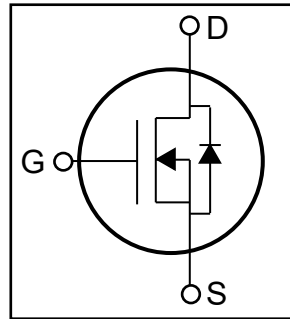
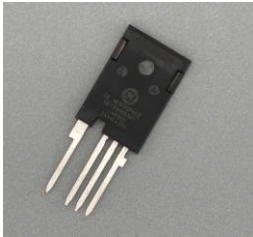




1200V SiC MOSFET



$$V_{DS} = 1200 \text{ V}$$

$$R_{DS(ON)} = 39 \text{ m}\Omega$$

$$T_{J,max} = 200^{\circ}\text{C}$$

MOSFET Static Characteristics @ $T_J=25^{\circ}\text{C}$ (unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
I_D	Continuous drain current	$V_{GS}=20 \text{ V}$, $T_C=25^{\circ}\text{C}$, $T_J=200^{\circ}\text{C}$			60	A
		$V_{GS}=20 \text{ V}$, $T_C=100^{\circ}\text{C}$, $T_J=200^{\circ}\text{C}$			45	
		$V_{GS}=20 \text{ V}$, $T_C=125^{\circ}\text{C}$, $T_J=200^{\circ}\text{C}$			39	
$I_{D,pulse}$	Pulsed drain current ¹⁾	$T_C=25^{\circ}\text{C}$, $T_J=200^{\circ}\text{C}$			89	A
P_{tot}	Power dissipation	$T_C=25^{\circ}\text{C}$			389	W
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS}=0 \text{ V}$, $I_{DS}=10 \mu\text{A}$	1200			V
I_{DSS}	Drain leakage current	$V_{DS}=1200 \text{ V}$, $V_{GS}=0 \text{ V}$, $T_J=25^{\circ}\text{C}$			10	μA
		$V_{DS}=1200 \text{ V}$, $V_{GS}=0 \text{ V}$, $T_J=200^{\circ}\text{C}$			100	
I_{GSS}	Gate-source leakage current	$V_{GS}= -15/+23 \text{ V}$			100	nA
V_{GS}	Recommended gate-source voltage			20		V
$V_{GS,max}$	Maximum gate-source voltage	$V_{DS}=0 \text{ V}$			-15/+23	
V_{TH}	Gate-source threshold voltage	$V_{GS}=V_{DS}$, $I_{DS}=10 \text{ mA}$, $T_J=25^{\circ}\text{C}$	2.0	2.8	3.8	
$R_{DS(ON)}$	Drain-source on-resistance	$V_{GS}=20 \text{ V}$, $I_{DS}=15 \text{ A}$, $T_J=25^{\circ}\text{C}$		37.9	50.1	m Ω
		$V_{GS}=20 \text{ V}$, $I_{DS}=41 \text{ A}$, $T_J=25^{\circ}\text{C}$		39.7	52.5	
		$V_{GS}=20 \text{ V}$, $I_{DS}=15 \text{ A}$, $T_J=200^{\circ}\text{C}$		78.4	103.5	
		$V_{GS}=20 \text{ V}$, $I_{DS}=30 \text{ A}$, $T_J=200^{\circ}\text{C}$		80.9	106.8	
		$V_{GS}=20 \text{ V}$, $I_{DS}=41 \text{ A}$, $T_J=200^{\circ}\text{C}$		83.0	109.5	
g_{fs}	Forward transconductance	$I_{DS}=40 \text{ A}$, $V_{DS}=10 \text{ V}$		19		S
$R_{GATE,ESR}$	Gate-source series resistance	$V_{GS}=20 \text{ V}$, V_{DC} , 25mV _{AC} , 100kHz, D-S shorted		0.27		Ω
E_{AS}	Single pulse avalanche energy	$I_D=15 \text{ A}$, $L=17 \text{ mH}$		1.97		J
R_{thJC}	Thermal resistance, junction-case	Assumes TO247-4L packaged die		0.38	0.45	$^{\circ}\text{C/W}$
T_J, T_{stg}	Bare chip/discrete max junction operating and storage temperature		-55		200	$^{\circ}\text{C}$



MOSFET Dynamic Characteristics						
Symbol	Parameter	Conditions	Min	Typ	Max	Units
C_{ISS}	Input capacitance	$V_{GS}=0\text{ V}, V_{DS}=500\text{ V}, f=100\text{ kHz}$		2120		pF
C_{OSS}	Output capacitance			107		
C_{RSS}	Reverse transfer capacitance			5		
$t_{d(on)}$	Turn-on delay time	$V_{DS}=600\text{ V}, V_{GS}=-5/+20\text{ V}, I_D=40\text{ A}, R_{G(ext)}=10\text{ }\Omega$		14		ns
t_r	Rise time			16		
$t_{d(off)}$	Turn-off delay time			34		
t_f	Fall time			18		
E_{ON}	Turn-on energy	$V_{DS}=600\text{ V}, V_{GS}=-5/+20\text{ V}, I_D=40\text{ A}, R_{G(ext)}=10\text{ }\Omega, L_G=50\text{ nH}, L_{LOAD}=1.6\text{ mH}$		0.58		mJ
E_{OFF}	Turn-off energy			0.17		
E_{TOT}	Total switching energy			0.75		
Q_G	Total gate charge ²⁾	$V_{GS}=-5\text{ to }18\text{ V}, I_{DS}=30\text{ A}, V_{DS}=900\text{ V}$		95		nC
Q_{GS}	Gate-source charge ²⁾			39		
Q_{GD}	Gate-drain charge ²⁾			24		

Diode Characteristics ³⁾

Symbol	Parameter	Conditions	Min	Typ	Max	Units
I_{SD}	Pulsed body diode current	$V_{GS}=0\text{ V}$			89	A
V_{SD}	Diode forward voltage	$V_{GS}=0\text{ V}, I_{SD}=40\text{ A}$		4.1		V
t_{rr}	Reverse Recovery Time	$I_{SD}=40\text{ A}, V_R=600\text{ V}, R_{G(ext)}=10\text{ }\Omega$		25		ns
Q_{rr}	Reverse Recovery Charge	$I_{SD}=40\text{ A}, V_R=600\text{ V}, R_{G(ext)}=10\text{ }\Omega, L_G=50\text{ nH}, L_{LOAD}=1.6\text{ mH}, di/dt=2157\text{ A}/\mu\text{s}$		337		nC
I_{rrm}	Peak Reverse Recovery Current	$I_{SD}=40\text{ A}, V_R=600\text{ V}, R_{G(ext)}=10\text{ }\Omega, L_G=50\text{ nH}, L_{LOAD}=1.6\text{ mH}, di/dt=2157\text{ A}/\mu\text{s}$		27		A

1) Pulse width limited by $T_{J,max}$.

2) Q_{gs} and Q_{gd} values were calculated using the two-curve extraction method shown in Fig. 12.

3) We recommend the use of body diode in synchronous rectification mode with repetitive conduction during switch commutation dead-time $\leq 1\text{ }\mu\text{s}$. Our long term (up to 13,000 hours) continuous switching test results show excellent reliability and forward voltage stability, indicating it is safe to use the body diode in this mode.



Figure 1. Output characteristics

$I_D = f(V_{DS}, V_{GS}); T_j = 25^\circ\text{C}$

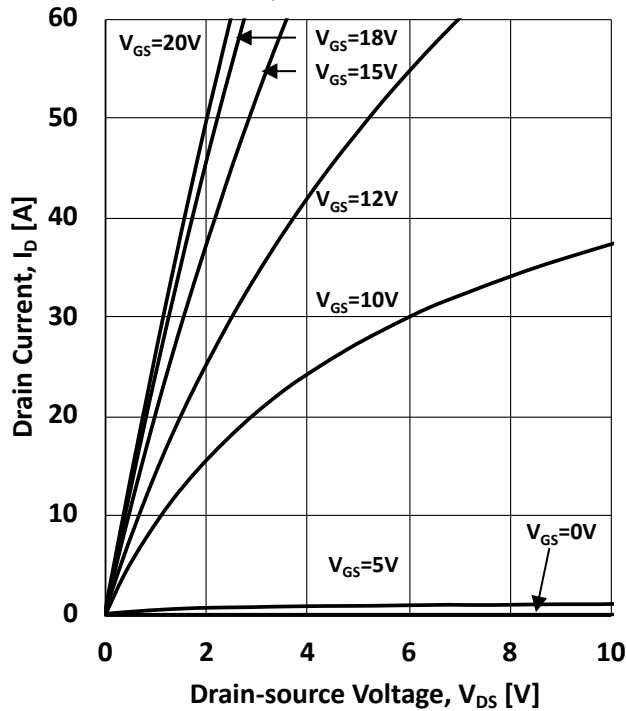


Figure 2. Output characteristics

$I_D = f(V_{DS}, V_{GS}); T_j = 200^\circ\text{C}$

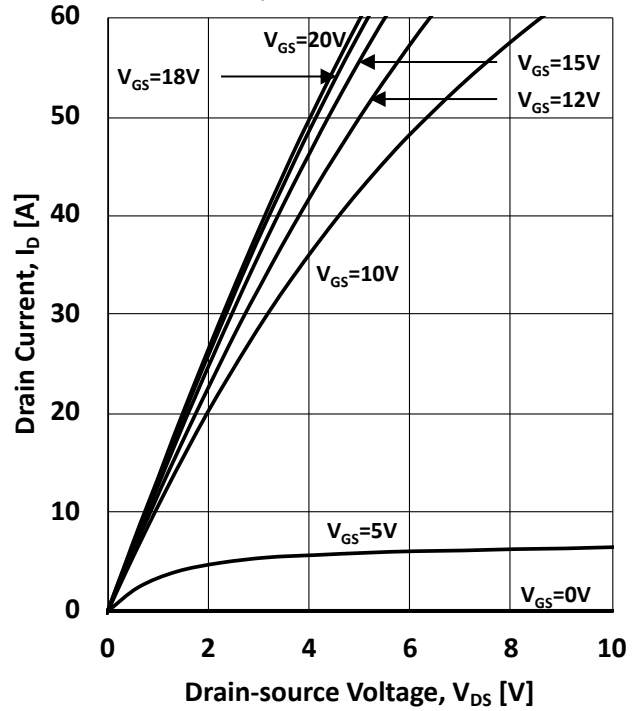


Figure 3. Threshold voltage

$V_t = f(T_j); V_{DS} = V_{GS}; I_D = 10\text{ mA}$

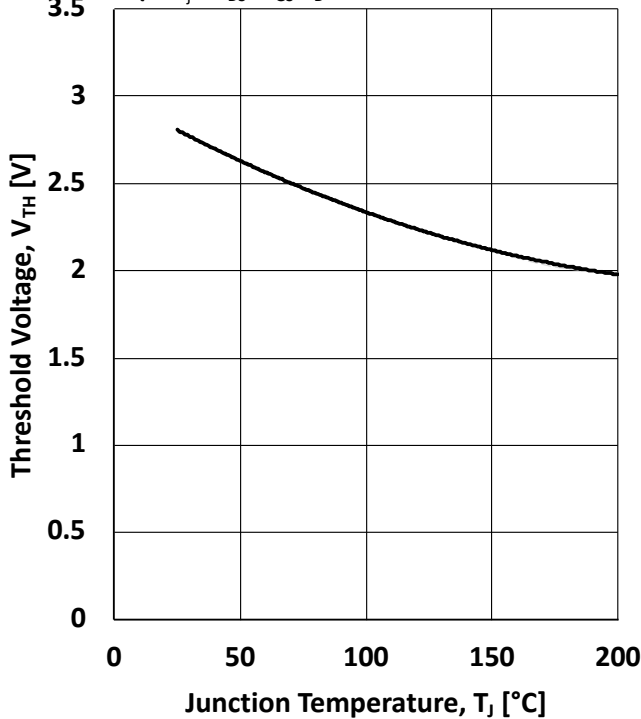


Figure 4. Drain-source on-state resistance

$R_{DS(on)} = f(T_j); I_D = 40\text{ A}$

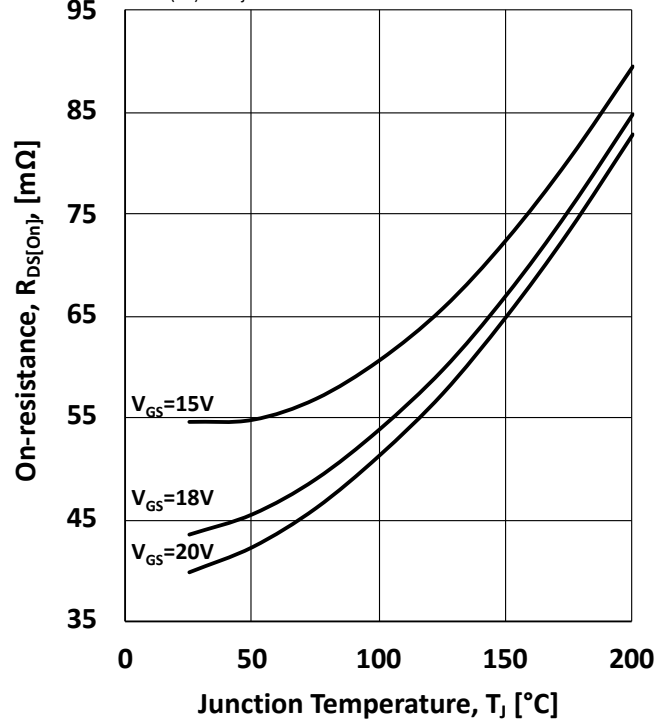




Figure 5. Drain-source on-state resistance

$$R_{DS(on)} = f(I_D); T_J = 25^\circ\text{C}$$

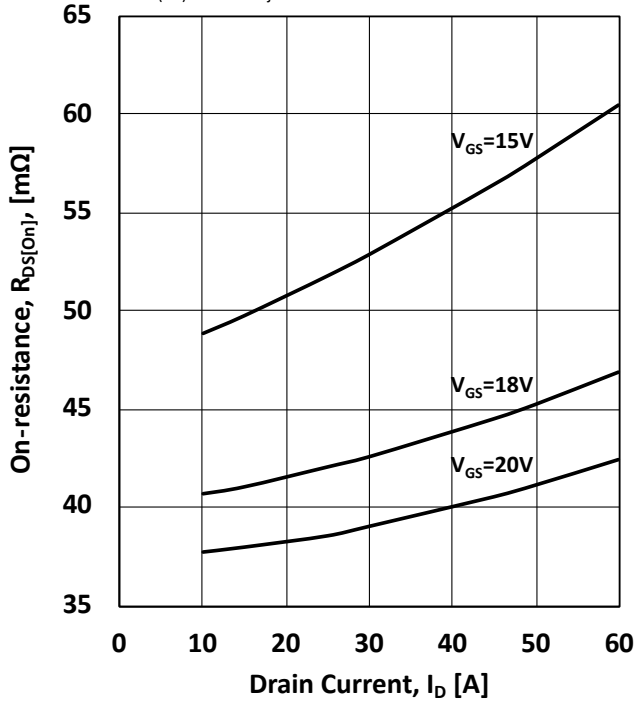


Figure 6. Drain-source on-state resistance

$$R_{DS(on)} = f(T_J); V_{GS} = 20\text{ V}$$

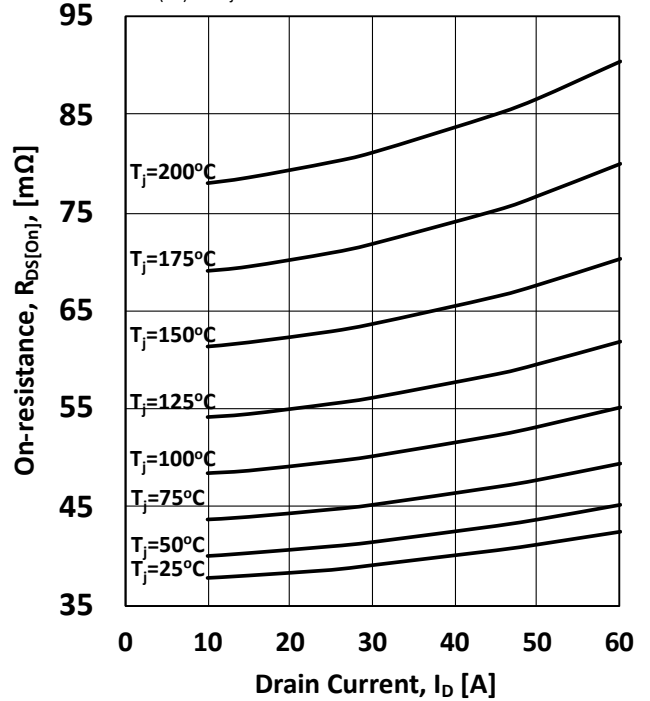


Figure 7. Third quadrant characteristics

$$I_D = f(V_{DS}, V_{GS}); T_J = 25^\circ\text{C}$$

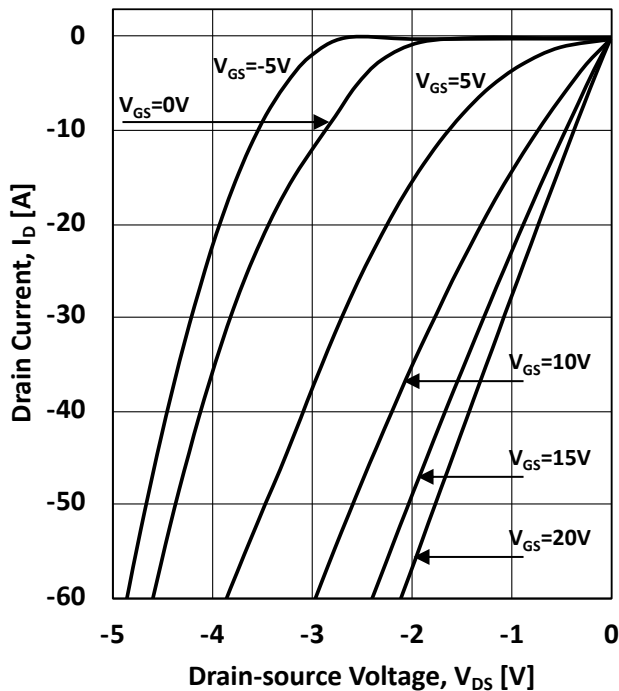


Figure 8. Third quadrant characteristics

$$I_D = f(V_{DS}, V_{GS}); T_J = 200^\circ\text{C}$$

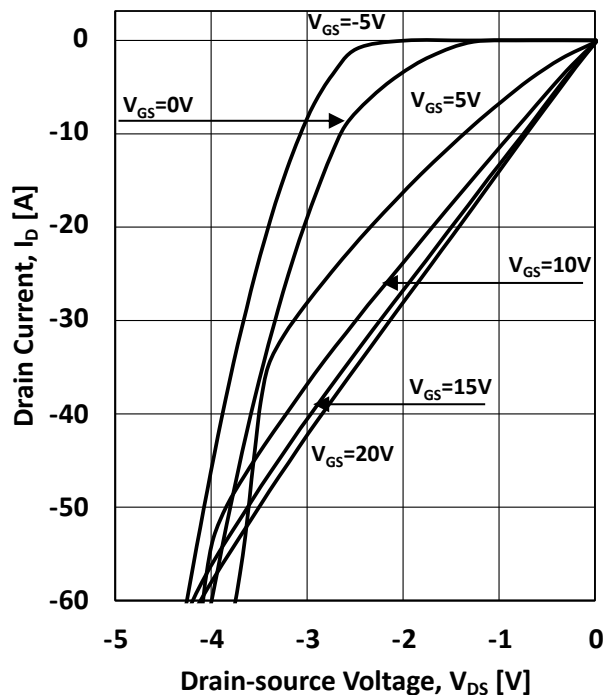




Figure 9. Capacitances

$C=f(V_{DS})$; $f=100\text{ kHz}$

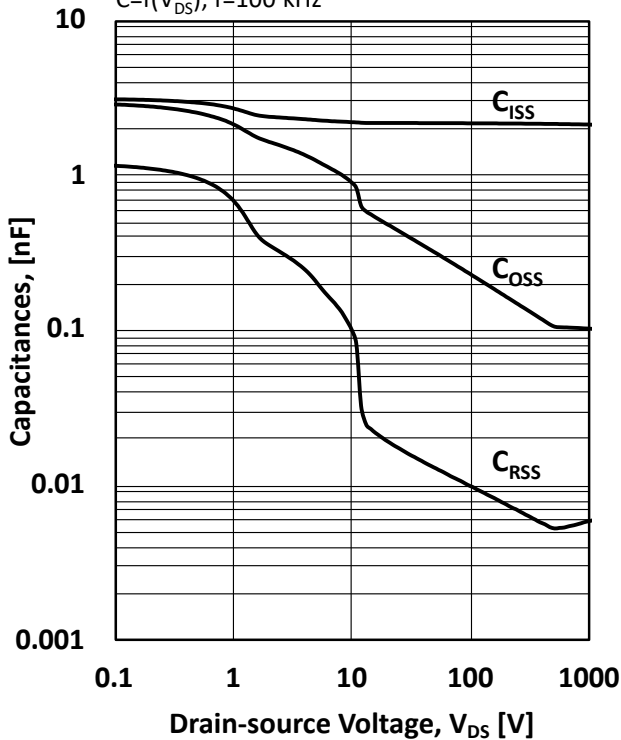


Figure 10. Inductive switching energies (see Fig. 17)

$E_{ON}=f(I_D)$; $E_{OFF}=f(I_D)$; $E_{TOT_SW}=f(I_D)$

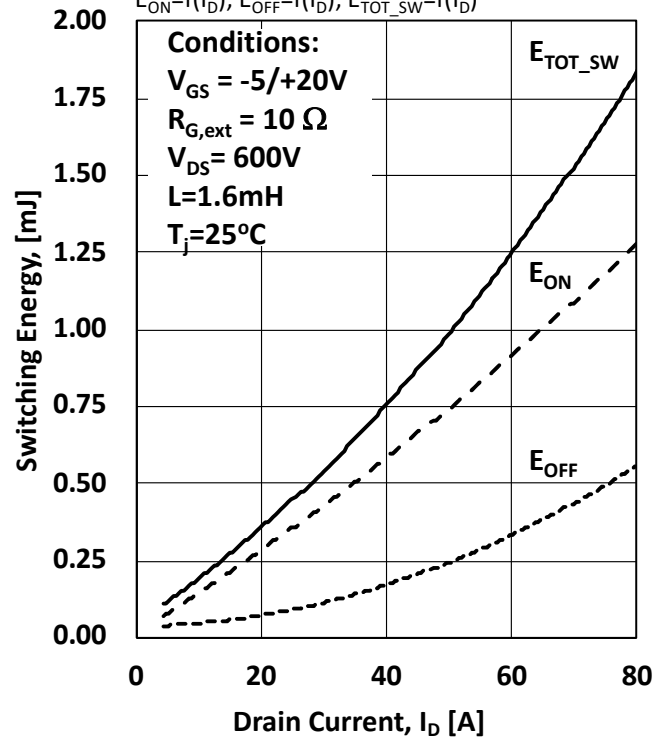


Figure 11. Typical unclamped inductive switching waveforms $I_D=f(t)$; $V_{DS}=f(t)$

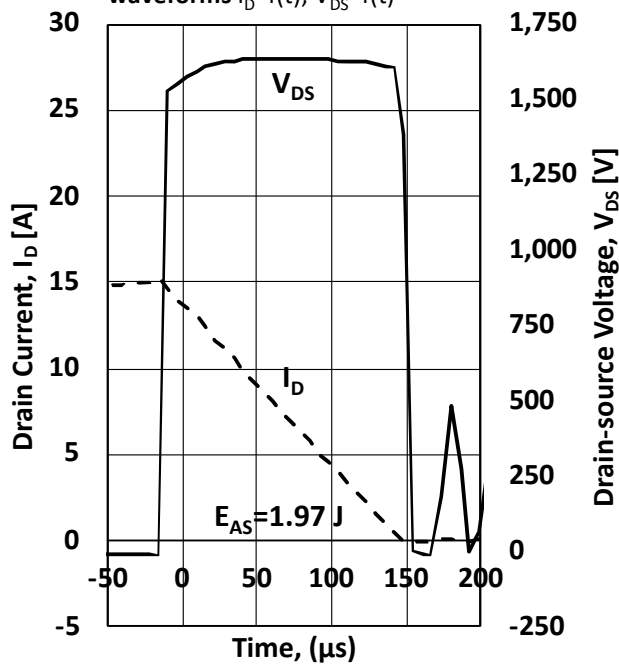


Figure 12. Gate charge

$V_{GS}=(-5 \dots +18V)$; $V_{DS}=900V$; $I_{DS}=30A$; $T_j=25^\circ C$

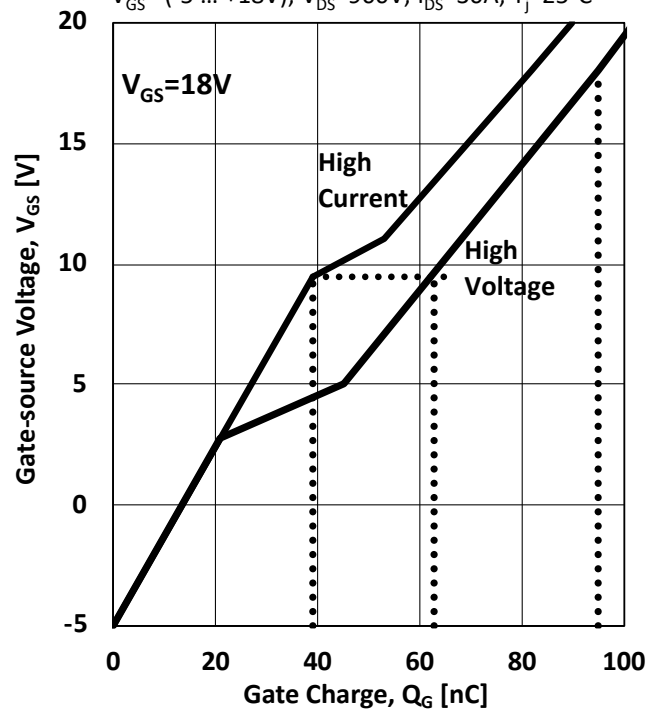


Figure 13. Transfer characteristic

$$I_D = f(V_{GS}); V_{DS} = 10 \text{ V}$$

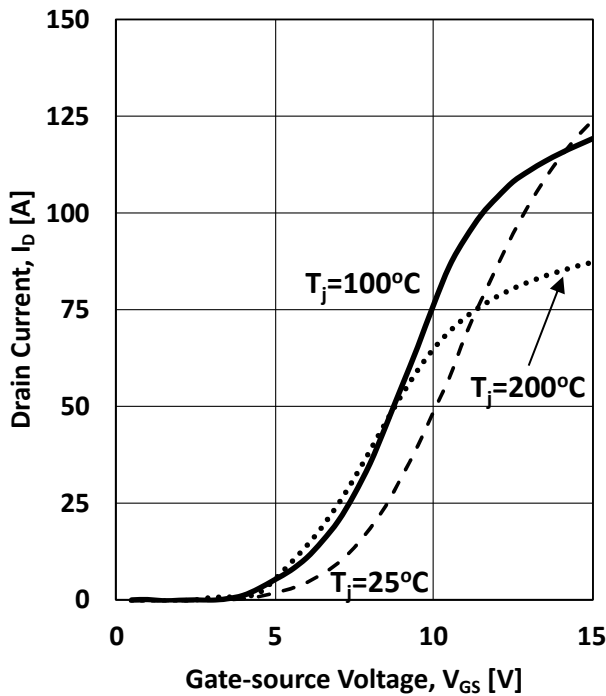


Figure 14. Power dissipation

$$P_{\text{tot}} = f(T_C)$$

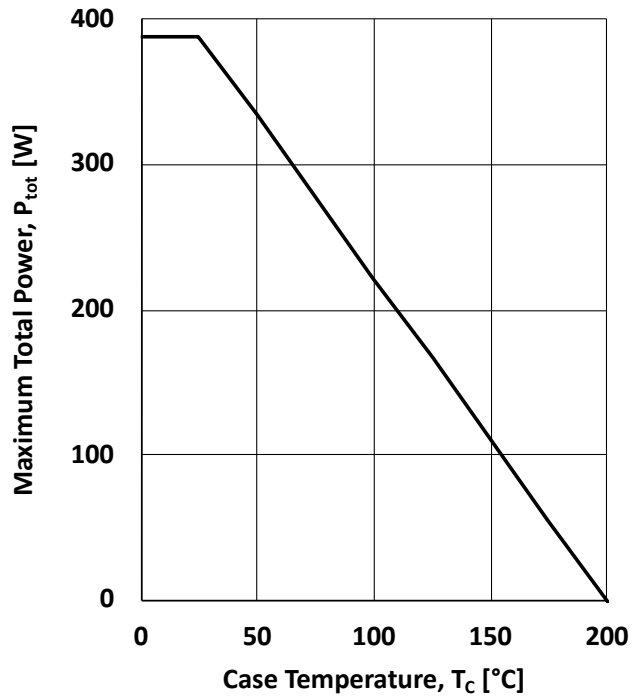


Figure 15. Transient thermal impedance

$$Z_{\text{th,jc}} = f(t_p, D); D = t_p / (\text{period})$$

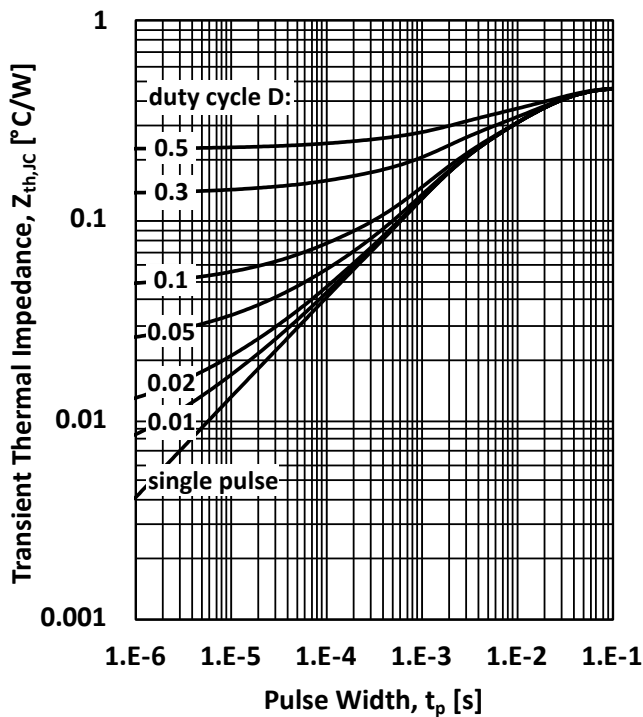


Figure 16. Safe operating area

$$I_D = f(V_{DS}, t_p); T_C = 25^\circ\text{C}; D = 0 \text{ (single pulse)}$$

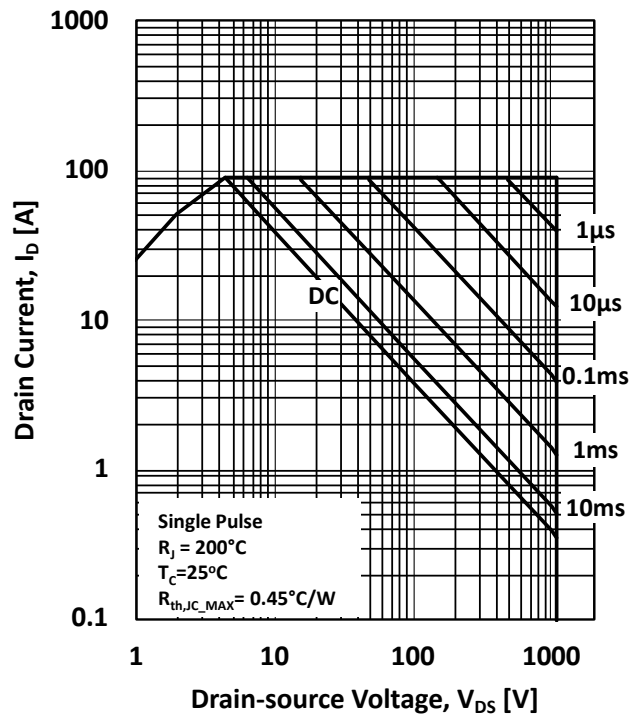




Figure 17. Clamped inductive switching test circuit

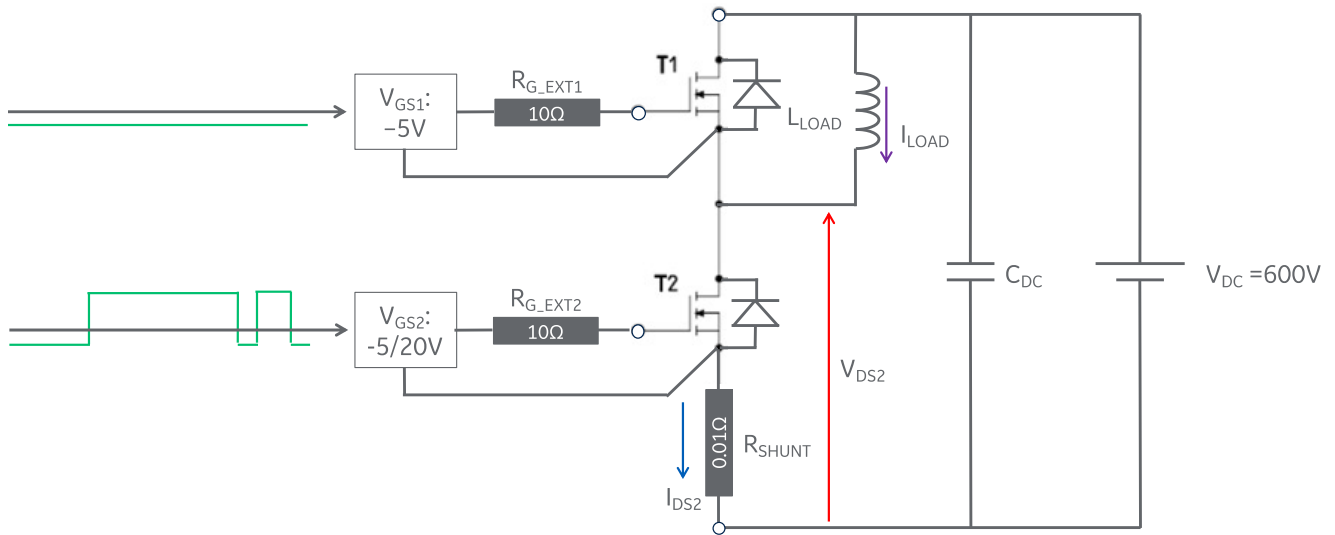


Figure 18. Switching waveforms for transition times

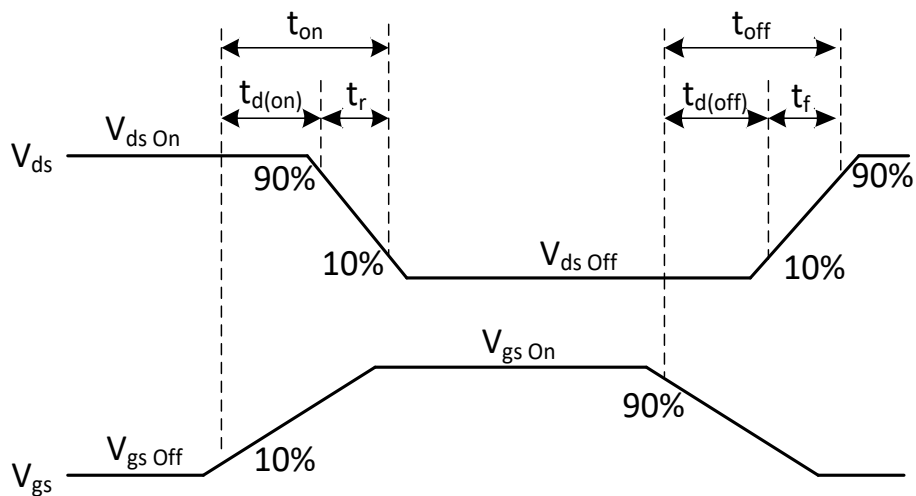
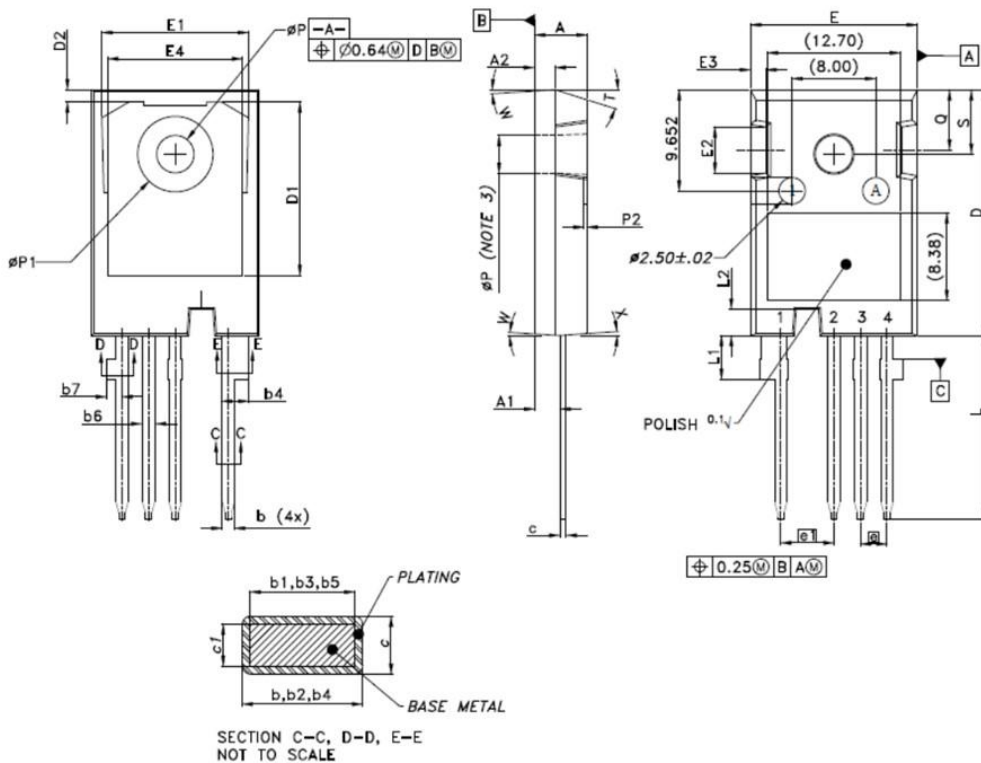


Figure 19. Part Dimensions (mm)



AREA	MIN	NOM	MAX
A	4.83	5.02	5.21
A1	2.29	2.415	2.54
A2	1.86	1.99	2.12
D	23.30	23.45	23.60
D1	15.85	16.55	17.25
D2	1.02	1.17	1.32
E	15.75	15.94	16.13
E1	13.89	14.02	14.15
E2	5.68	4.39	5.10
E3	1.00	1.45	1.90
E4	12.38	12.91	13.43
e		2.540 BSC	
e1		5.080 BSC	
L	17.31	17.57	17.82
L1	3.97	4.17	4.37
L2	2.35	2.50	2.65
b	1.07	—	1.33
b1	1.07	1.20	1.28
b2	2.39	—	2.64
b3	2.39	—	2.69
b4	2.39	—	2.94
b5	2.39	2.53	2.84
b6	1.07	—	1.60
b7	1.30	—	1.70
c	0.55	—	0.68
c1	0.55	0.60	0.65
øP	3.51	3.58	3.65
Q	5.49	5.75	6.00
S	6.04	6.15	6.30
øP1		7.18 REF	
T		17.5° REF	
W		3.5° REF	
X		4° REF	
P2	0.05	0.175	0.30

NOTES:

1. DIMENSIONS ARE IN MILLIMETERS
2. DIMENSION D & E DO NOT INCLUDE MOLD FLASH, MOLD FLASH SHALL NOT EXCEED 0.127 MM PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREME OF THE PLASTIC BODY.
3. #P TO HAVE A MAXIMUM DRAFT ANGLE OF 1.5° TO THE TOP OF THE PART WITH A MAXIMUM HOLE DIAMETER OF 3.65mm.
4. ADDED DIMENSION P2 TO SPECIFY EJECTION MARK DEPTH



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