HMM40N65T

MOSFET - SiC Power,Single N-Channel
650 V,60 mΩ,40 A

$V_{(BR)DSS}$	$R_{DS(on)}$	I_D MAX
650 V	60 mΩ	99 A

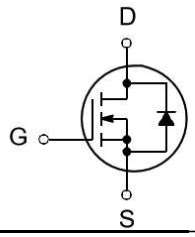
Features

- Typ. RDS(on) = 60 mΩ
- Ultra Low Gate Charge (QG(tot) = 46 nC)
- Capacitance (Coss = 80 pF)
- 100% UIL Tested

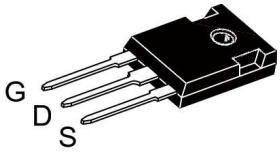
Typical Applications

- UPS
- DC/DC Converter
- EV charging
- Solar PV inverters

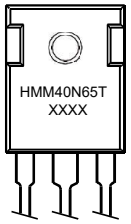
N-CHANNEL MOSFET



TO-247-3L



MARKING DIAGRAM



Maximum Ratings (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Conditions		Value	Unit
Drain–Source Voltage	V_{DSS}	T_J = –55...175°C; T_C = 25°C		650	V
Gate–Source Voltage	V_{GS}	Under transient events < 100 ns		-8/19	V
Recommended Turn on Gate–Source Voltage	$V_{GS, on}$	T_C < 175°C		15	V
Recommended Turn off Gate–Source Voltage	$V_{GS, off}$			-4	V
Continuous DC Drain Current for $R_{th(j-c, max)}$	I_{DDC}	V_{GS} = 15 V	T_C = 25°C	40	A
			T_C = 100°C	20	A
Pulsed Drain Current,Pulse width t_P limited by T_{jmax}	I_{DM}	V_{GS} = 18 V, T_C = 25°C		99	A
Power Dissipation	Ptot	T_C = 25°C,T_J=175°C		150	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}			–40 to +175	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Thermal Resistance Maximum Ratings

Parameter	Symbol	Value	Unit
Junction-to-Case (Note 1)	$R_{\theta JC}$	0.99	°C/W
Junction-to-Ambient (Note 2)	$R_{\theta JA}$	40	°C/W

1.The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2.Repetitive rating, limited by max junction temperature

Static Electrical Characteristics

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} =0 V, I_D = 100 uA		650			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 650 V	T_J = 25 °C		1	50	μA
Forward Transconductance	g_{fs}	V_{DS} = 20V, I_D = 13.2 A	T_J = 25 °C		10		S
			T_J = 175 °C		9		
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 15V, I_D = 13.2 A	T_J = 25 °C	42	60	80	mΩ
			T_J = 175 °C		81		
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS} = V_{DS}, I_D = 5 mA	T_J = 25 °C	1.8	2.3	3.6	V
			T_J = 175 °C		1.9		
Gate-Source Leakage Current	I_{GSS}	V_{GS} = 15 V, V_{DS} = 0V			10	250	nA
Input Capacitance	C_{ISS}	V_{GS} = 0 V, V_{DS} = 600V, f = 1 MHz, V_{AC} = 25 mV			1020		pF
Output Capacitance	C_{OSS}				80		
Reverse TransferCapacitance	C_{RSS}				9		
C_{OSS} Stored Energy	E_{OSS}				15		μJ

Dynamic Electrical Characteristics

Parameter	Symbol	Test Conditions		Typ	Unit
Turn-On Switching Energy (Body Diode)	E_{ON}	V_{GS} = -4/15 V, V_{DS} = 400 V, I_D = 13.2 A, $R_{G(ext)}$ = 2.5 Ω, L=135uH	T_J = 175 °C	110	μJ
Turn-On Switching Energy (Body Diode)	E_{OFF}	V_{GS} = -4/15 V, V_{DS} = 400 V, I_D = 13.2 A, $R_{G(ext)}$ = 2.5 Ω, L=135uH	T_J = 175 °C	22	
Turn-On Delay Time	$t_{d(on)}$	V_{GS} = -4/15 V, V_{DS} = 400 V, I_D = 13.2 A, $R_{G(ext)}$ = 2.5 Ω, L=135uH, Timing relative to V_{DS} Inductive load	T_J = 25 °C	9	ns
Rise Time	t_r	V_{GS} = -4/15 V, V_{DS} = 400 V, I_D = 13.2 A, $R_{G(ext)}$ = 2.5 Ω, L=135uH, Timing relative to V_{DS} Inductive load	T_J = 25 °C	20	ns
Turn-Off Delay Time	$t_{d(off)}$	V_{GS} = -4/15 V, V_{DS} = 400 V, I_D = 13.2 A, $R_{G(ext)}$ = 2.5 Ω, L=135uH, Timing relative to V_{DS} Inductive load	T_J = 25 °C	17	ns
Fall Time	t_f	V_{GS} = -4/15 V, V_{DS} = 400 V, I_D = 13.2 A, $R_{G(ext)}$ = 2.5 Ω, L=135uH, Timing relative to V_{DS} Inductive load	T_J = 25 °C	8	ns
Total Gate Charge	$Q_{G(tot)}$	V_{GS} = -4/15 V, V_{DS} = 400 V, I_D = 13.2 A, Per IEC60747-8-4		46	nC
Gate-Source Charge	Q_{GS}			14	
Gate-Drain Charge	Q_{GD}			14	
Internal Gate Resistance	RG,int	f = 1 MHz, V_{AC} = 25 mV		3	Ω

Reverse Diode Characteristic

Parameter	Symbol	Test Conditions		Typ	Unit
Drain-Source Reverse Voltage	V_{SD}	V_{GS} = -4 V, I_{SD} = 6.6 A	T_J = 25 °C	5.1	V
			T_J = 175 °C	4.8	
Continuous Reverse Drain Current for $R_{th(j-c, max)}$	I_{SDC}	V_{GS} = -4 V T_c = 25 °C	T_J = 25 °C	40	A
Peak Reverse Drain Current	I_{SM}	V_{GS} = -4 V, T_J = 25 °C, Pulse width t_P limited by T_{jmax}		99	A
Reverse Recovery Time	t_{RR}	V_{GS} =-4 V, I_{SD} = 13.2 A, V_R = 400 V, dI_S/dt = 750 A/μs, T_J = 175 °C		29	ns
Reverse Recovery Charge	Q_{RR}			181	nC
Peak Reverse Recovery Current	I_{RRM}			9	A

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

Typical Performance

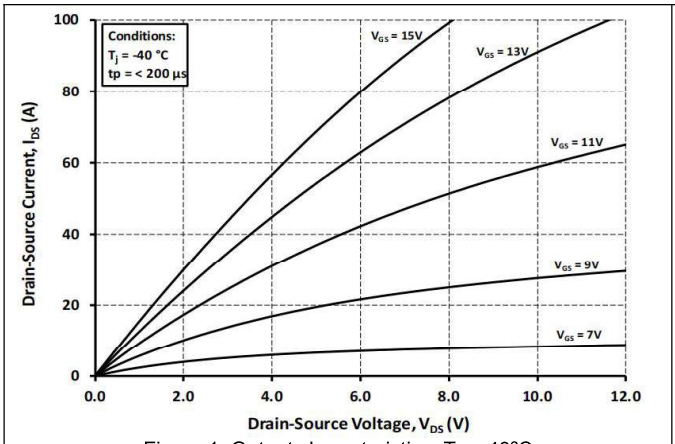


Figure 1. Output characteristics, T_J= -40ºC

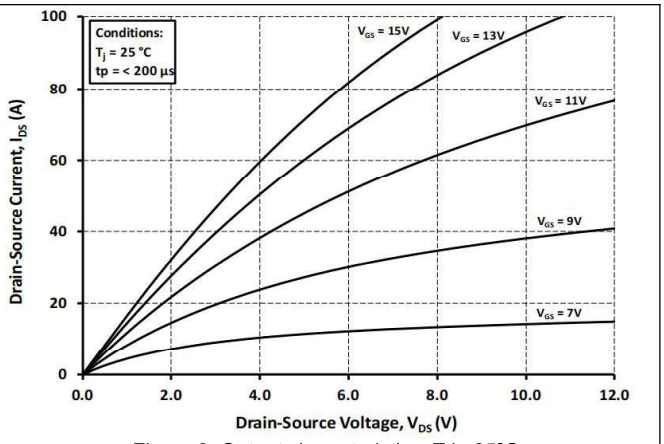


Figure 2. Output characteristics, TJ= 25ºC

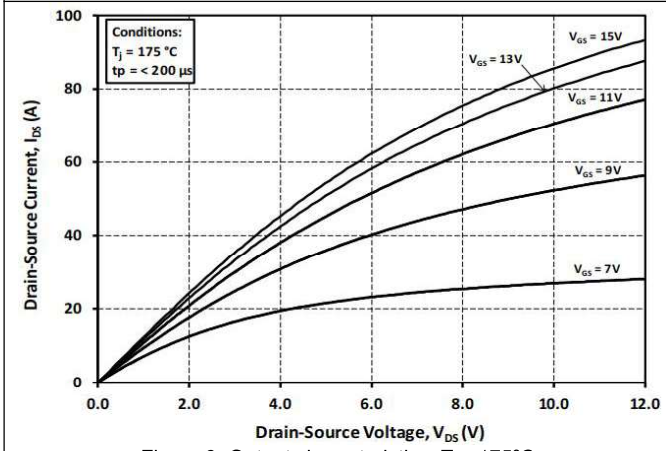


Figure 3. Output characteristics, T_J= 175ºC

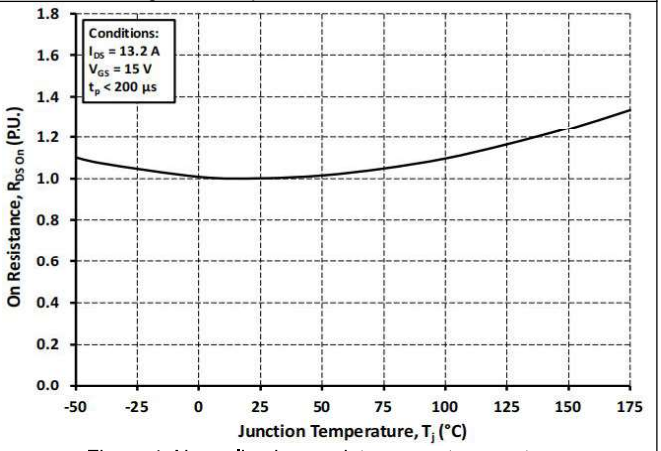


Figure 4. Normalized on-resistance vs. temperature

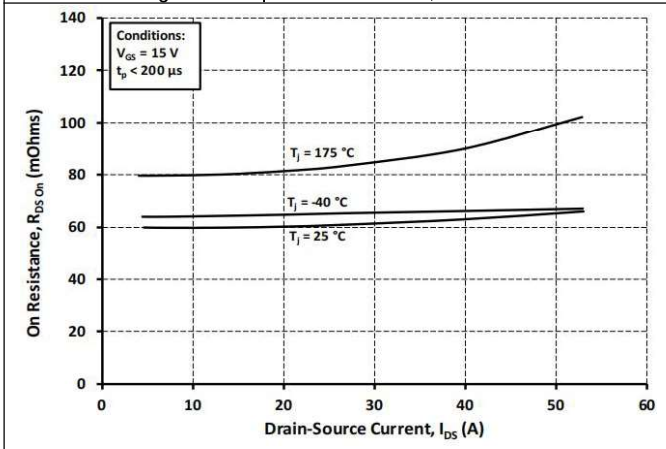


Figure 5. On-resistance vs. drain current
For Various Temperatures

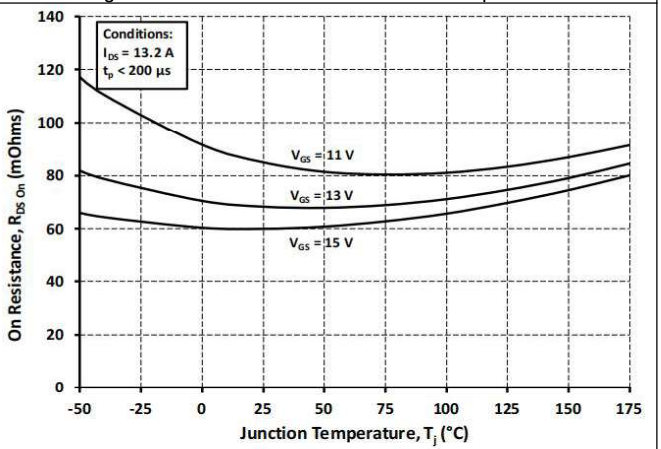


Figure 6. On-resistance vs. Temperature
for various gate voltage

Typical Performance

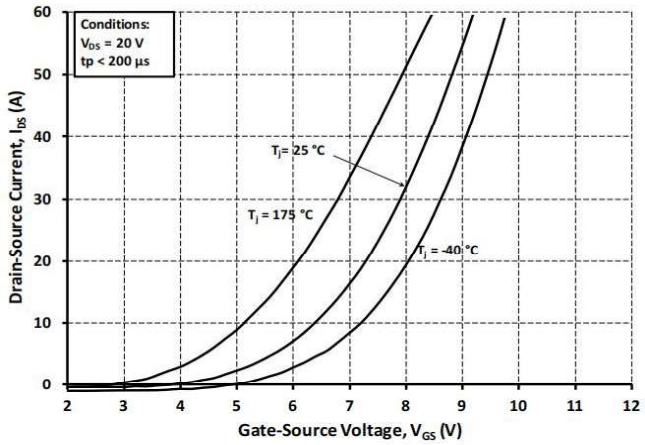


Figure 7. Transfer characteristic for various junction temperatures

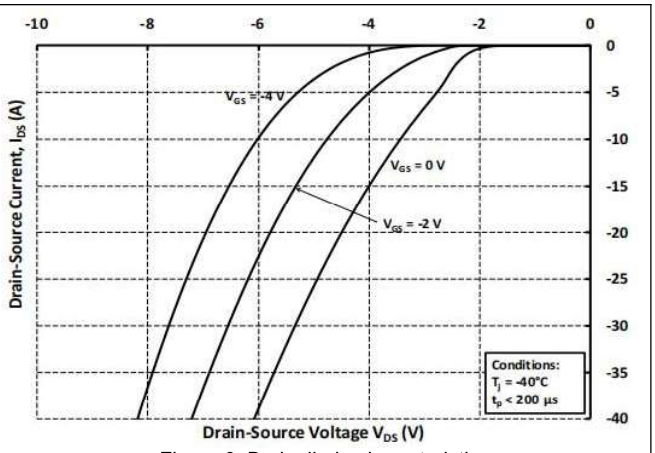


Figure 8. Body diode characteristic at T_J= -40ºC

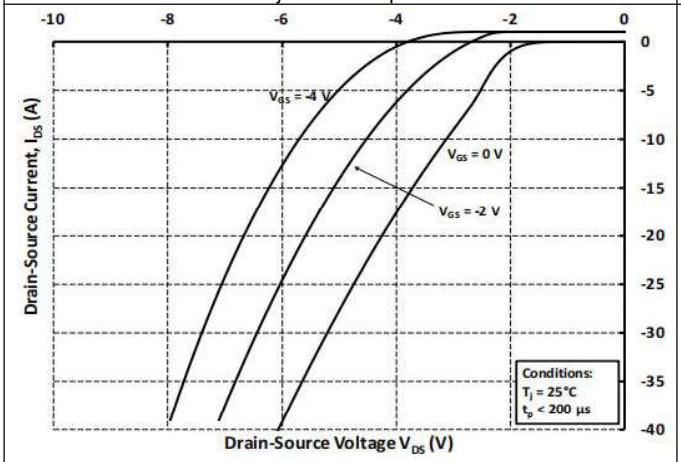


Figure 9. Body diode characteristic at T_J= 25ºC

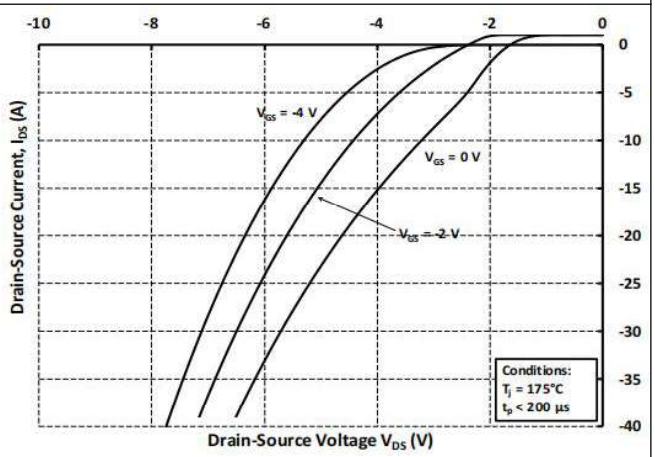


Figure 10. Body diode characteristic at T_J= 175ºC

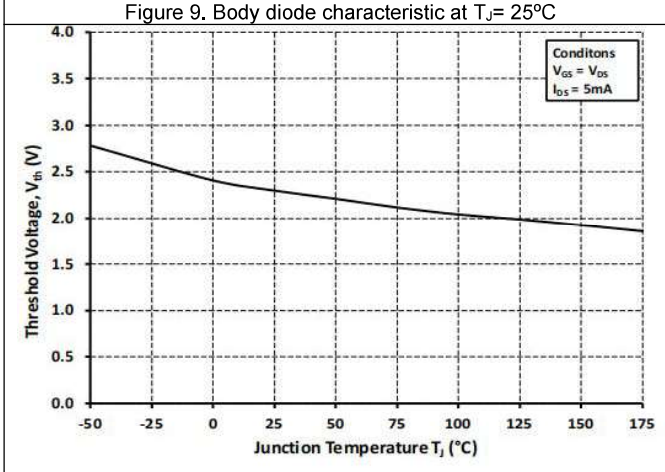


Figure 11. Threshold voltage vs. temperature

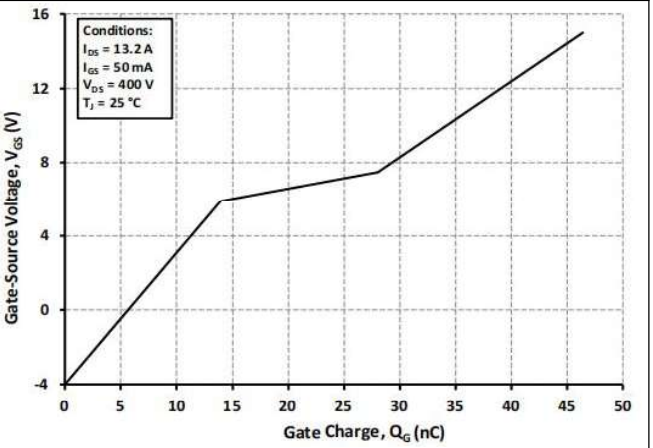


Figure 12. Gate charge characteristic

Typical Performance

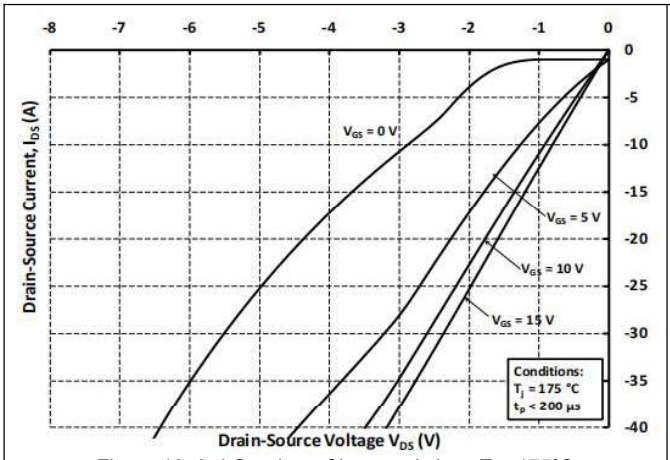


Figure 13. 3rd Quadrant Characteristic at T_J= 175ºC

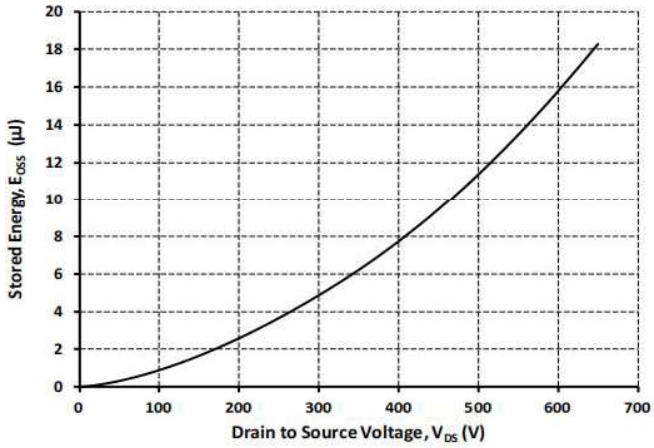


Figure 14. Output capacitor stored energy

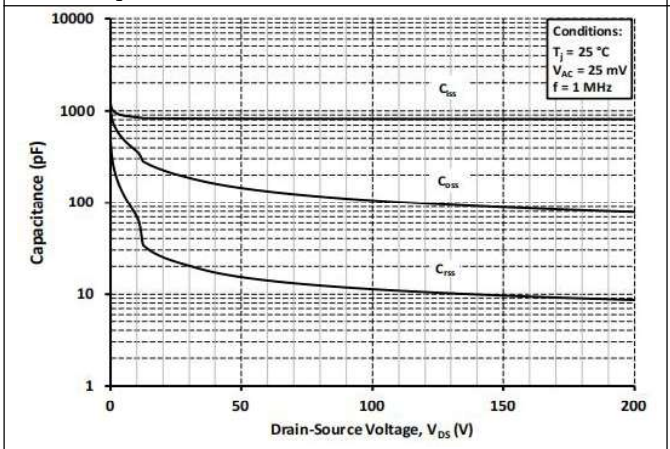


Figure 15. Capacitances vs. drain-source voltage

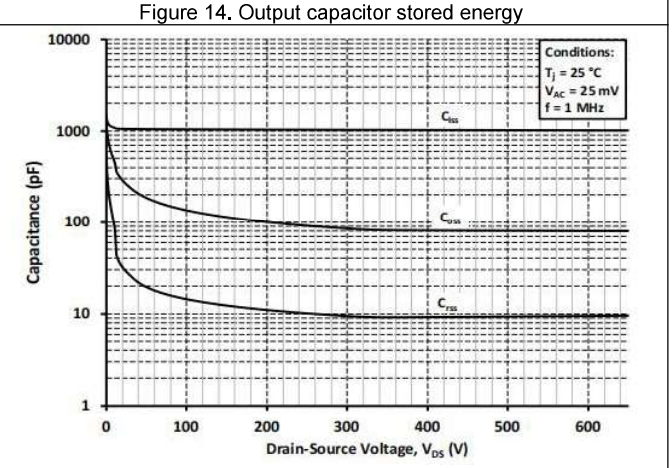


Figure 16. Capacitances vs. drain-source voltage

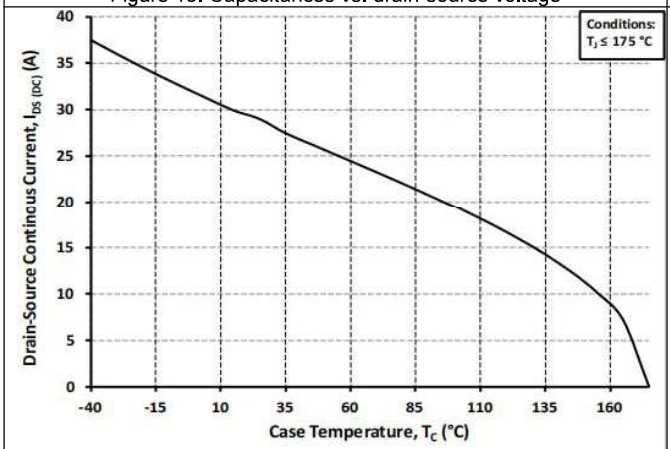


Figure 17. Continuous drain current derating vs. case temperature

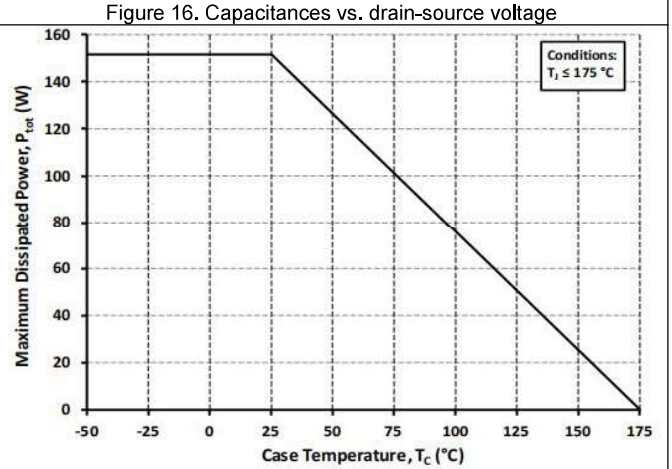


Figure 18. Maximum power dissipation derating vs. case temperature

Typical Performance

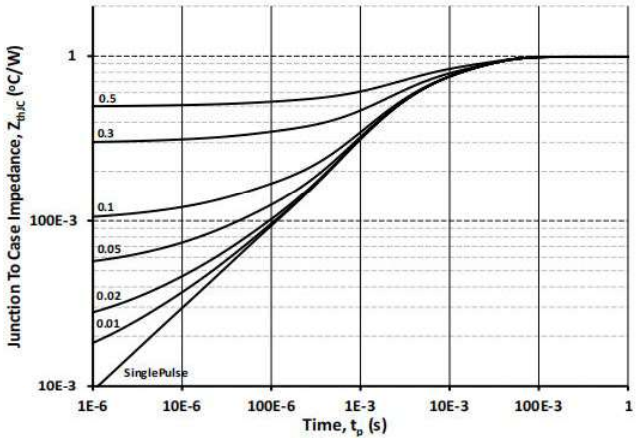


Figure 19. Transient thermal impedance (junction - case)

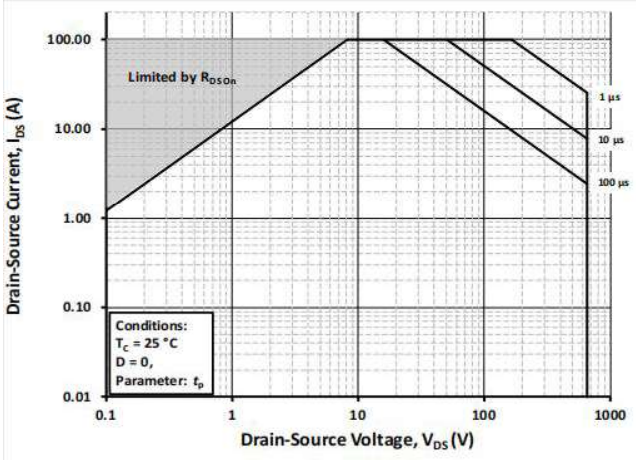


Figure 20. Safe operating area

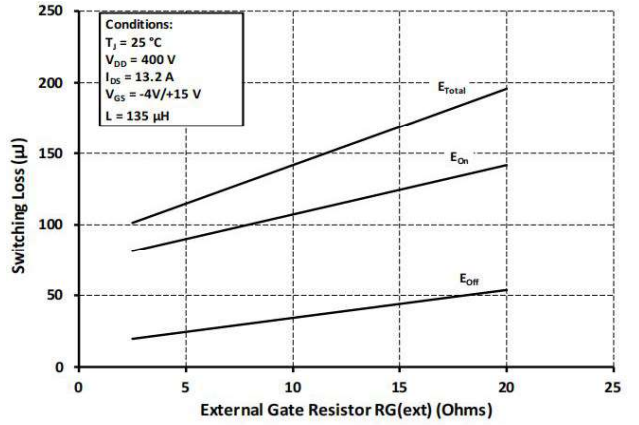


Figure 21. Clamped inductive switching energy vs. R_G(ext)

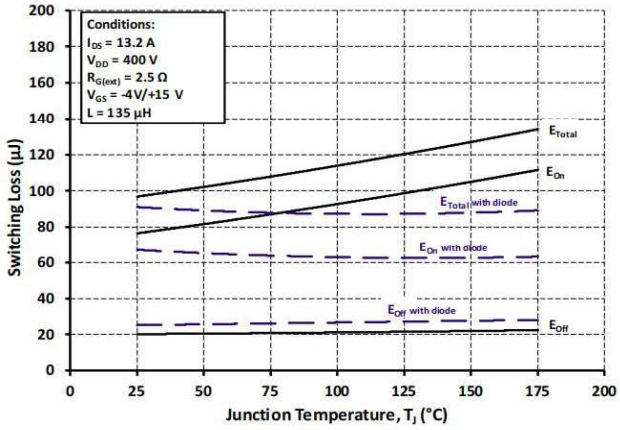


Figure 22. Clamped inductive switching energy vs. temperature

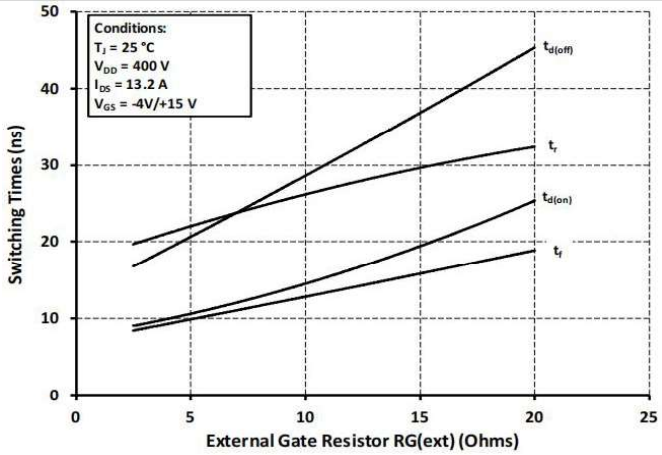
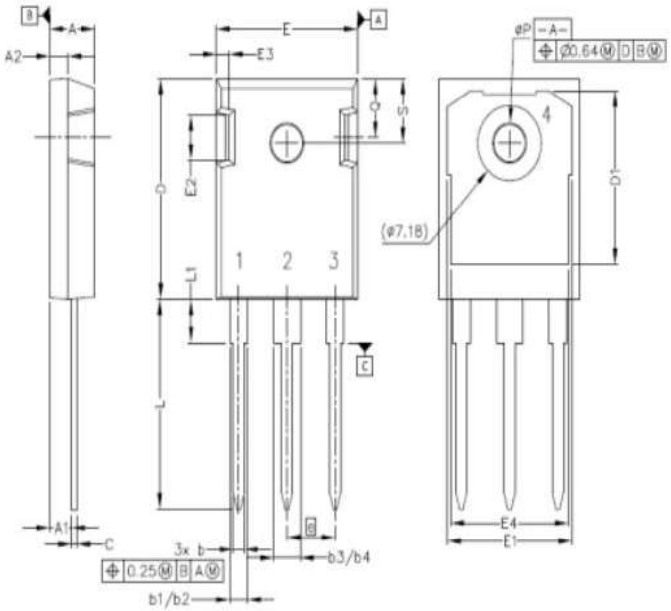


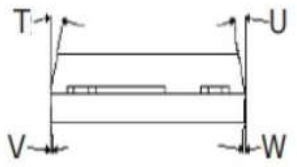
Figure 23. Switching times vs. R_G(ext)

Package Marking And Ordering Information

Part Number	Top Marking	Package	Packing Method	Reel Size	Tape Width	Quantity
HMM40N65T	HMM40N65T XXXX	TO-247 Long Lead	Tube	N/A	N/A	30 Units

Package Dimensions：TO-247-3





Pinout Information:

- Pin 1 = Gate
- Pin 2, 4 = Drain
- Pin 3 = Source

POS	Inches		Millimeters	
	Min	Max	Min	Max
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.042	.052	1.07	1.33
b1	.075	.095	1.91	2.41
b2	.075	.085	1.91	2.16
b3	.113	.133	2.87	3.38
b4	.113	.123	2.87	3.13
c	.022	.027	0.55	0.68
D	.819	.831	20.80	21.10
D1	.640	.695	16.25	17.65
D2	.037	.049	0.95	1.25
E	.620	.635	15.75	16.13
E1	.516	.557	13.10	14.15
E2	.145	.201	3.68	5.10
E3	.039	.075	1.00	1.90
E4	.487	.529	12.38	13.43
e	.214 BSC		5.44 BSC	
N	3		3	
L	.780	.800	19.81	20.32
L1	.161	.173	4.10	4.40
ØP	.138	.144	3.51	3.65
Q	.216	.236	5.49	6.00
S	.238	.248	6.04	6.30
T	9°	11°	9°	11°
U	9°	11°	9°	11°
V	2°	8°	2°	8°
W	2°	8°	2°	8°