

FMOSCP115N65-H

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FMOSCP115N65-H

115A 650V N-Channel Enhancement Mode Silicon Carbide Power MOSFET

Features

- $V_{DS} = 650V$, $I_D = 115A$.
- $R_{DS(ON)} \leq 26m\Omega$, @ $V_{GS} = 20V$, $I_D = 50A$.
- Low on-resistance and high current density.
- Low capacitance for high frequency operation.
- Low impedance Kelvin source pin-out.
- Ultra-high avalanche ruggedness.
- Positive temperature coefficient device.
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21).

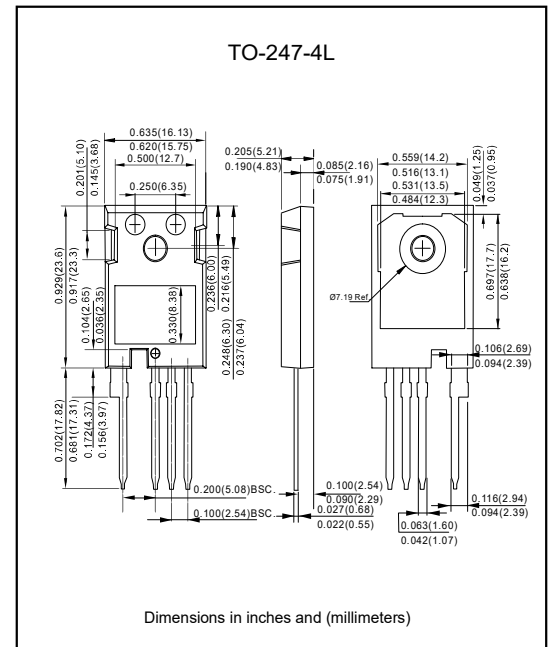
Applications

- Solar/ wind renewable energy, and power inverters.
- DC/DC converters, UPS, and PFC.
- Switching mode power supply, EV charging station, and motor drives.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : Molded plastic, TO-247-4L.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Mounting Position : Any.

Package outline



Maximum ratings (At $T_c=25^\circ C$ unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Maximum drain to source voltage ($V_{GS}=0V$, $I_D=100\mu A$)	V_{DS}	650	V
Recommend Gate-source voltage Static, recommended DC operating values	$V_{GS(OP)}$	-5 to +20	V
Maximum Gate-source voltage Transient operating limit (AC f > 1Hz, duty cycle < 1%)	$V_{GS(Max)}$	-10 to +25	V
Continuous drain current, @ $V_{GS}=20V$ ($T_c=25^\circ C$) ($T_c=110^\circ C$)	I_D	115	A
		72	
Pulsed drain current, t_{PW} limitation per Fig. 15	$I_{D(pulse)}$	281	A
Avalanche energy, single pulse ($V_{DD}=100V$, $I_D=14A$)	E_{AS}	3.2	J
Power dissipation ($T_c=25^\circ C$)	P_D	375	W
Mounting torque (M3 or 6-32 screw)	M_d	1	Nm
Typical thermal resistance, junction to case	$R_{\theta JC}$	0.4 (Typ.)	$^\circ C/W$
Soldering temperature	T_L	260	$^\circ C$
Junction temperature	T_J	+175	$^\circ C$
Storage temperature range	T_{STG}	-55 to +175	$^\circ C$

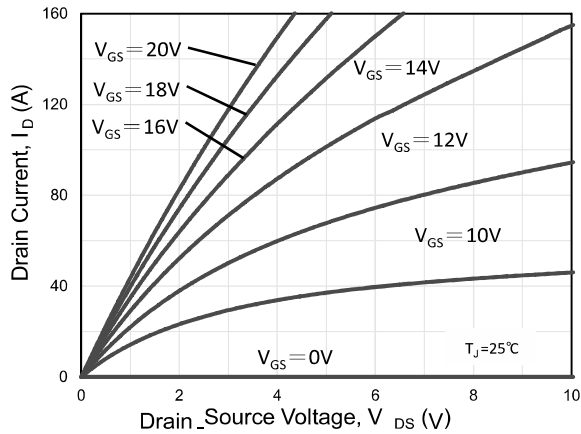
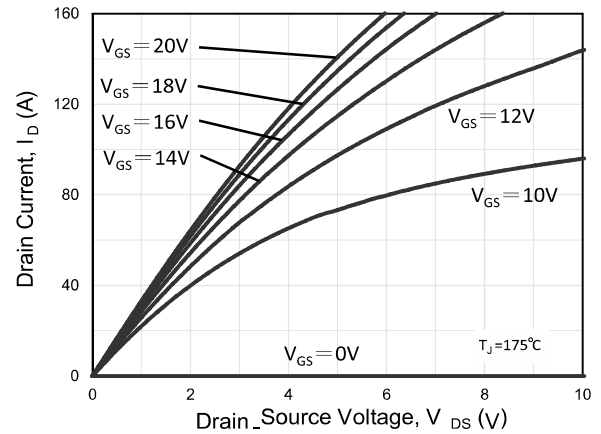
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Electrical characteristics (At $T_c=25^{\circ}\text{C}$ unless otherwise specified)

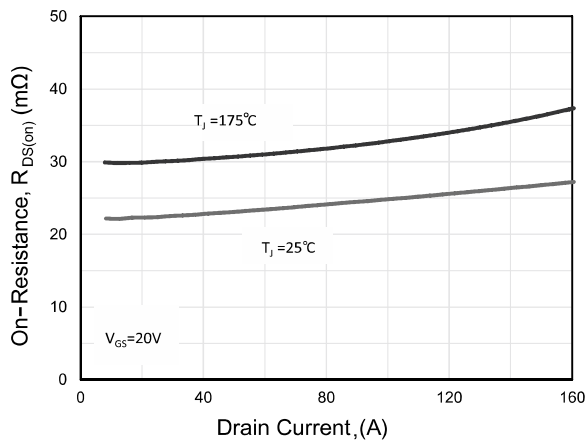
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Off characteristics						
Drain-source breakdown voltage	BV _{DSS}	I _D =100μA, V _{GS} =0V	650			V
Drain-source leakage current	I _{DSS}	V _{DS} =650V, V _{GS} =0V		<1	100	μA
		V _{DS} =650V, V _{GS} =0V, T _J =175°C		10	500	
Gate-source leakage current	I _{GSS}	V _{GS} =20V, V _{DS} =0V			250	nA
On characteristics						
Gate threshold voltage	V _{GS(TH)}	V _{DS} =10V, I _{DS} =50mA		2.2	3.0	V
Static drain-source on-state resistance	R _{DS(ON)}	V _{GS} =20V, I _{DS} =50A		20	26	mΩ
		V _{GS} =20V, I _{DS} =50A, T _J =175°C		30		
Transconductance	g _{FS}	V _{DS} =10V, I _{DS} =60A		18.2		S
Dynamic parameters						
Input capacitance	C _{iss}	V _{GS} =0V, V _{DS} =400V, f=1.0MHz, V _{AC} =25mV		4838		pF
Out capacitance	C _{oss}			359		
Reverse transfer capacitance	C _{rss}			47		
Effective output capacitance, energy related	C _{o(er)}	V _{GS} =0V, V _{DS} =0 to 400V		445		
Effective output capacitance, time related	C _{o(tr)}	I _D =const. , V _{GS} =0V, V _{DS} =0 to 400V		616		
C _{OSS} Stored energy	E _{OSS}	V _{GS} =0V, V _{DS} =400V, f=1.0MHz, V _{AC} =25mV		34		μJ
Turn-on switching energy	E _{ON}	V _{DS} =400V, V _{GS} =0/+20V, I _D =50A, R _{G(ext)} =2.7Ω		229		
Turn-off switching energy	E _{OFF}			119		
Internal gate resistance	R _{G(int)}	f=1.0MHz, V _{AC} =25mV		0.6		Ω
Gate to source charge	Q _{gs}	V _{DS} =400V, V _{GS} =-5V/+20V, I _D =50A		80		nC
Gate to drain charge	Q _{gd}			75		
Total gate charge	Q _g			287		
Gate plateau voltage	V _{pl}			7.6		V
Short- circuit withstand time	t _{sc}	V _{GS} =0/15V , V _{DS} =400V, R _G =100Ω		<18		μs
Turn-on delay time	t _{d(on)}	V _{DS} =400V, V _{GS} =-4V/+20V, I _D =35A, R _L =11.4Ω, R _{G(ext)} =2.7Ω		29		ns
Rise time	t _r			51		
Turn-off delay time	t _{d(off)}			30		
Fall time	t _f			16		
Built-in SiC diode characteristics						
Diode forward voltage	V _{SD}	I _{SD} =10A, V _{GS} =0V		2.9		V
Diode continuous current	I _S	V _{GS} =0V, T _C =25°C		61.5		A
Peak reverse recovery current	I _{rrm}	V _{GS} =0V, I _{SD} =30A, V _{DS} =400V, di/dt=300A/μs		6.9		A
Reverse recovery time	t _{rr}			77		ns
Reverse recovery charge	Q _{rr}			301		nC

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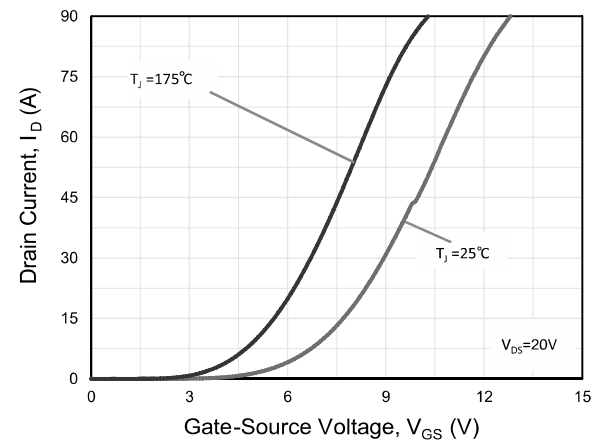
Rating and characteristic curves

Forward output characteristics at $T_J = 25^\circ\text{C}$ Forward output characteristics at $T_J = 175^\circ\text{C}$ 

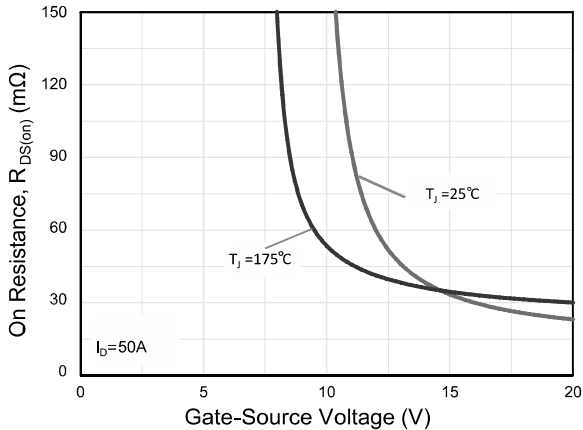
On-resistance vs. Drain current



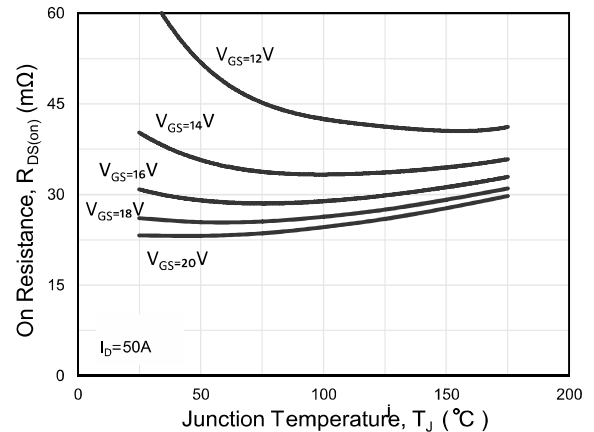
Transfer characteristics



On-resistance vs. Gate voltage

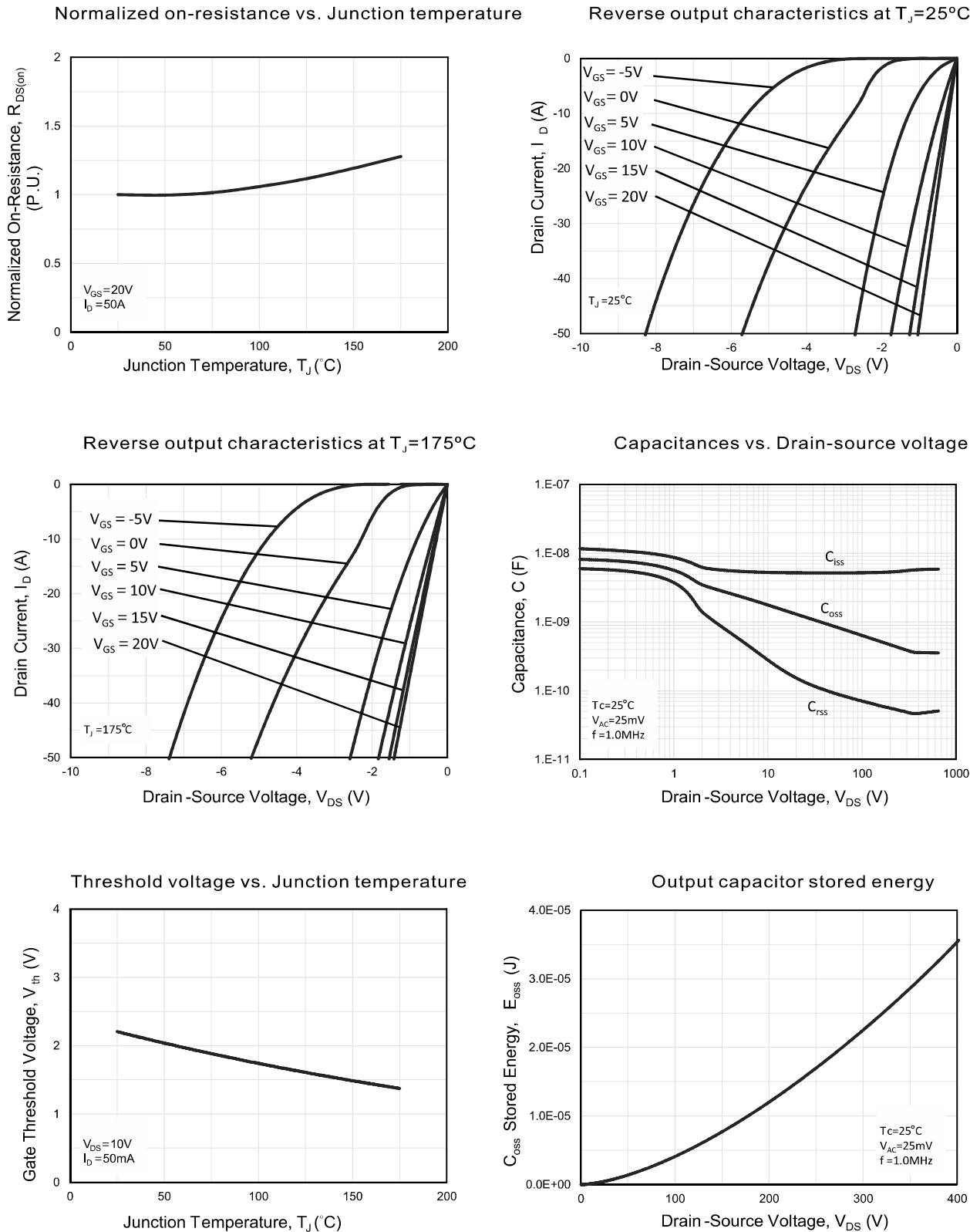


On-resistance vs. Junction temperature



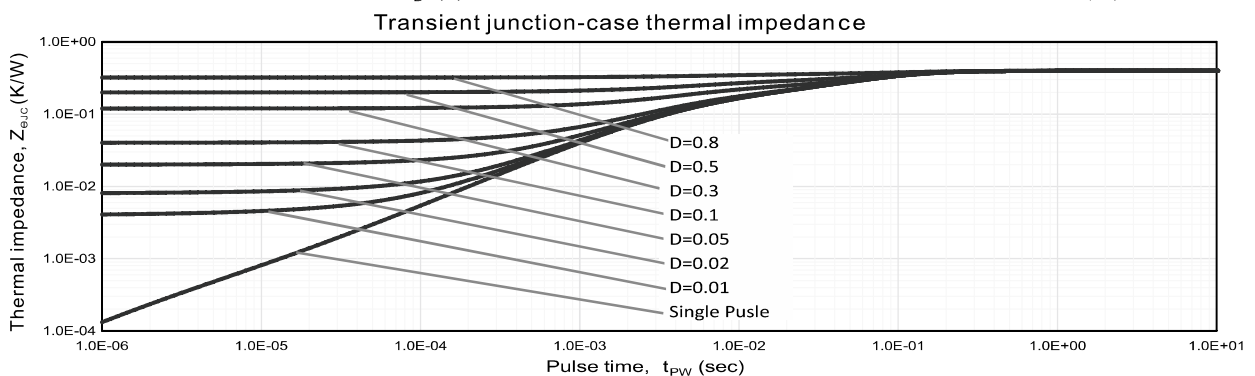
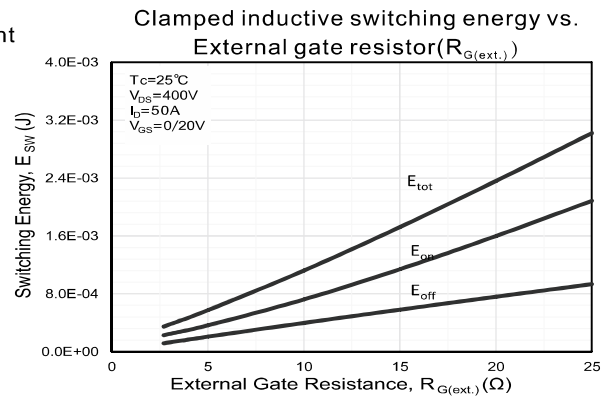
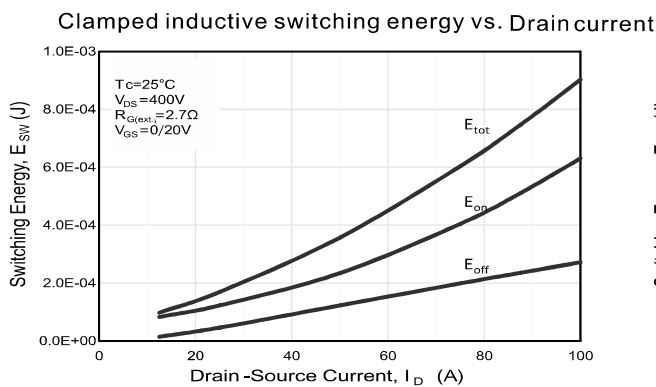
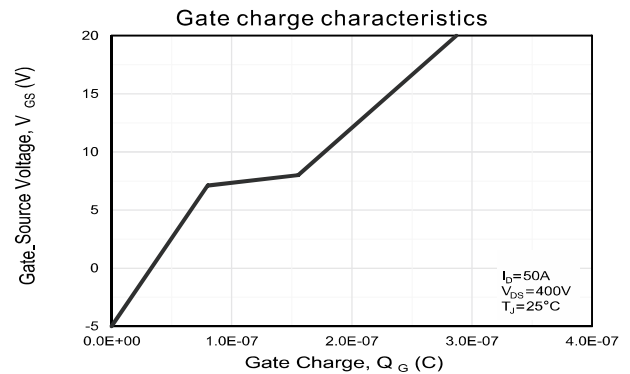
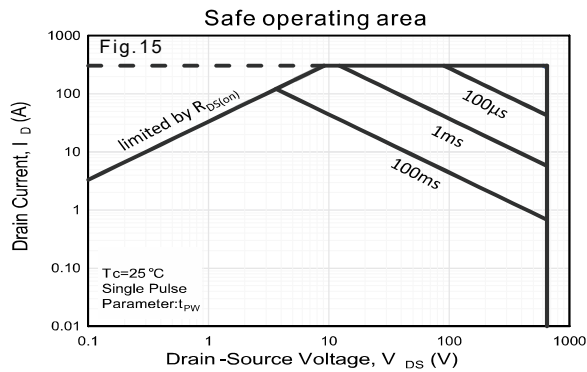
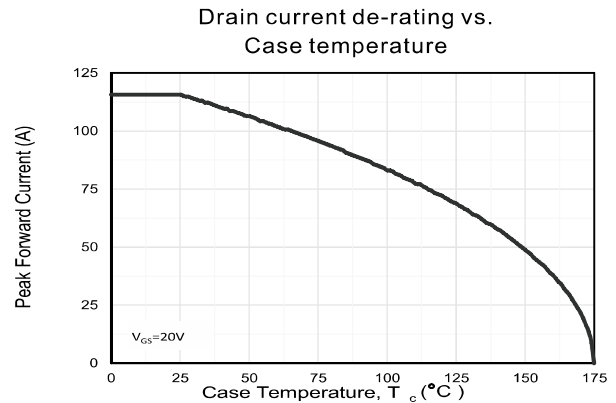
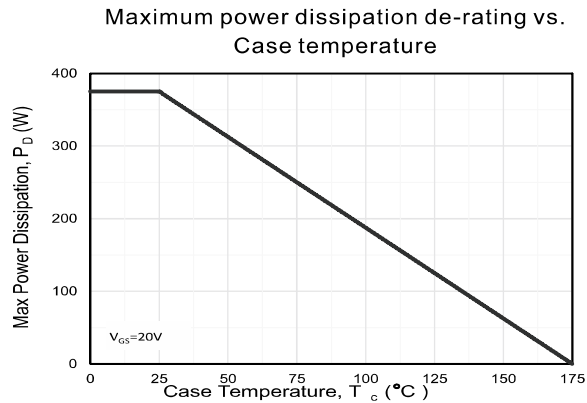
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Rating and characteristic curves



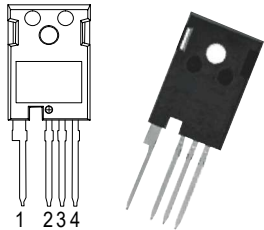
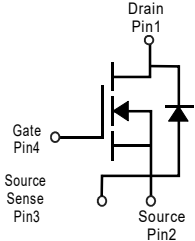
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Rating and characteristic curves



FMOSCPE115N65-H

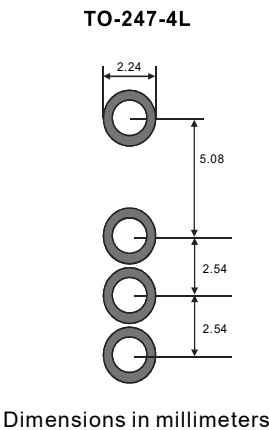
Pinning information

Pin	Simplified outline	Symbol
Pin 1 Drain Pin 2 Source Pin 3 Source sense Pin 4 Gate		

Marking

Type number	Marking code
FMOSCPE115N65-H	CPE115N65

Suggested solder pad layout

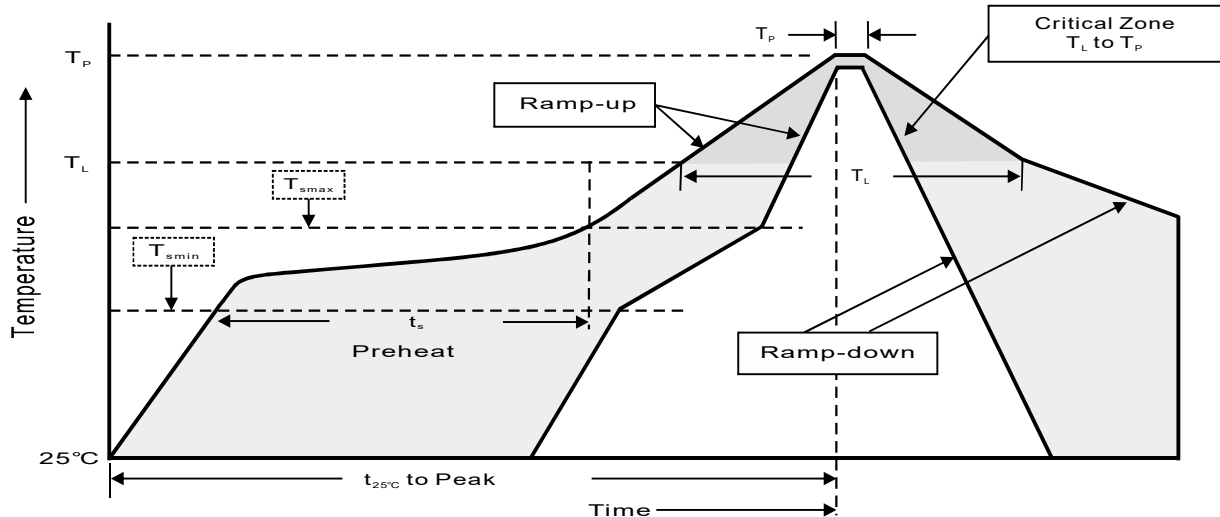


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Suggested thermal profiles for soldering processes

1.Storage environment: Temperature = 5°C ~ 40°C Humidity = 55%, ±25%

2.Reflow soldering of surface-mount devices



3.Reflow soldering

Profile feature	Soldering condition
Average ramp-up rate (T_L to T_p)	< 3 °C/sec
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (Min to Max) (t_s)	150°C 200°C 60 ~ 120 sec
T_{smax} to T_L - Ramp-up rate	< 3 °C/sec
Time maintained above : - Temperature (T_L) - Time (T_L)	217°C 60 ~ 260 sec
Peak temperature (T_p)	255 °C -0/+5°C
Time with 5°C of actual peak temperature (T_p)	10 ~30 sec
Ramp-down rate	< 6 °C/sec
Time 25°C to peak temperature	< 6 minutes