

1200V SiC MOSFET

Features

- High blocking voltage with low $R_{DS(on)}$
- High frequency operation with low Capacitance
- Simple to drive with -4V/+15V gate
- Robust body diode with low Q_{rr}
- 100% Avalanche Tested

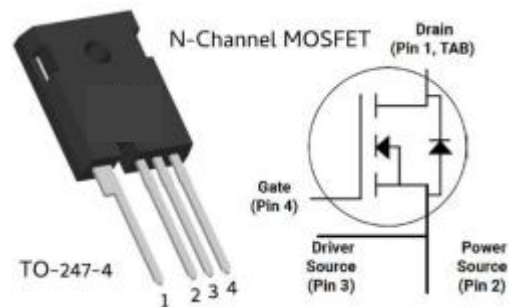
Applications

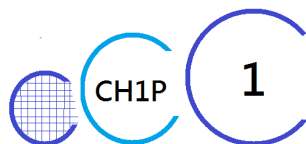
- EV motor drives
- EV/HEV charging station
- Energy storage and Battery charging
- High voltage DC-DC converters
- Solar / Wind Inverters
- UPS and PFC

Product Summary

Item	Typical Value	Unit
V_{DS}	1200	V
$R_{DS(on)}$ @ $V_{GS} = 15V$ (Typ)	15	$m\Omega$
I_D	155	A

Pin Description





preliminary

CMU15C120NH-2474

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

Parameter	Symbol	Value	Units
Drain-Source Voltage	V_{DS}	1200	V
Gate-Source Voltage	V_{GS}	-4/+15	V
Continuous Drain Current	I_{DS}	155	A
Pulsed Drain Current	I_{DM}	313	A
Total Power Dissipation	P_D	652	W
Junction Temperature Maximum	T_{JMAX}	175	$^{\circ}\text{C}$
Storage Temperature	$T_{Storage}$	-55 to 175	$^{\circ}\text{C}$

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

Static ($T_J=25^\circ\text{C}$ unless otherwise specified)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	1200	---	---	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 1200V, V_{GS} = 0V$	---	---	60	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = 15V, V_{DS} = 0V$	0	5	100	nA
		$V_{GS} = -4V, V_{DS} = 0V$	-100	-5	0	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 15V, I_D = 75A$	---	15	20	m Ω
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 30mA$	1.8	---	3.2	V
Diode Forward Voltage	V_{SD}	$I_S = 40A, V_{GS} = -4V$	---	4.2	---	V
Dynamic ($T_J=25^\circ\text{C}$ unless otherwise specified)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance	C_{iss}	$V_{GS} = 0V, V_{DS} = 1000V, f = 100kHz$	---	6550	---	pF
Output Capacitance	C_{oss}		---	202	---	
Reverse Transfer Capacitance	C_{rss}		---	10	---	
Turn-On Switching Energy	E_{ON}	$V_{DS} = 800V, I_D = 75A, V_{GS} = -4V/15V, R_G=2\Omega, L=200\mu H$	---	804	---	μJ
Turn-Off Switching Energy	E_{OFF}		---	201	---	
Total Gate Charge	Q_g	$V_{DS} = 800V, I_D = 75A, V_{GS} = -4V/15V$	---	235	---	nC
Gate-Source Charge	Q_{gs}		---	74	---	
Gate-Drain Charge	Q_{gd}		---	73	---	
Turn-on delay time	$T_{d(on)}$	$V_{DS} = 800V, I_D = 75A, V_{GS} = -4V/15V, R_G=2\Omega, L=200\mu H$	---	15	---	nS
Rise time	T_r		---	33	---	
Turn-off delay time	$T_{d(off)}$		---	63	---	
Fall time	T_f		---	14	---	
Internal gate input resistance	R_g	$f=1MHz, I_D = 0A$	---	3	---	Ω

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

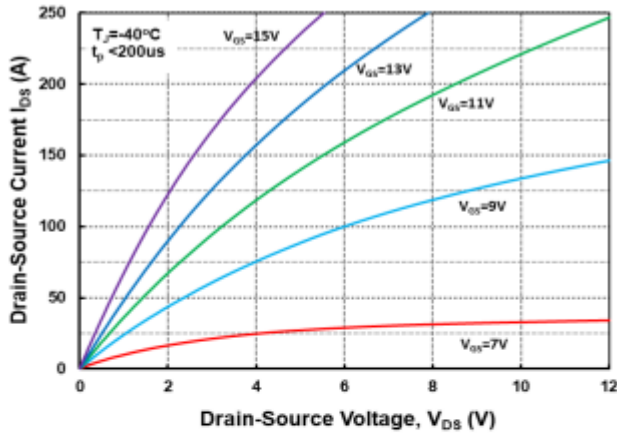


Figure 1. Output Characteristics, $T_J = -40^\circ\text{C}$

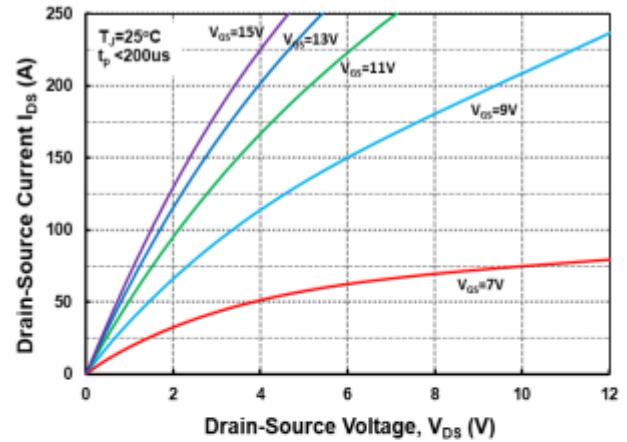


Figure 2. Output Characteristics, $T_J = 25^\circ\text{C}$

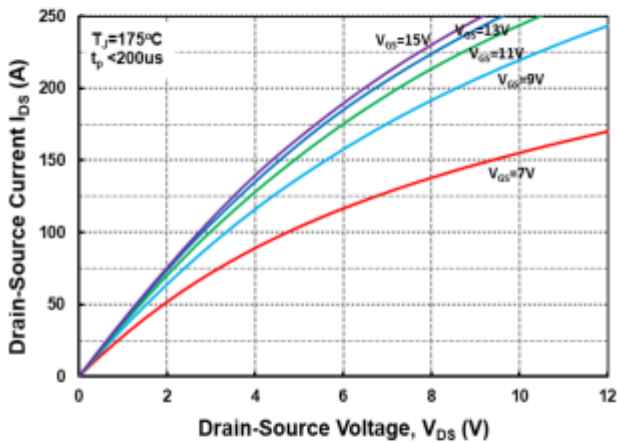


Figure 3. Output Characteristics, $T_J = 175^\circ\text{C}$

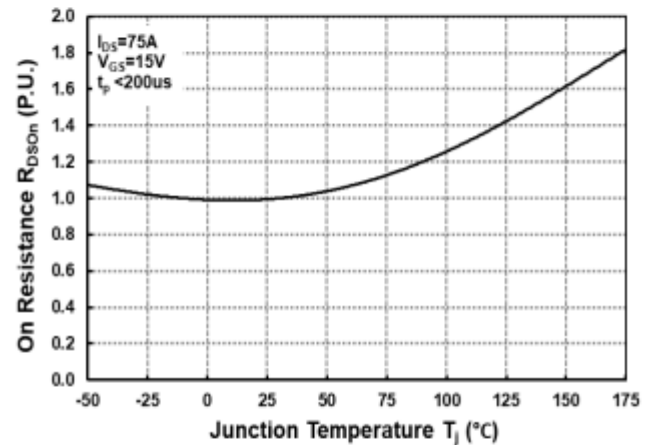


Figure 4. Normalized On-Resistance vs. Temperature

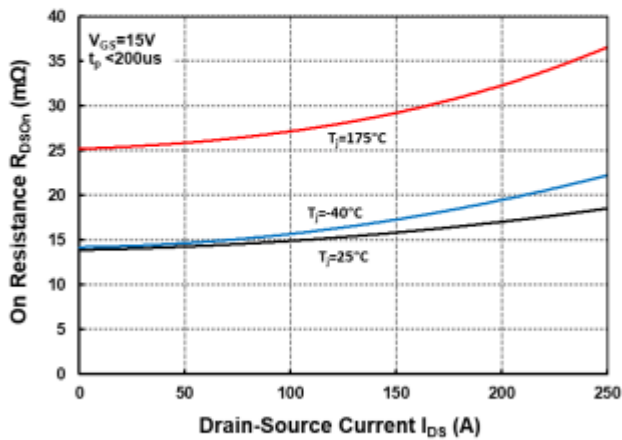


Figure 5. On-Resistance vs. Drain Current for Various Temperatures

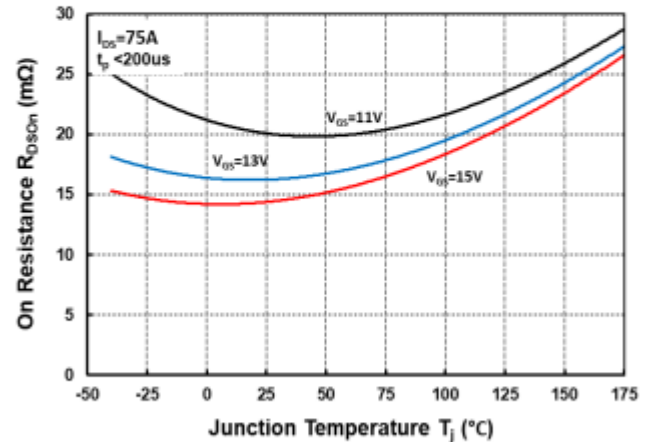


Figure 6. On-Resistance vs. Temperature for Various Gate Voltage

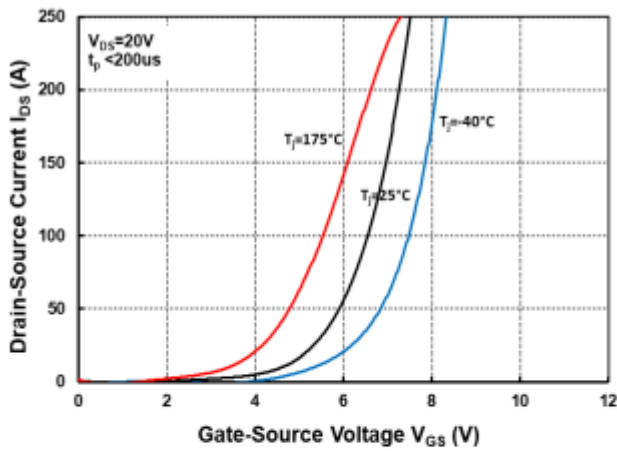


Figure 7. Transfer Characteristic for Various Junction Temperatures

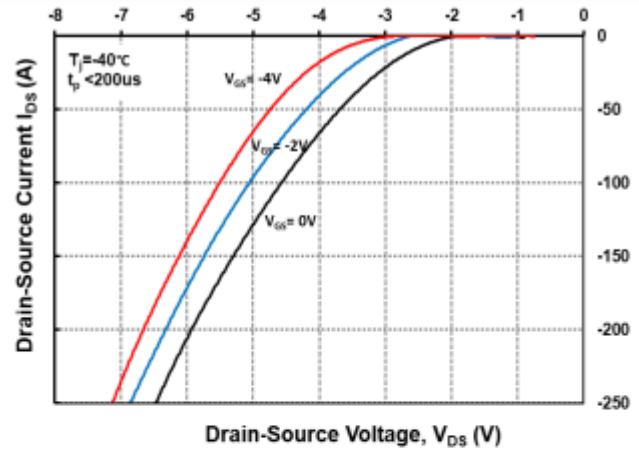


Figure 8. Body Diode Characteristics @ -40°C

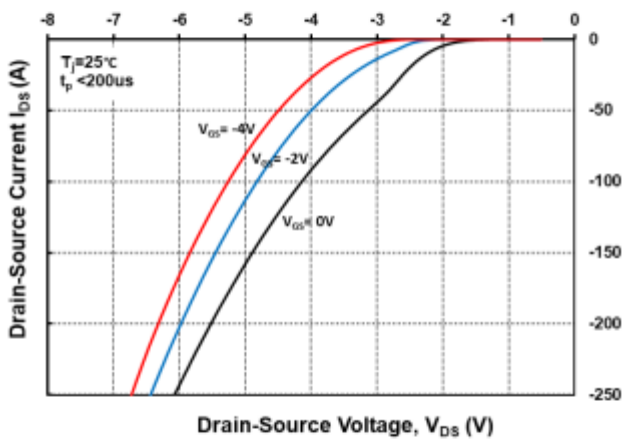


Figure 9. Body Diode Characteristics @ 25°C

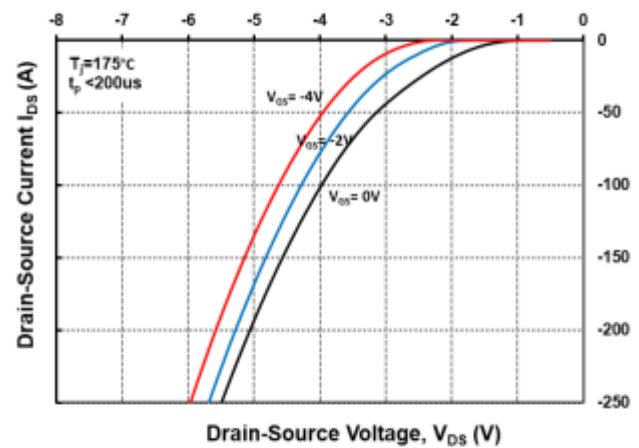


Figure 10. Body Diode Characteristics @ 175°C

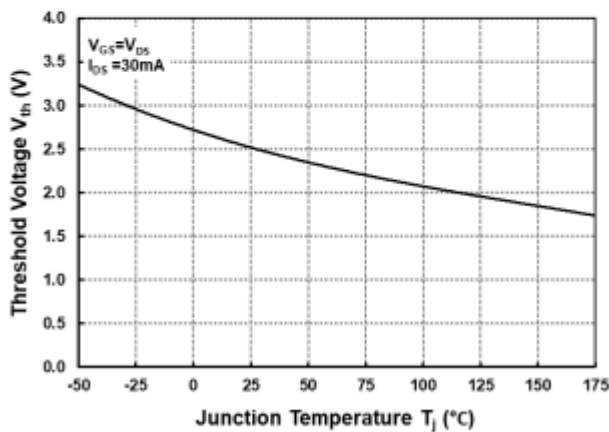


Figure 11. Threshold Voltage vs. Temperature

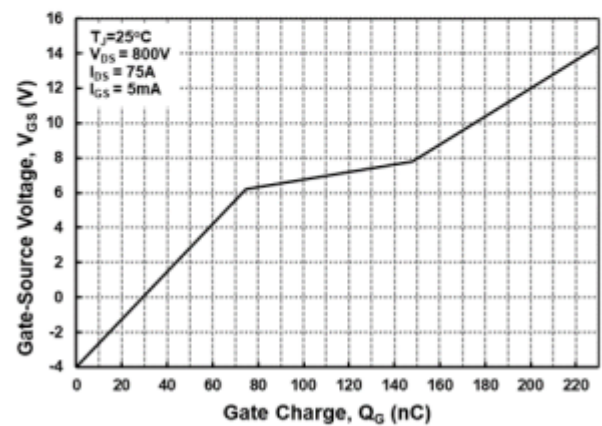


Figure 12. Gate Charge Characteristics

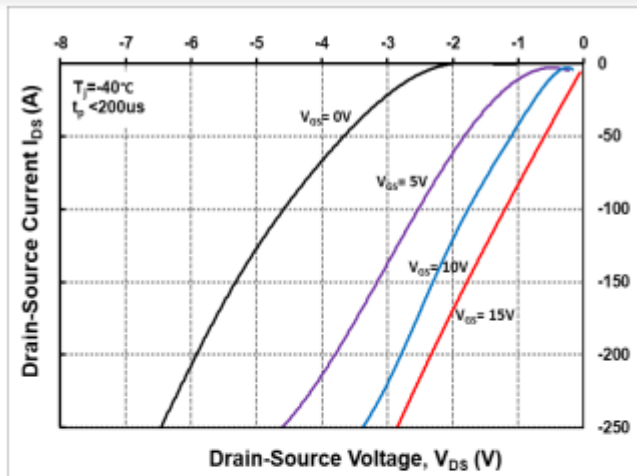


Figure 13. 3rd Quadrant Characteristics @ -40°C

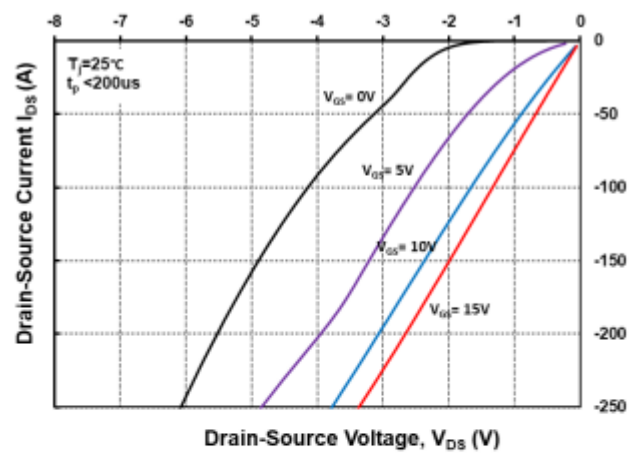


Figure 14. 3rd Quadrant Characteristics @ 25°C

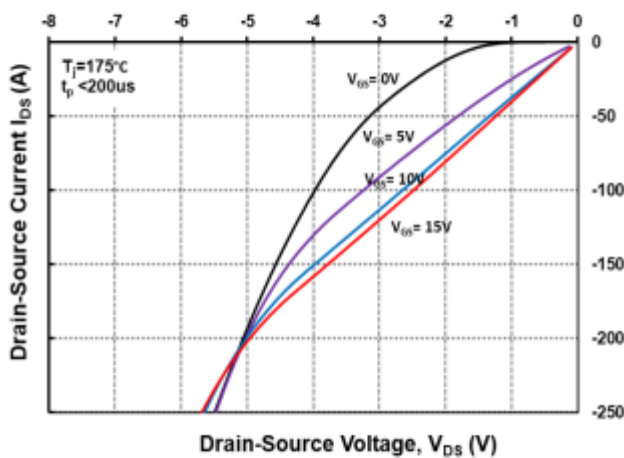


Figure 15. 3rd Quadrant Characteristics @ 175°C

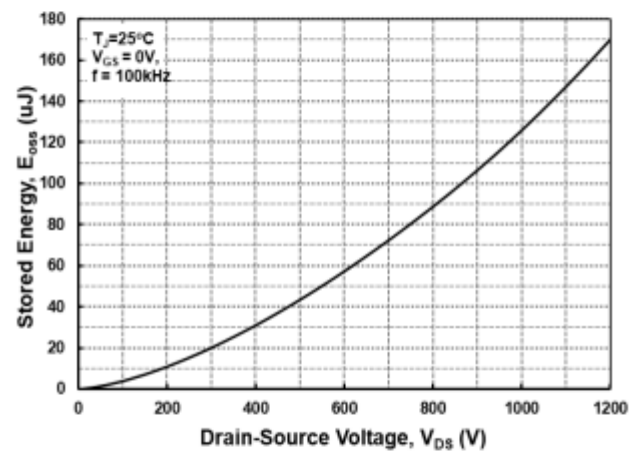


Figure 16. Output Capacitor Stored Energy

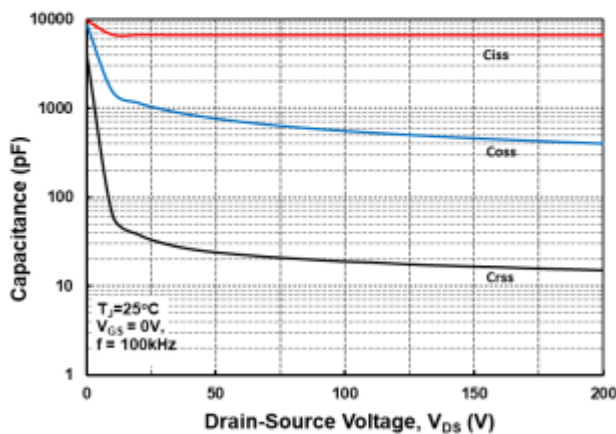


Figure 17. Capacitances vs. Drain-Source Voltage (0-200V)

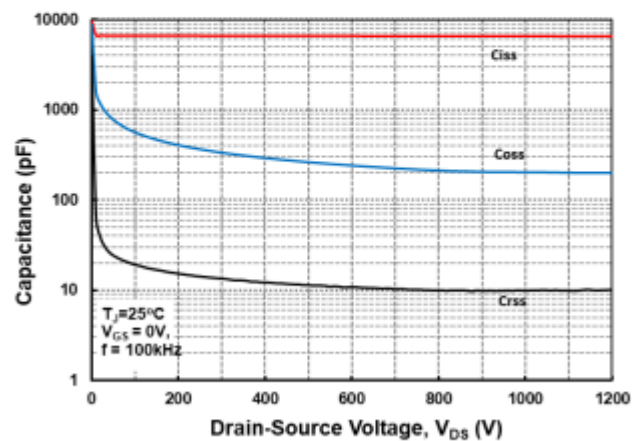


Figure 18. Capacitances vs. Drain-Source Voltage (0-1200V)

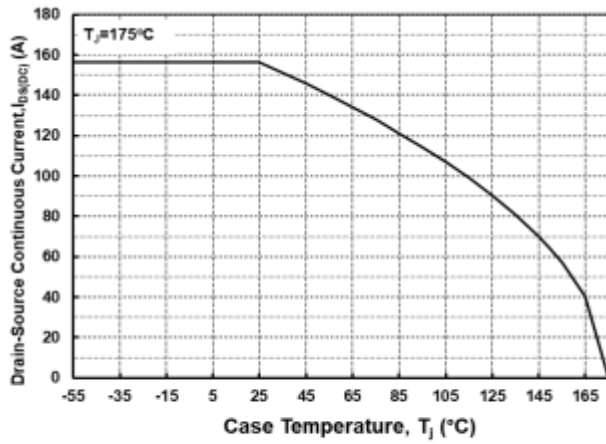


Figure 19. Continuous Drain Current Derating vs. Case Temperature

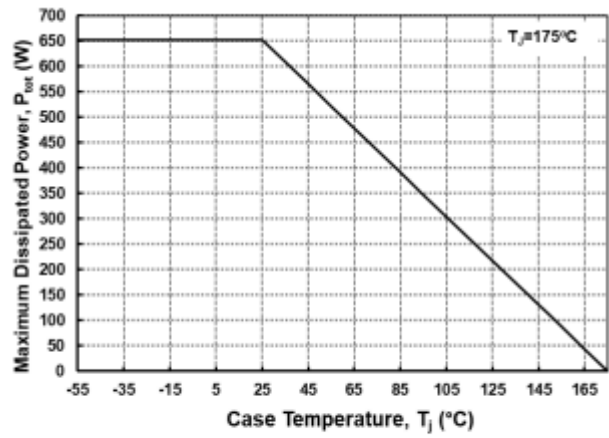
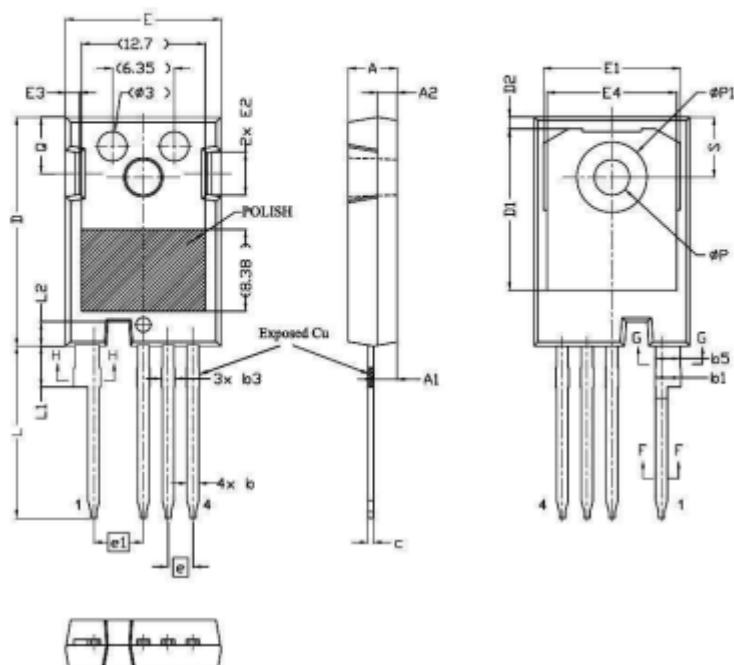


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

Package Dimensions

(TO-247-4 Package)



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b'	1.07	1.20	1.28
b	1.07	1.20	1.33
b1	2.39	2.67	2.94
b2	2.39	2.67	2.84
b3	1.07	1.30	1.60
b4	1.07	1.30	1.50
b5	2.39	2.53	2.69
b6	2.39	2.53	2.64
c	0.55	0.60	0.68
c1	0.55	0.60	0.65
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
D2	0.95	1.19	1.25
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e	2.54 BSC		
e1	5.08 BSC		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
ϕP	3.51	3.61	3.65
$\phi P1$	7.19 REF.		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30

Recommended Solder Pad Layout

