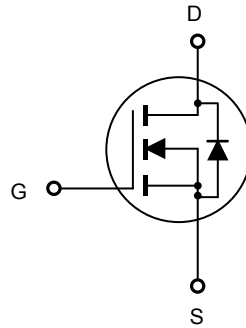# CED16N10L/CEU16N10L

N-Channel Enhancement Mode Field Effect Transistor

PRELIMINARY

FEATURES

■ 100V, 13.3A, $R_{DS(ON)}$ = 115mΩ @V_{GS} = 10V.

$R_{DS(ON)}$ = 125mΩ @V_{GS} = 5V.

■ Super high dense cell design for extremely low $R_{DS(ON)}$.

■ High power and current handing capability.

■ Lead free product is acquired.

■ TO-251 & TO-252 package.

CEU SERIES
TO-252(D-PAK)

CED SERIES
TO-251(I-PAK)

ABSOLUTE MAXIMUM RATINGS T_C = 25°C unless otherwise noted

Parameter	Symbol	Limit	Units
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	13.3	A
Drain Current-Pulsed [a]	I_{DM}	53	A
Maximum Power Dissipation @ T_C = 25°C	P_D	43	W
- Derate above 25°C		0.34	W/°C
Operating and Store Temperature Range	T_J, T_{stg}	-55 to 175	°C

Thermal Characteristics

Parameter	Symbol	Limit	Units
Thermal Resistance, Junction-to-Case	$R_{θJC}$	3.5	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{θJA}$	50	°C/W

CED16N10L/CEU16N10L

Electrical Characteristics T_C = 25°C unless otherwise noted

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0V, I_D = 250µA	100			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 100, V_{GS} = 0V			1	µA
Gate Body Leakage Current, Forward	I_{GSSF}	V_{GS} = 20V, V_{DS} = 0V			100	nA
Gate Body Leakage Current, Reverse	I_{GSSR}	V_{GS} = -20V, V_{DS} = 0V			-100	nA
On Characteristics [b]						
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS} = V_{DS}, I_D = 250µA	1		3	V
Static Drain-Source	$R_{DS(on)}$	V_{GS} = 10V, I_D = 6.5A		95	115	mΩ
On-Resistance		V_{GS} = 5V, I_D = 5A		100	125	mΩ
Forward Transconductance	g_{FS}	V_{DS} = 10V, I_D = 6.5A		5		S
Dynamic Characteristics [c]						
Input Capacitance	C_{iss}	V_{DS} = 25V, V_{GS} = 0V, f = 1.0 MHz		630		pF
Output Capacitance	C_{oss}			105		pF
Reverse Transfer Capacitance	C_{rss}			26		pF
Switching Characteristics [c]						
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 50V, I_D = 13.3A, V_{GS} = 10V, R_{GEN} = 25Ω		11	22	ns
Turn-On Rise Time	t_r			2.7	6	ns
Turn-Off Delay Time	$t_{d(off)}$			73	150	ns
Turn-Off Fall Time	t_f			7.5	15	ns
Total Gate Charge	Q_g	V_{DS} = 80V, I_D = 13.3A, V_{GS} = 10V		17	25	nC
Gate-Source Charge	Q_{gs}			2.2		nC
Gate-Drain Charge	Q_{gd}			3.5		nC
Drain-Source Diode Characteristics and Maximun Ratings						
Drain-Source Diode Forward Current	I_S				13.3	A
Drain-Source Diode Forward Voltage [b]	V_{SD}	V_{GS} = 0V, I_S = 13.3A			1.5	V

Notes :
a.Repetitive Rating : Pulse width limited by maximum junction temperature
b.Pulse Test : Pulse Width ≤ 300µs, Duty Cycle ≤ 2%.
c.Guaranteed by design, not subject to production testing.
d. L=0.5mH, I_{AS}=13.3A, VDD=25V, R_G=25Ω, Starting T_J=25°C
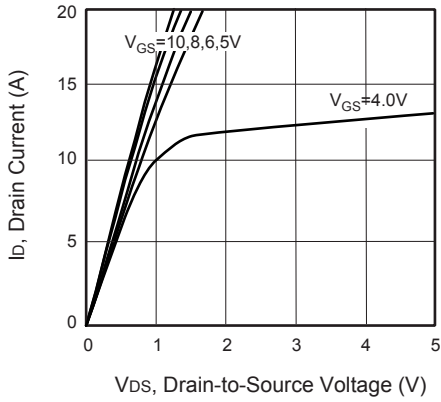
Figure 1. Output Characteristics

V_{GS}=10,8,6,5V

V_{GS}=4.0V

I_D, Drain Current (A)

V_{DS}, Drain-to-Source Voltage (V)
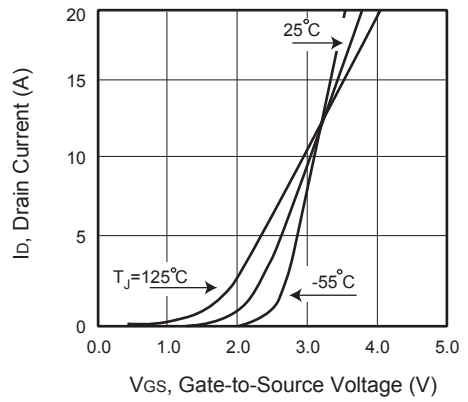
Figure 2. Transfer Characteristics

25°C

T_J=125°C

-55°C

I_D, Drain Current (A)

V_{GS}, Gate-to-Source Voltage (V)

Figure 3. Capacitance

C_{iss}

C_{oss}

C_{rss}

C, Capacitance (pF)

V_{DS}, Drain-to-Source Voltage (V)
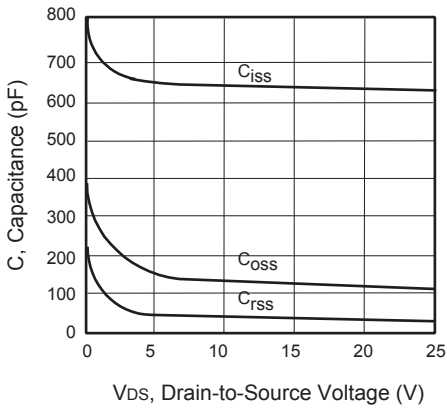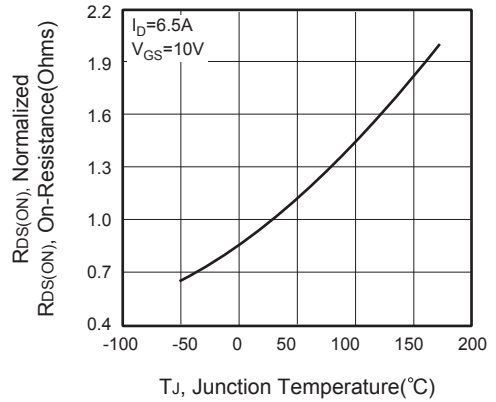
Figure 4. On-Resistance Variation with Temperature

I_D=6.5A
V_{GS}=10V

$R_{DS(ON)}$, Normalized
$R_{DS(ON)}$, On-Resistance(Ohms)

T_J, Junction Temperature(°C)
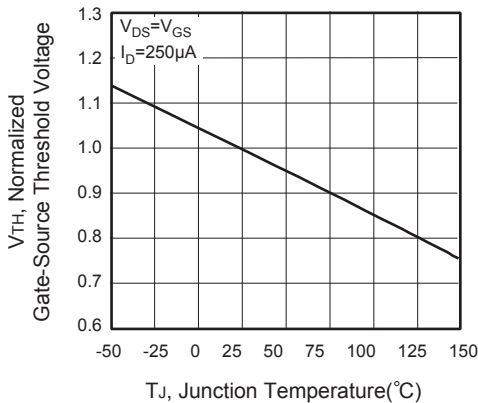
Figure 5. Gate Threshold Variation with Temperature

V_{DS}=V_{GS}
I_D=250µA

V_{TH}, Normalized
Gate-Source Threshold Voltage

T_J, Junction Temperature(°C)
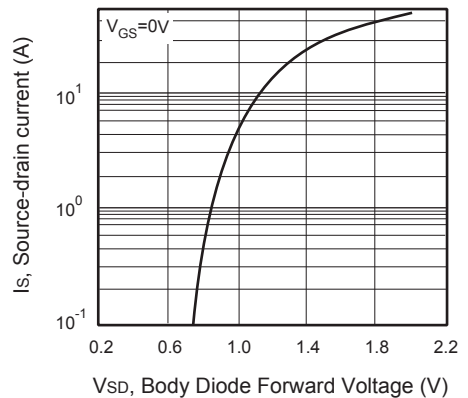
Figure 6. Body Diode Forward Voltage Variation with Source Current

V_{GS}=0V

I_S, Source-drain current (A)

V_{SD}, Body Diode Forward Voltage (V)
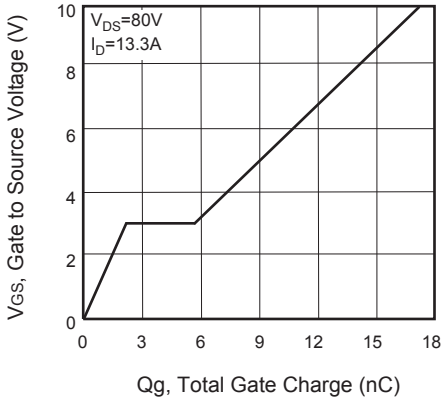
Figure 7. Gate Charge

Figure 7 axes: VGS, Gate to Source Voltage (V) vs Qg, Total Gate Charge (nC). VDS=80V, ID=13.3A
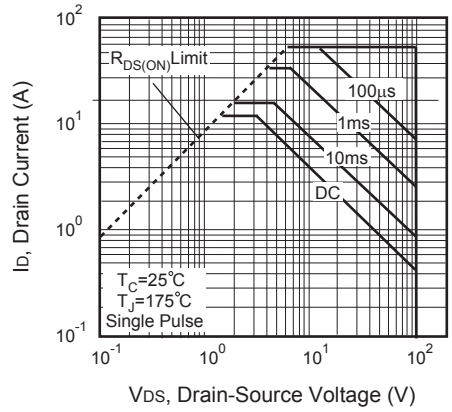
Figure 8. Maximum Safe Operating Area

Figure 8 axes: ID, Drain Current (A) vs VDS, Drain-Source Voltage (V). RDS(ON)Limit, 100μs, 1ms, 10ms, DC, TC=25°C, TJ=175°C, Single Pulse
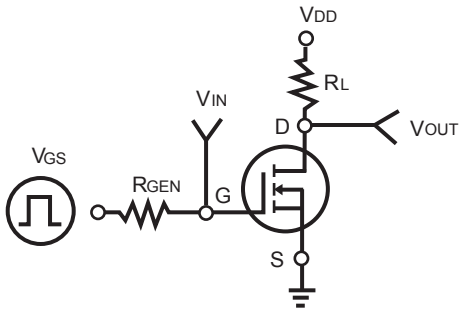
Figure 9. Switching Test Circuit

Figure 9: VDD, RL, D, VOUT, VIN, VGS, RGEN, G, S
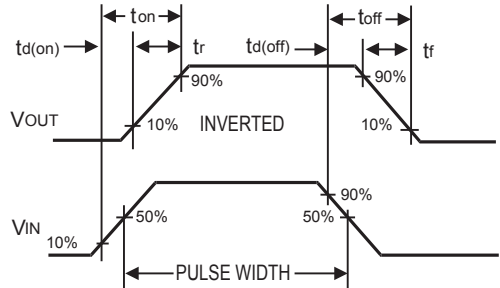
Figure 10. Switching Waveforms

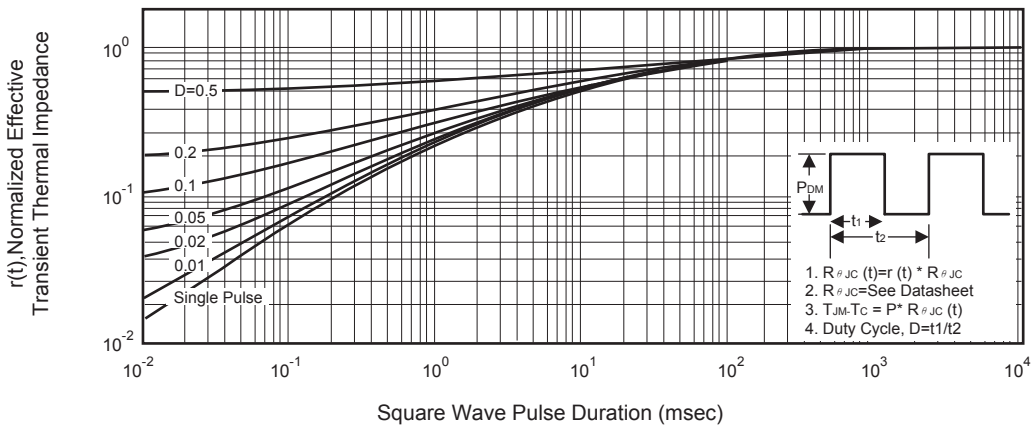Figure 10: ton, toff, td(on), tr, td(off), tf, VOUT, 90%, 10%, INVERTED, 90%, 10%, VIN, 10%, 50%, 90%, 50%, PULSE WIDTH

Figure 11. Normalized Thermal Transient Impedance Curve

Figure 11 axes: r(t), Normalized Effective Transient Thermal Impedance vs Square Wave Pulse Duration (msec). D=0.5, 0.2, 0.1, 0.05, 0.02, 0.01, Single Pulse. P_{DM}, t_1, t_2.

1. $R_{\theta JC}(t) = r(t) * R_{\theta JC}$
2. $R_{\theta JC}$=See Datasheet
3. $T_{JM}-T_C = P * R_{\theta JC}(t)$
4. Duty Cycle, $D = t_1/t_2$