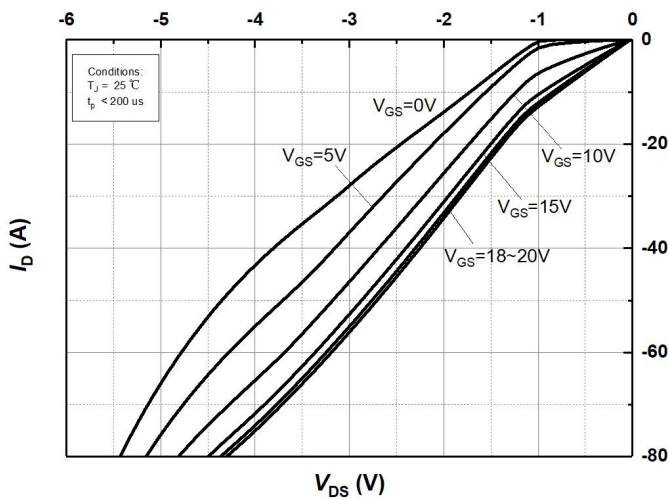


Figure 11. 3rd Quadrant Characteristic at $T_j=25\text{ °C}$

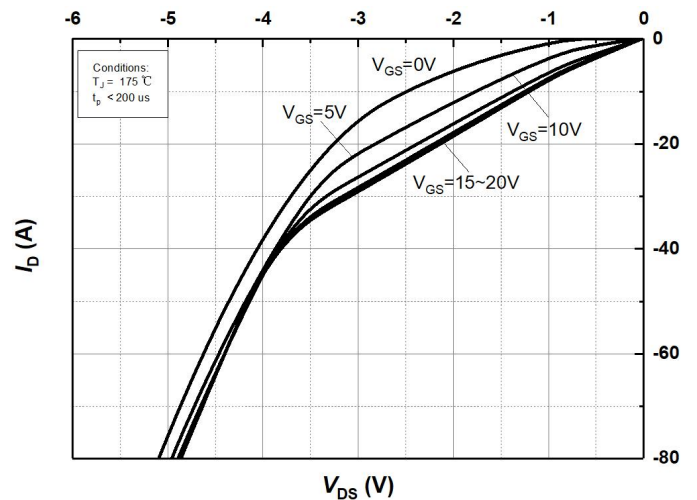


Figure 12. 3rd Quadrant Characteristic at $T_j=175\text{ °C}$

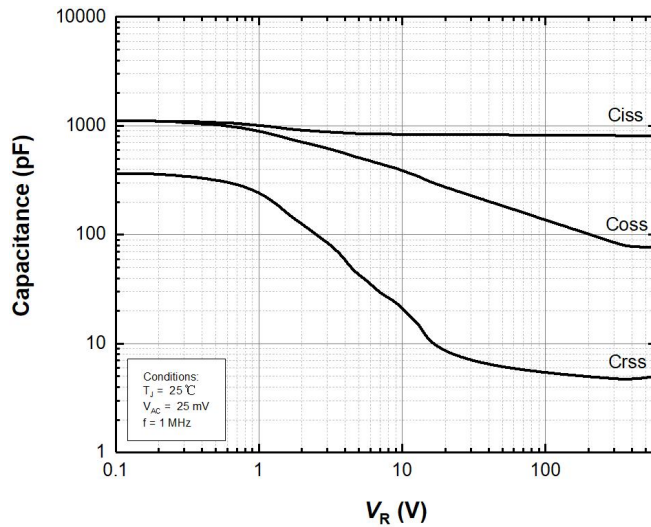


Figure 13. Capacitances vs. Drain-Source Voltage (0 – 600V)

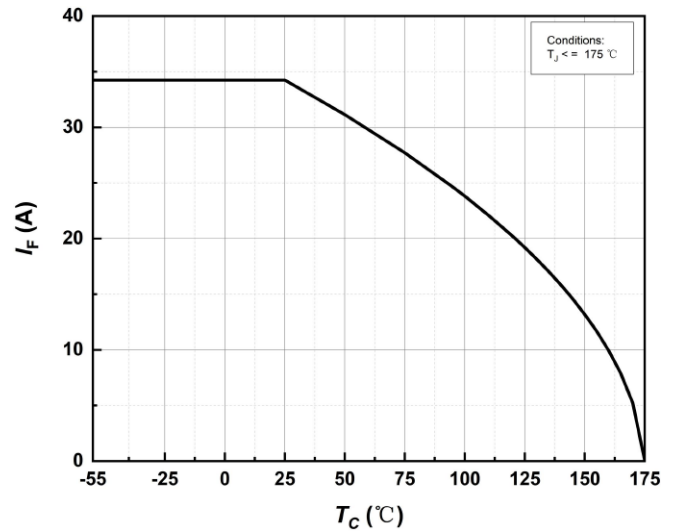


Figure 14. Continuous Drain Current Derating vs Case Temperature

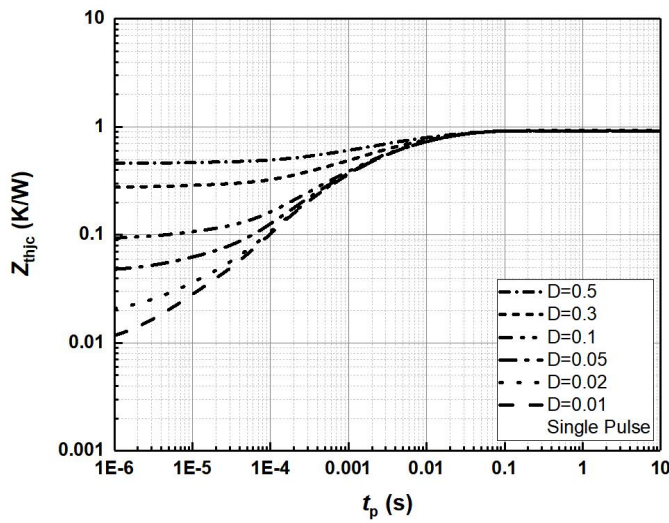


Figure 15. Transient Thermal Impedance (Junction – Case)

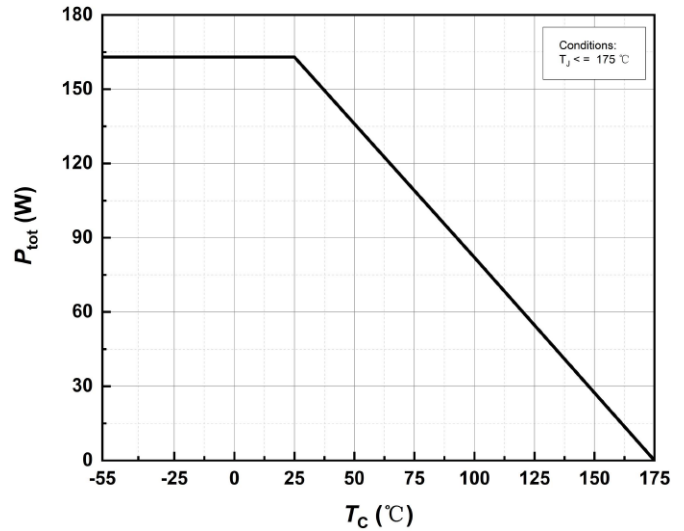


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

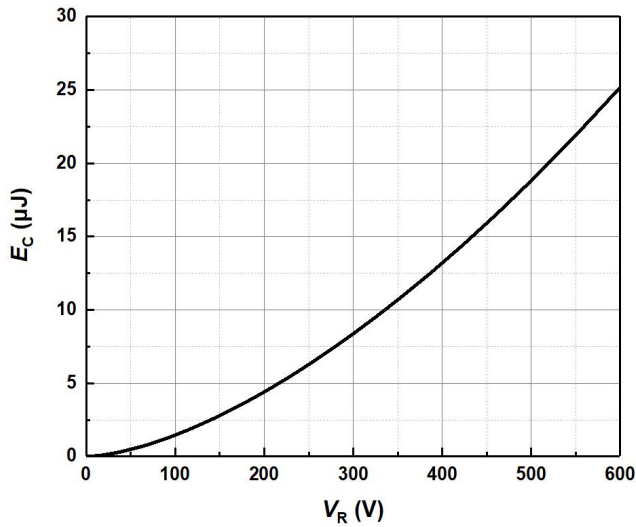


Figure 17. Output Capacitor Stored Energy

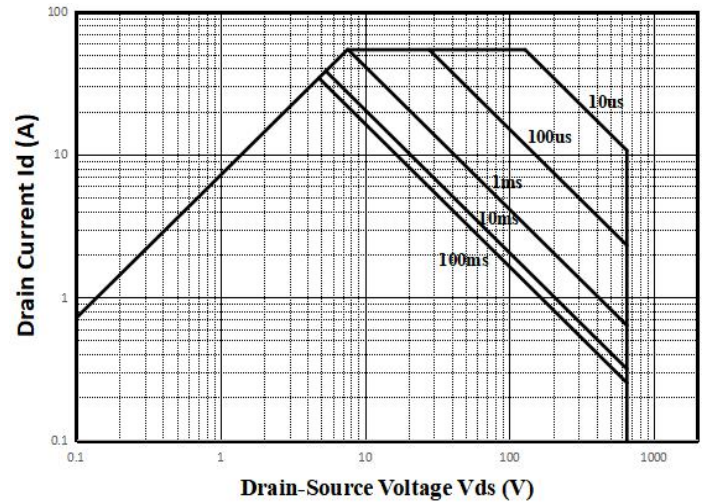


Figure 18. Safe Operating Area

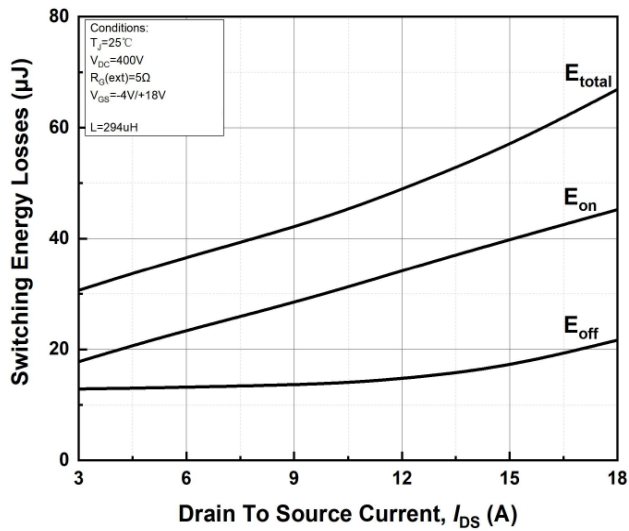


Figure 19. Clamped Inductive Switching Energy vs. Drain Current($V_{DD} = 400V$)

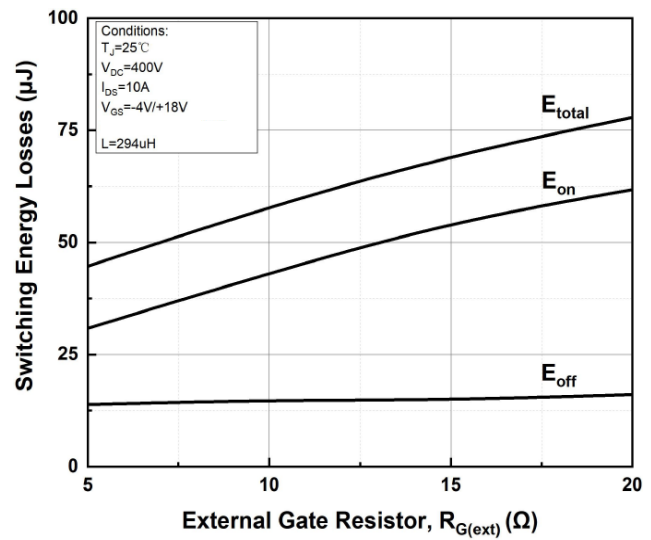


Figure 20. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

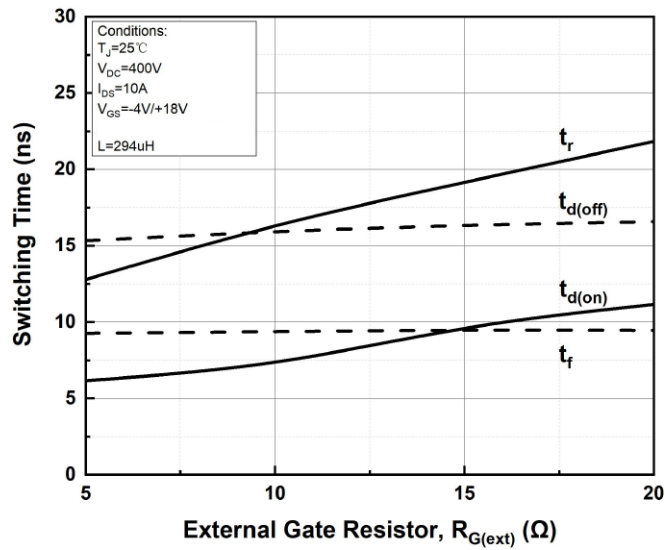
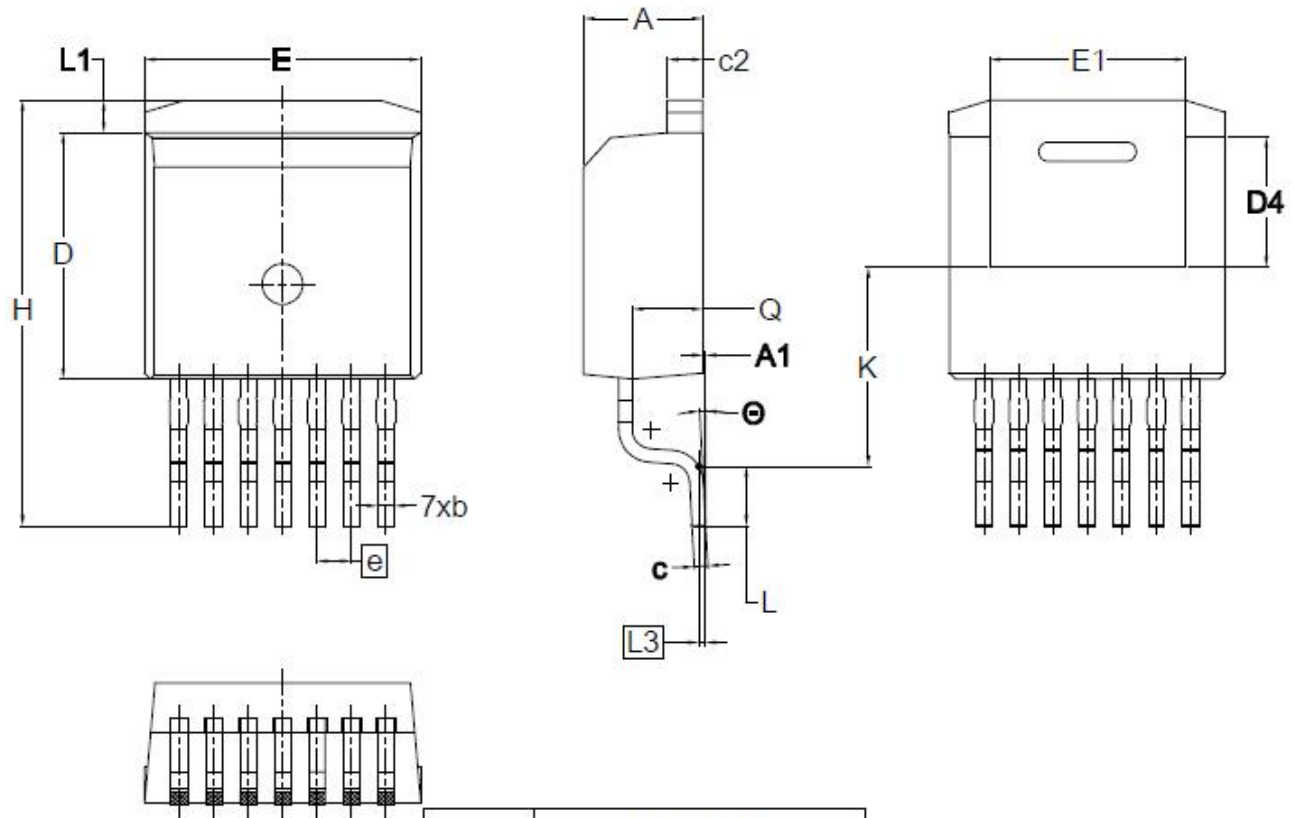


Figure 21. Switching Times vs. $R_{G(ext)}$



Package Dimensions

Package TO-263-7L



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.30	4.40	4.50
A1	0.00	0.10	0.25
b	0.50	0.60	0.70
c	0.45	0.50	0.60
c2	1.20	1.30	1.40
D	8.93	9.08	9.23
D4	4.65	4.80	4.95
E	10.08	10.18	10.28
E1	6.82	7.22	7.62
e	1.27 BSC		
H	15.00	15.70	16.00
K	7.30		
L	1.90	2.20	2.50
L1	1.00	1.20	1.40
L3	0.25 BSC		
Q	2.45	2.60	2.75
Θ	0°	3°	7°



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